

**INSIGHTS INTO THE PSYCHOBIOLOGY OF PERSONALITY OF  
INDIVIDUALS LIVING WITH CHRONIC ASTHMA TO INFORM  
TREATMENT PLANNING**

by

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**THIS DISSERTATION IS DEDICATED TO**

my husband Wynand

my children: Esther (friend Andrew), Lilian, Beatrice and Wynand

my mother, Esther and late father, Nick

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A family effort has been accomplished! I am proud of you. Thank you for your unfailing belief in me.

## DECLARATION

I declare that **INSIGHTS INTO THE PSYCHOBIOLOGY OF PERSONALITY OF INDIVIDUALS LIVING WITH CHRONIC ASTHMA TO INFORM TREATMENT PLANNING** is my own work and that all sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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Esther W. Erasmus

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Date

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## **ABSTRACT**

This research project aims to provide insights into the psychobiology of personality of individuals living with chronic asthma to inform treatment planning. Personal experience in observing emotional and social difficulties in an asthmatic child over years and an article on the effects of asthma medication on the cognitive and psychosocial functioning of asthmatic learners raised awareness of the problem. Medical illnesses, acute and chronic, are often accompanied by a number of disease-related stressors or events that produce stress. Stress-induced changes in the nerve and immune system affect cognitive and emotional functioning that adversely affect personality development and significantly decrease the individual's quality of life, particularly if sustained over a long period of time. This project followed a quantitative mode of enquiry, and personality profiles were compiled at hand of the 16-PF Questionnaire. The research sample consisted of 11 Afrikaans speaking, 18-year-old asthmatic individuals from the same school. Significantly meaningful characteristics associated with chronic asthma were identified, i.e., a highly tense temperament, accompanied by low resilience, subjective anxiety, low self-worth, as well as surgency or uninhibited behaviour, tempered by moderate spontaneity and warmth. It is envisioned that these insights might significantly inform planning of treatment regimes and lifestyle modification programmes. Stress relief might improve neuroendocrine and immune functioning, delay disease progression, and reduce morbidity and mortality. The focus is thus on a general stress-coping model in order to improve quality of life.

## **KEY WORDS**

Asthma; asthmatic children; chronic illness; chronic stress; disease-related stressors; health management programme; immune functioning; personality development; psychobiology of personality; stress induced changes.

## **CHAPTER ONE**

# **THE ORIENTATIONAL INTRODUCTION AND ACTUALISATION OF THE RESEARCH PROBLEM, THE PROBLEM STATEMENT, THE RESEARCH HYPOTHESIS, AS WELL AS THE RESEARCH METHODOLOGY AND RESEARCH DESIGN**

### **1.1 INTRODUCTION**

This research project aims to provide insights into the psychobiology of personality as a tool for improving psychological and physical health states of individuals living with chronic asthma. Why is it worthy to consider the psychobiology of personality involved in asthma? Medical illnesses, acute and chronic, are often accompanied by a number of disease-related stressors or events that produce stress. These stressors include, but are not limited to physical discomfort, loss of control, financial strain, role changes, death anxiety, social stigma, and general life uncertainty (Andersen 2002: 590-610; Antoni 2003: 173-188). In addition, environmental stressors also affect physiology, neurotransmitters, hormones, and even neurons, sometimes in more than transient ways (Zuckerman 2005: 247). There is therefore little debate that reducing the psychological burden of medical conditions and related stressors is a worthwhile venture for improving at least some aspects of chronically ill individuals' psychological and physical health states. Understanding the psychobiology of personality involved in asthma might contribute to efficacy of treatment plans and lifestyle modification interventions to improve quality of life. Quality of life measures proved to be a useful indication of the efficiency of asthma therapy (Okele, Wu, Krishnan, Rand, Skinner & Diette 2004: 1). If treatment and lifestyle modification planning is done at hand of a thorough understanding of the psychobiology of personality, it might have positive psychological and physiological effects, for example reduce psychological and physical symptoms, alter neuroendocrine and immune functioning, delay disease progression, and reduce morbidity and mortality. This research project thus builds on a general stress-coping model in order to compile a psychobiological personality trait model for asthmatics. It is envisioned that these insights might significantly

contribute to planning of treatment and lifestyle modifications for improving psychological and physical health states of individuals living with chronic asthma.

## **1.2 AWARENESS OF THE RESEARCH PROBLEM**

After having read an article dealing with the effects of asthma medication on the cognitive and psychosocial functioning of asthmatic learners (Naudé & Pretorius 2003), I experienced ambivalence towards pharmacological treatment regimes, since I became alerted to the associated adverse side effects of asthma medication, yet I realized the necessity of treatment. I consequently reviewed some literature on this topic; only to find that treatment is often symptomatic – more severe symptoms necessitate aggressive treatment regimens with higher dosages of medication, which usually include some cortisone derivatives, resulting in an upsurge of side effects. Brown, Khan and Nejtek (1999) ascribed the following symptoms to the prolonged administration of cortisone derivatives: depression (sadness and suicidal ideation), lability (mood swings), mania or hypomania (incidents of elevated mood), increased energy, insomnia, agitation, irritability, rapid speech; delusional beliefs and disorganized thought processes. Both adults and children suffer from these symptoms. The research findings offered by Brown and co-workers (1999) raised questions in my mind about the underlying psychobiology of personality of asthmatic individuals, especially pertaining to an apparent innate proneness to experience mood disturbances and vulnerability to anxiety and stress. Are asthmatic individuals predisposed to develop compromised affect in reaction to chronic illness? Does psychobiological programming result in a specific personality profile? And do asthmatic individuals show specific vulnerability to develop anxiety spectrum disorders? Smyth, Stone, Hurewitz and Kaell (1999) implemented a stress management programme that demonstrated improvements in lung function and overall disease activity among asthmatic individuals, suggesting that anxiety and stress might play a significant psychobiological role in this condition. This search towards a deeper understanding of the underlying personality structure of asthmatic individuals motivated me to consider this topic for my dissertation.

From personal experience I noted that an extensive and tiring process often paves the way towards a diagnosis of chronic asthma, and it usually only happens after a history of breathing difficulties, lung trouble and intermittent hospitalisation. A close family

member, an adolescent girl, was diagnosed with chronic asthma after serious deterioration of lung function. Even with a history of minor seasonal asthmatic attacks, although sometimes years apart, it was difficult for a layperson to detect the increased medical severity of her asthmatic status. Yet, it had been easy to notice her anxious behaviour during those years. Reflecting on the entwined nature of her overt anxiety and deteriorating asthma status during those years, I am convinced that a deeper understanding is needed of the relationship between stress and anxiety spectrum tendencies and the severity of asthma. In recollection it is easy to recall those many times that this girl seemed anxious, yet with little or no apparent reason, e.g. separation anxiety as a toddler, which later intermittently surfaced again during early childhood. As a toddler she seemed content to be playing alone and at times she even avoided peer interaction, which culminated in frequent feelings of loneliness. Eventually, after chronic asthma had been diagnosed following years of sporadic asthma attacks, and once her medical condition had been stabilized, it became obvious that she was more willing and eager to interact with friends. Her improved physical health state supported her to engage socially and to more habitually invite friends over. Prior to this she had been socially cautious, and she tended to avoid social interaction with peers, whom she subjectively experienced as being 'different' - to such extent that her physical health state might have limited or deprived her of social learning opportunities. After her asthma status had been stabilized, she was better able to apply herself socially, especially in terms of risk-taking behaviour. However, I'm speculating on the probable co-existence of innate anxiety with chronic asthma, as well as whether the onset of anxiety spectrum behaviour could be attributed to a specific psychobiology of personality, or whether asthma as a chronic medical condition holds the potential to programme and steer personality development towards a certain direction.

### **1.3 ACTUALITY, ANALYSIS OF THE RESEARCH PROBLEM AND LITERATURE REVIEW**

Rees and Kanabar (2001: 4-6) claim that the prevalence of asthma is gradually on the increase in most countries, while Gustafson and co-workers (2002: 2) state that the prevalence of childhood asthma has doubled during the recent decade. According to these researchers the frequency of asthma diagnoses has risen globally and it has become the most common chronic disease in childhood and adolescence.

“Asthma is a complicated illness, which is related to the functioning of the central nervous system and to immunological disorders” (Stern 1981: 4). The severity of asthma attacks can be mild to life threatening, and symptoms might vary from mere congestion to ‘status asthma’, which is a life threatening persistent bronchial spasm resulting in possible unconsciousness and significant changes in the chemistry and metabolism of the body (Stern 1981: 3).

According to Okele, Wu, Krishnan and co-workers (2004: 1) the quality of life, and so the emotional well being of some asthmatic individuals, are compromised by feelings of depression, as well as by increased asthmatic morbidity associated with poor control of asthma symptoms. Kang and Fox (2000: 1) found that acute stress may induce significant neuroendocrine and immune changes that can affect pulmonary function in children with and without asthma. These negative physiological and psychological health states lead to increased use of health care services, consultations with health care practitioners, and school absenteeism. Okele et al (2004: 1) recommend that quality of life assessment should form part of an extensive, all-embracing health care regime.

### **1.3.1 The influence of asthma on the developing personality**

Despite William McDougall’s argument in 1939 that medicine and psychology cannot learn from each other, a more holistic view of the connectedness and integration between the soma and psyche started to evolve from the neo-psychoanalytic theories, and this holistic view is now being accepted by the affective neurosciences (Oxington 2005). Apparently the majority of recent researchers have only focussed on the negative aspects of being a care-recipient or a caregiver, such as findings suggesting that a secondary risk for emotional difficulty is involved with chronic illnesses (Vila, Nollet-Clemcon, de Blik, Mouren-Simeoni & Scheinmann 2000: 1-15). In addition, empirical findings suggest that chronic illness habitually result in compromised emotional and cognitive functioning among chronically ill (Naudé & Pretorius 2003).

The complex human nature requires that the entire body of variables contributing to personality development is considered, i.e., “seeing the whole person in his/her context” (Stern 1981: 37), in order to promote an understanding of how illness affects personality development. The body of variables includes (but is not limited to) genetic

predispositions, immunological deficits, innate proneness to allergies, temperamental differences, and the psychobiological make-up of the individual, which might predispose development of a certain personality type (Vila et al 2000). These researchers argue that chronic physical illness affects the individual's self-perception, as well as the individual's interaction with family members and the broader social environment. Complaints of emotional difficulty often accompany symptoms of severe asthma, especially when asthmatic individuals do not respond to or comply with treatment regimes. It was concluded that successful resolution of emotional difficulty frequently also stabilises asthma symptomatology. In addition, Vila and co-workers (2000) reported a higher incidence of behavioural disturbances among asthmatic individuals, compared to non-asthmatic populations, such as denial, overly compensating behaviours, depression, embarrassment, and a lack of confidence, in keeping with Stern's (1981: 11) earlier remark that asthma be called '*a disease of dependency*'. Although Stern could not single out any specific personality type, this researcher also reported on feelings of being singled out, a strong fear of death, inhibited demonstration of anger and self-assertion, higher personal goal setting, often higher verbal intelligence accompanied by poorer performance ability, over-anxiousness, limited self-confidence and feelings of guilt.

According to Rees and Kanabar (2001: 12) asthma is primarily a genetic disorder, yet symptomatology might be exacerbated by vulnerability to allergens, psychogenic factors, and a susceptible personality structure. Although these researchers have pointed out a susceptible personality structure, they did not elaborate on the delicate intricacy between personality structure and physiological health, nor did they flesh out the nature of such a personality structure. Even though various researchers have commented on a variety of personality indicators based on peripheral observations, the preceding overview illustrates the scarcity of research into the psychobiology of personality involved in asthma. What then are the factors associated with asthma that might influence personality development?

### **1.3.2 Psychosocial factors: Family burden**

Chronic asthma holds psychological implications for patients and their families. The quality of family interaction is often determined by family members' degree of emotional adjustment to this chronic illness (Duff 2001: 350-357). Although asthmatic individuals are very much dependent on specialized medical health services, their supplementary

primary health care continues to be the responsibility of the parents, caregivers, and/or relatives. Any asthma treatment regime requires that accommodating changes be made to the family lifestyle, coupled with greater financial burdens due to additional medical expenses, which factors might compromise quality of life (Gustafson, Olofsson, Anderson, Lindberg & Schollin 2002: 2,7). A common psychological response to these accommodating changes is role overload which results from the physical, psychological, emotional, social, and financial strains that are associated with providing care to an ill family member (Pinquart & Sörensen 2005: 167). Overload resulting from these strains may affect parenting style and child-rearing practices, thereby ultimately affecting the personality development of the asthmatic child.

In addition, caring for a chronically ill family member could become an overwhelming obligation, which might impact on the personality development of the offspring. The psychological stress that escalates within the family arises from various aspects of the disease, such as the severity, visibility, predictability and course of the condition itself, the resilience of the patient and caregivers, and the social and medical living environment (Bookwala & Schulz 2000: 607-616). Pinquart and Sörensen (2005: 166) report that stress may also emerge from the changing nature of caregivers' social roles. For example, caregivers may have less time to spend with friends, to fulfil other family obligations, to pursue leisure pursuits, or to work outside the home. These subjective burdens may produce certain emotional reactions in parents as caregivers, such as feelings of entrapment, worry, anxiety, frustration and fatigue. A substantial number of studies shows that providing care for a chronically ill family member is associated with increased psychological distress (Donaldson, Tarrier & Burns 1998: 248-256; Schulz, Newsom, Mittelmark, et al 1997: 110-116; Schulz, O'Brien, Bookwala & Fleissner 1995: 71-791; Schulz, Tompkins, Wood & Decker 1987: 401-428), and this increased psychological distress might change the affective atmosphere within the inner family circle, thereby affecting the way the asthmatic child is raised, and ultimately his or her personality development.

Vila et al (2000: 2) argue that a chronic, severe illness starting early in life, accompanied by a risk of dying from asphyxia, might be anxiogenic for children and parents, and consequently may be associated with the pathogenesis of atypical and unhealthy family interactions. Duff (2001: 350-357) observed a loss of identity, a loss of independence, and

isolation from the peer group among adolescents suffering from chronic asthma, resulting in subjective depreciation of the self, as well as depression and anxiety. Vila and co-workers (2000: 9) noted similar observations, suggesting a probable higher incidence of anxiety spectrum disorders among asthmatic children.

### **1.3.3 Stress, anxiety and illness**

Stress reactions play an important and often harmful role in stimulating chemical changes in the complex endocrine circuitry that determine main physiological and psychological functions. Baron and Byrne (1997: 528) identified two factors that are involved in stress related illness, namely when enduring stressors lead to depression, anxiety and worry that interfere with day-to-day functioning, and when the immune system is compromised due to chronic stress, especially when physical reserves are exhausted. Physical reserves are used to resist or to cope with stress, and even anticipated stressful events can weaken or suppress immunity (Sternberg 1995: 722-723). According to Kiecolt-Glaser (in Kaplan 1991: 913) chronic health problems and associated medication may adversely affect immune functioning. Some researchers describe asthma as an autoimmune disease and asthmatics' particular vulnerability to stress (O'Leary 1990: 363). During a stressful situation the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system activates the physiological stress response, which is regulated by complex feedback mechanisms. This activation results in changes in the concentration of several stress related mediators, e.g. the secretion of cortisol from the adrenal cortex, resulting in immune suppression. Different stressors induce different patterns of mediators (Kimura, Isowa, Ohira & Murashima 2005: 1; Pruett 2003: 133). Research findings demonstrated a positive correlation between compromised immune functioning and affective disorders (Franceschi, Olivieri, Marchegiani et al 2005; Ader & Cohen 1993; Irwin et al 1987), suggesting an embedded psychobiology.

### **1.3.4 Uplifts associated with care recipient/caregiver relationships**

Thus far research findings have only pointed out negative emotions associated with asthma, and these negative emotions were noted among asthmatic care recipients as well as caregivers - surely there must be some positive offshoot associated with caring for

chronically ill that might impact on the personality development of asthmatic care recipients?

Pinquart and Sörensen (2005: 165-206) argue that despite caregiving stressors, caregivers also experience associated positive events, the so-called ‘uplifts of caregiving’, such as feeling useful, appreciating closeness to the care recipient, and experiencing pride in one’s own abilities to handle crises. Could it be that these uplifts might potentially counter the known psychological burdens flowing from caregiving distress? Farran, Keane-Hagerty, Salloway, Kupferer, and Wilken (1991: 483) conducted a qualitative study among Alzheimer’s disease family caregivers and reported that up to 90% of their research participants experienced pride in their ability to meet challenges, an enhanced sense of meaning, or a closer relationship with the care recipient. I thus propose that parents as caregivers of asthmatic individuals might experience similar uplifts, which might result in a special kind of emotional bonding and attachment, thereby influencing parent-child interactions in a unique way, and ultimately also the psychobiology of the asthmatic child’s personality.

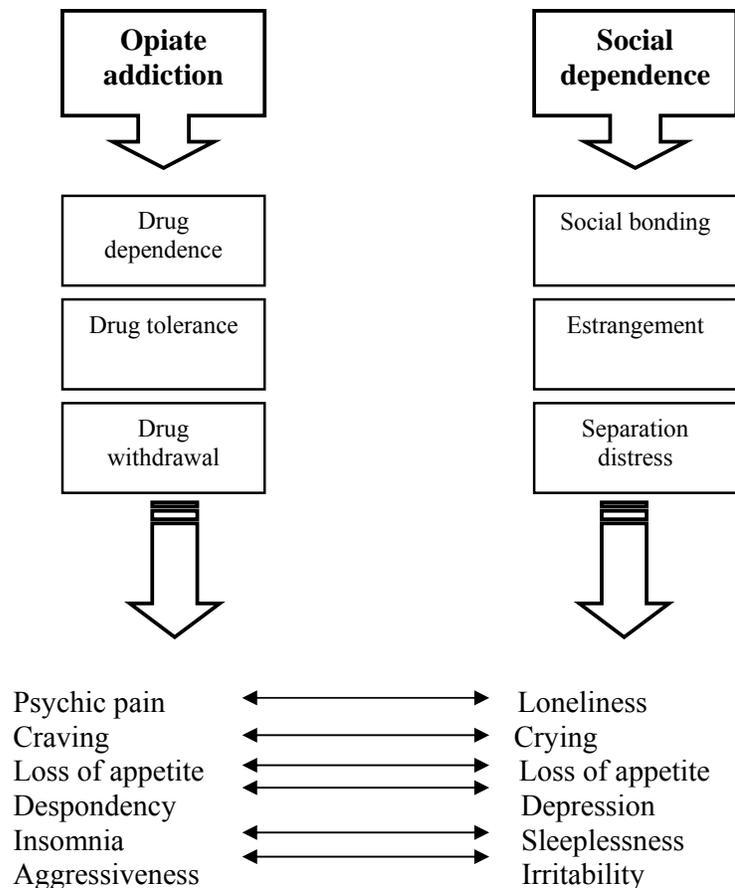
From a psychobiological point of view the uplifts and positive well being ensuing from these care-recipient/caregiver relationships are likely to reflect oxytocin-induced bonding and attachment. Oxytocin is a hormone that promotes a feeling of connection and bonding, and it is released during close interactions with loved ones, such as when a parent hugs his/her child, or when a mother nurses her child (Slater 2006: 45). Panksepp (1998: 249) reports that neurochemical systems within the sub-cortical areas such as the cingulate gyrus, septal area, bed nucleus of the stria terminalis, and preoptic and medial areas of the hypothalamus, along with their respective mesencephalic projection areas are mediated by oxytocin and are responsible for social processes such as bonding, acceptance, nurturance, and love. When these chemical systems show imbalances, the individual experiences emotional problems, which, if sufficiently severe, can be deemed psychiatrically significant bonding disorders.

Social bonding is of enormous psychological importance, for if it is inadequately established, the individual could suffer severe consequences for the rest of his or her life. A solid social bond appears to give the child sufficient confidence to explore the world and face a variety of life challenges as they emerge. Panksepp (1998: 254) states that a child

that never had a secure base during childhood may spend the rest of its life with insecurities and emotional difficulties, in keeping with the well-known attachment theory. According to Panksepp (1998: 255) these social bonds have a certain neurochemical foundation, e.g., specific neural circuits mediate separation distress and these circuits are under the control of the brain opioid system. It is well acknowledged that parents, particularly the mothers, are more involved in the care of their asthmatic children due to disease-related demands, compared to mothers of non-asthmatic children. Psychologists suggest that this maternal involvement usually result in social dependence and separation anxiety among asthmatic children, which seems to be a generalizing statement. Why then do some asthmatic children become dependent, while others show adequate self-sufficiency? Panksepp (1998: 255) states that when parents share friendly time grooming and caring for their children, as well as when they share positive, loving and pleasurable family interaction, the opioid systems of children are activated.

From a psychobiological perspective it is inferred that the brain opioid system might be inhibited in some asthmatic individuals presenting with social dependence and separation anxiety, while those who have experienced positive social interaction and care within the family might develop self-sufficiency due to release of opioids in the brain. These lines of inquiry provide a powerful new way to understand social dependence and separation distress among some asthmatic children, because the brain opioid system was found to exert a powerful inhibitory effect on social dependence and separation distress. Consequently, it seems to be the quality of involvement and care that is implicated in the pathogenesis of dependence and separation distress among asthmatic children, and not the quantity of maternal involvement and care. Similarly, Cattell (1989) found that some asthmatic individuals show a certain vulnerability to substance dependence, especially to alcohol - a phenomenon that is poorly understood.

Panksepp (1998: 255) argues that there are some dynamic similarities between opiate addiction and oxytocin-induced social dependence, as illustrated in figure 1.1 below:



**Figure 1.1: Similarities between opiate addiction and social dependence**

Source: Adapted from Panksepp 1998: 255

In a similar way do neural circuits mediate family attachments and social bonding, and this circuitry is neurochemically controlled by oxytocin, a non-peptide hormone synthesized in the para-ventricular and supra-optical nuclei of the hypothalamus (Wu & Yu 2004: 119). In reviewing these findings I drew some inferences between observed behaviors among asthmatic individuals and oxytocin-induced behaviors, suggesting that a certain psychobiology characterizes the asthmatic individual's personality structure.

It is known that oxytocin performs diverse biological functions through the oxytocin receptor, a G-protein coupled receptor (Panksepp 1998: 250). Apart from the role that oxytocin plays in social bonding; it is also implicated in behavioral regulation in general, as well as in spatial learning and memory, especially verbal memory storage (Bruins,

Hijman & Van Ree 1992: 461). Various researchers have demonstrated that oxytocin and its derivatives may either inhibit or facilitate social memory, depending on dose, route or paradigm (Popik & van Ree 1998: 415; Engelmann, Ebner, Wotjak & Landgraf 1998: 89; Kendrick, Da Costa & Broad et al 1997: 383). In addition to these findings Wu and Yu (2004: 119-125) explored the role of oxytocin in spatial learning and memory in the nucleus basalis of Meynert (NBM) of the hippocampus and suggested that oxytocin plays an inhibitory role in spatial learning. In converging these findings with reported advanced verbal abilities among asthmatic individuals, accompanied by inhibited non-verbal abilities, it is suspected that the dynamics of oxytocin brain circuitry might be inter-related to quality of early bonding as well as to language development, due to heightened release of oxytocin associated with early bonding and care.

Wu and Yu (2004) argue that oxytocin probably impairs spatial learning through the interaction with cholinergic system, since this system of NBM has been demonstrated earlier to play a very important role in learning and memory (Muir, Page, Sirinathsinghji, Robbins & Everitt 1993: 123– 131). The wide variety of observed effects has led to the suggestion that oxytocin has a more general effect on cortical arousal rather than a specific effect limited to a certain stage of information processing (Gimpl & Fahrenholz 2001: 629). In addition, Tsumoto (1993: 263– 270) hypothesized that oxytocin could be “a possible substrate of forgetting”. Complementary to these findings on the role of oxytocin in information processing, behavioral effects were also noted. Panksepp (1998: 201) states that oxytocin promotes nurturing behaviour and positive social bonds, and that it is an effective anti-aggressive agent. It is thus suspected that asthmatic individuals might be more submissive and peace seeking within social relations due to this psychobiological connotation.

Furthermore, Wu and Yu (2004: 119-125) reported that treatment with oxytocin, either intra-ventricular or into certain brain areas (gyrus dentate, dorsal raphe nucleus) impaired passive avoidance, while Dubrovsky, Harris, Gijsbers and Tatarinov (2002: 141– 147) reported that oxytocin induced long-term depression on the dentate gyrus.

Specific information processing styles, together with personality traits such as submissiveness and peace-seeking behaviors, passive avoidance, anxiety, depression, and dependence might produce specific coping mechanisms, which might have implications for

planning of psychological and physiological health promoting and treatment programmes, thereby justifying an investigation into the psychobiology of personality involved in asthma.

#### **1.4 RATIONALE FOR THE STUDY**

Considering the preceding review of the relevant literature, as well as the analysis of the research problem, the rationale for this study will now be explained.

##### **1.4.1 Stress reduction among special medical populations**

The basic premise is that certain personality types are more vulnerable to life stressors, resulting in mood and anxiety disorders, as well as maladaptive coping mechanisms. When reviewing the sympathetic adrenomedullary (SAM) system and the hypothalamic-pituitary-adrenal (HPA) axis, there seems to be a close link between the psychobiology of personality and physiological responses to stressors associated with chronic illness (Kemeny 2003: 124-129). Individuals showing specific personality traits are more vulnerable to express physiological responses to stressors as chronic disease, e.g., cardiovascular disease, diabetes, hypertension, and probably certain autoimmune responses (Cattell 1989). In addition, stress can enhance the inflammatory response of the immune system, while chronic inflammation can adversely affect health and exacerbate asthma symptoms (Oxington 2005). Thus, chronic stressors such as medical conditions can negatively impact health outcomes because of their deleterious effects on both the endocrine and immune systems (Kemeny 2003: 124-129). An in-depth understanding of asthmatic individuals' basic personality traits might promote an awareness of specific vulnerability to stressors and of co-existing anxiety and mood disorders, as well as constitutional differences in reactivity and self-regulation, influenced over time by heredity, maturation, culture, gender and experience (Zuckerman 2005).

Asthma is mostly viewed a chronic illness that requires lifelong treatment, and it is often accompanied by financial, social, and psychological burdens. Individuals diagnosed with asthma are subject to a number of stressors that, while not unique to this medical condition, often combine to present a formidable challenge with which to cope. Given the potentially harmful effects of stress and maladaptive coping mechanism, professional health care

workers have become interested in specific personality traits that might predispose these individuals to be more vulnerable to the negative effects of enduring stress and maladaptive coping mechanisms; traits that might promote resilience among this specific medical population; traits that might support stress reduction interventions, health protective behaviour, and lifestyle modification intervention as tools for improving psychological and physical health states among individuals living with asthma.

As a consequence of specific personality traits, enduring distress, denial (a coping mechanism that is often maladaptive), and low compliance to health interventions have been found to predict more rapid disease progression (Ironson, Field, Scafidi et al 1996). In addition, Antoni, Lehman, Kilbourn and colleagues (2001) demonstrated at hand of clinical studies the beneficial impact of cognitive-behavioural stress management (CBSM) interventions and stress reduction interventions, such as exercise programs, on immunological and health-related indices among chronically ill populations (Antoni et al 2001). Both the exercise and the CBSM intervention studies demonstrated positive psychological and immune changes, with a significant buffering effect on increases in anxiety and depressed mood among chronically ill populations, together with an increase in several beneficial immune markers. Additional endocrine changes were observed, including decreases in urinary cortisol levels and increases in serum dehydroepiandrosterone sulphate (DHEA-S) that were related to reductions in depressed mood (Crues 2000). Reductions in plasma noradrenalin levels were associated with decreases in anxiety. A shift in endocrine levels is associated with reductions in mood disturbance and perceived stress. These hormonal changes are consequently associated with immune changes in asthmatic individuals. Considering that asthmatic individuals are routinely treated with corticosteroids to address inflammatory responses, and that asthma as a chronic illness poses additional stressors, it might be inferred that plasma corticosteroids, as well as plasma noradrenalin levels might be heightened. Increased plasma corticosteroid levels due to heightened stress habitually trigger depressed mood disorders, while increases in plasma noradrenalin commonly result in exacerbated anxiety responses. Depressed mood and heightened anxiety closely relate to disturbed social relations, illustrating that personality traits and associated behaviour originate from the psychobiology of personality.

Stress management interventions have also been developed to assist chronically ill individuals towards medication compliance, which asthmatic individuals often perceive as a stressful burden. These findings suggest that an understanding of the psychobiology of personality associated with asthma and identification of at-risk personality traits might buffer the distress response and immunological changes following diagnosis of status asthma, resulting in positive health behaviours and medication compliance. Stern (1981: 4) implicates central nervous system and immunological involvement in the pathogenesis of asthma, therefore insights into the neurobiology of personality might ultimately serve as a tool for improving psychological and physical health states of individuals living with chronic asthma, because central nervous system and immunological functioning, as well as sympathetic and parasympathetic system arousal embed the psychobiology of personality.

Perceived stress may lead to increased sympathetic nervous system arousal, and such activation may then contribute to adverse cardiovascular effects such as myocardial ischemia or cardiac arrhythmias, which are often found in close association with asthma (Claar & Blumenthal 2003). A meta-analysis of early studies examining the efficacy of stress management interventions in cardiovascular disease populations demonstrated that supplementing standard health care regimes with stress management interventions was related to increased quality of life and reduced mortality (Linden, Stossel & Maurice 1996). Although stress management interventions among chronically ill populations with/or at-risk-for cardiovascular disease might not reliably decrease disease-related morbidity and mortality, it was demonstrated that such interventions can lower risk-markers and should thus be considered as a useful adjunct therapy along with standard medical care (Sundin, Lisspers, Hofman-Bang, Nygren, Ryden & Ohman 2003; Blumenthal, Jiang, Babyak, Krantz, Frid, Coleman, Waugh, Hanson, Applebaum, O'Connor & Morris 1997). Rutledge and Loh (2004) concluded that such stress management interventions offer additional benefit, over and above usual medical care, in chronically ill individuals. However, in order to meet these demands, insights into the psychobiology of personality associated with asthma should be explored.

#### **1.4.2 Neurochemistry and circuitry**

It was already noted that the endocrine system is activated with stress, primarily through activation of the HPA axis, as the endocrine system's neuromodulators or neuropeptides

are secreted in reaction to stress, thereby affecting the nervous system, since these stress hormones are donated directly into the bloodstream (Gaab, Sonderegger, Scherrer & Ehlert 2005: 429). Corticotrophin releasing factor (CFR) is secreted by the hypothalamus and stimulates the pituitary gland. Further down the HPA axis the pituitary gland activates the adrenal gland, and the stress hormones adrenaline, noradrenalin and cortisol are secreted to complete the feedback loop between the limbic system and the various parts of the HPA axis (Panksepp 1998: 119). The stress response, via sympathetic efferents, activates the release of adrenaline and noradrenalin from the adrenal medulla. It is therefore suspected that asthmatic individuals might reveal specific personality traits, and consequently also a unique psychobiology of personality.

#### **1.4.2.1 Adrenaline**

The existence of adrenaline in the brain was not accepted until the adrenaline-synthesizing enzyme phenyl-ethanolamine-N-methyl transferase (PNMT) was detected by immunohistochemical methods (Panksepp 1998: 119). This enzyme is localized in the lower brainstem, fused with noradrenergic neurons (Herlenius & Lagercrantz 2004: 8). Adrenalin in the brain is probably involved in neuroendocrine and blood pressure control, associated with cardiovascular disease in asthmatic individuals.

#### **1.4.2.2 Noradrenalin**

Compared to dopamine system outputs that are restricted to the reptilian brain (i.e., the basal ganglia) and the frontal cortex, the projections of the noradrenalin systems are more widespread. The cell bodies of the noradrenergic neurons are concentrated in the brain stem, particularly in the locus coeruleus within the caudal pons (Kolb & Whishaw 2003: 114). Five major noradrenergic tracts originate from the locus coeruleus and disperse through the whole brain (Herlenius & Lagercrantz 2004: 9). The locus coeruleus controls higher brain activity via the *dorsal noradrenalin pathway*. This pathway sends inputs to the cortex, hypothalamus, cerebellum, lower brain stem, and spinal cord, thereby exerting control over cortical arousal and attention, fear and anxiety, and learning and memory. The *ventral noradrenalin pathway* infiltrates the hypothalamus and the limbic system (Panksepp 1998: 101). With low noradrenalin activity individuals tend to perseverate on a task, despite stimulus change, mostly because of attention deficits. Such individuals are

prone to act impulsively rather than deliberately, demonstrating that impulsivity has a psychobiological substrate.

#### **1.4.2.3 *Cortisol***

Diaz, Fuxe and Ogren (1997: 129) reported that administration of glucocorticosteroids induce alterations of dopamine receptor responses. Since asthmatic individuals are often and routinely treated with glucocorticosteroids, it follows that their dopamine receptor responses might be altered, resulting in mood disorders. Due to glucocorticosteroid involvement in stress responses, glucocorticoid overload resulting from enduring stress can alter healthy immune system functioning, thereby affecting cytokines and indirectly the monoaminergic circuits in the brain (Jarskog, Xiao & Wilkie et al 1997: 711). Teratogenic effects of chronic exposure to glucocorticoids can alter the monoamine turnover in the locus coeruleus and nucleus tractus solitarius (Peyronnet, Dalmaz & Ehrström et al 2002: 858). In addition, enduring stress appears to affect ascending serotonergic projections into the hippocampus and long-lasting increase in glucocorticoid receptors (Sapolsky 1996: 749-750). These reciprocal changes are implicated in a permanently altered HPA axis.

#### **1.4.2.4 *Dopamine and Serotonin***

Serotonin (5-HT) and dopamine are of interest because individuals with mood disorders have consistently been found to have abnormal levels of blood plasma serotonin and/or dopamine (Hughes, Petty, Fheikha, & Kramer 1996: 79). The fact that dopamine appears to be necessary for circuits in the basal ganglia to function suggests that it may have an indirect role in memory formation (Kolb & Whishaw 2003). The 5-HT neurons have widespread projections making it possible to coordinate complex sensory and motor behavioral conditions. Meyer, Van Papendorp, Meij and Viljoen (2004: 7) report that serotonin is involved in the regulation of circadian rhythms, temperature regulation, control of mood, and serotonergic activity is found to be highest during waking and arousal.

### **1.4.3 Personality traits**

Personality traits are enduring patterns of perceiving, relating to, and thinking about the environment and oneself that are exhibited in a wide range of social and personal contexts (DSM-IV-TR 2000). Specific personality traits might result in specific maladaptive functioning in areas such as cognition, affectivity, interpersonal functioning, and impulse control across a broad range of personal and social situations. This maladaptive functioning might lead to clinically significant distress or impairment in social, occupational, and other important areas of functioning, and if indicated, a single clinical diagnosis of Personality Disorder might be coded on Axis II, or in co-existence with another Axis I-disorder, while medical conditions such as asthma are recorded on Axis III.

There have been many different attempts to identify the most fundamental dimensions that underlie the entire domain of normal and pathological personality functioning, varying from two- or three-dimensional systems (Eysenck & Eysenck 1985; Block 2001; Tellegen 1985) to five dimensional systems (Goldberg 1990; Costa & McCrae 1992), consisting of five super traits such as neuroticism, extraversion, openness, agreeableness, and conscientiousness. Cattell (1989) introduced the 16-Personality Factor analysis, thereby covering the most important areas of personality function/dysfunction. This research project is organized around these 16 factors of personality.

### **1.4.4 The link between personality traits, chronic illness, self-care and treatment compliance**

Skinner, Hampsonb and Fife-Schawb (2002) compared three models of association between personality, personal model beliefs, and self-care in a cross-sectional design. These researchers postulated that (a) emotional stability determines self-care indirectly through personal model beliefs, and conscientiousness is a direct predictor of self-care; (b) emotional stability determines self-care indirectly through personal model beliefs, and conscientiousness moderates the association between beliefs and self-care; and (c) both emotional stability and conscientiousness determine self-care indirectly through personal model beliefs. Structural equation indicated that both emotional stability (Factor C on the 16PF) and conscientiousness (Factors G and Q3) determine self-care indirectly through personal model beliefs.

Van Tilberg and co-workers in 2001 administered the *Beck Depression Inventory* (BDI) to investigate the relationship between depression and level of self-care among chronically ill individuals. They concluded that variations in depressive mood, below the level of clinical depression, are associated with meaningful differences in level of self-care, and it was suggested that this effect may be mediated, at least in part, by decreased self-care behaviours in patients with more depressed mood.

Previous research showed that providing patients with information about their medical condition is mostly insufficient for treatment compliance. Nuryberg, Kreidler and Weisslerb in 1996 developed a new model for studying and promoting treatment compliance based on the theory of cognitive orientation, which assumes that in addition to knowledge, it is necessary to also consider the individual's goals, values and self image, i.e., individuals' scores on factors C, G, Q2 and Q3 of the 16-PF. In addition, Lane and co-workers in 2000 investigated whether traits of normal personality are associated with adherence to health management programs at hand of correlation and linear regression models. It was found that neuroticism and several specific traits including anxiety, angry hostility, depression, and self-consciousness played a significant role in adherence to health management programmes. These researchers concluded that personality traits might offer new insights into health management and lifestyle modification programmes for individuals undergoing standard medical treatment. They also found that the relative tendency to focus on the needs of others instead of oneself, i.e., low scores on factors Q2 and Q3 of the 16-PF, could prove to be a risk factor for poor self-care.

Williams, Colder and Lane et al in 2002 examined the relationship between neuroticism and physical symptom reports among 94 diabetics by correlating disease-related symptoms with rated negative affect, positive affect, and blood glucose levels. It was demonstrated that neuroticism, negative affect, and positive affect were all related to symptom frequency. Neuroticism moderated the relation between positive affect and symptom reports - lower positive affect strongly relates to symptom reports among highly neurotic individuals. In addition, there was evidence that symptoms mediated the relationship between neuroticism and state negative affect. These researchers concluded that neurotism might negatively impact on self-regulatory behaviour in chronically ill individuals, and thereby they demonstrated the psychobiological substrate to personality and how specific

personality traits might contribute to physical illness, and conversely how physical illness might contribute to a specific psychobiological constellation of personality traits.

## **1.5 DEFINITION OF KEY CONCEPTS**

The following definitions are offered in order to enhance the focus of this research project:

### **1.5.1 Insights**

Insights suggest a deeper knowledge of a certain phenomena, with the associated ability to make significant relations, inferences and conclusions.

### **1.5.2 Psychobiology of personality**

Psychobiology serves as a frame of reference to understand, to explore and to explain phenomena at all levels of personality. The basic premise is that a specific neurochemical brain circuitry underlies different personality traits. In this study it is a comprehensive term to describe the connection between the psyche and the different levels of influence and expression in personality as it is explored and explained in different subject areas, like psychophysiology, psycho-biochemistry, psychopathology and psychopharmacology.

### **1.5.3 A tool**

A tool could be seen as an instrument that might be utilized towards construction of a certain product, referring for purposes of this research project to the planning of health treatment programs for people living with asthma.

### **1.5.4 Psychological health states**

The concept ‘psychological health states’ refers to an optimum level of cognitive, affective, social and occupational functioning without significant distress, disability, or other disabling conditions.

For purposes of this research project ‘psychological health’ implies the absence of one or more specific psychological or behavioural factors that might adversely affect a general medical condition such as asthma. There are several different ways in which these factors can adversely affect asthma. These factors can influence the course of asthma, they may interfere with treatment, or they may constitute an additional health risk for the individual, e.g., continued overeating in an individual with weight-related diabetes. These factors may also precipitate or exacerbate asthma symptoms by eliciting stress-related physiological responses such as bronchospasms in individuals with asthma.

“Psychological factors play a potential role in the presentation and/or treatment of almost every medical condition” (APA 2000: 732), therefore the concept ‘psychological health’ refers to an absence of factors that have a clinically significant effect on the course or outcome of asthma, or place the individual at a significantly higher risk for an adverse outcome” (APA 2000: 732).

#### **1.5.5 Physical health states**

The title of this research project implies a distinction between ‘psychological health’ and ‘physical health’ that is a reductionistic view of the body/mind dualism. A personality trait or a maladaptive coping style could significantly affect the course or treatment of asthma. In addition, personality traits can pose a risk factor for certain illnesses, e.g., “type A”, pressured, hostile behaviour for coronary artery disease, and problematic personality traits and maladaptive coping styles can impede the working relationship with health care personnel (APA 2000: 732).

#### **1.5.6 Asthma**

According to Stern (1981: 2) asthma is the process where airflow to and from the small air sacs of the lung is constricted by the muscular contraction of the bronchial wall, which prevent the normal emptying of the hyper-inflated alveoli. During an asthma attack, an excess of mucus, which becomes thicker as it dries, is produced and secreted in the lungs, thus further reducing the airflow.

### **1.5.7 Chronic asthma**

According to Holgate (1997: 12) chronic asthma is the result of structural alteration and persistent inflammation of the airways due to the dysregulation of cytokine. The structurally altered airways become non-respondent to treatment. The concept 'chronic' thus implies that this medical condition is of unremitting, enduring and pervasive nature.

### **1.5.8 Anxiety**

Anxiety is an ongoing or lasting tension that is generally associated with an apprehended unknown. In the case of asthma, anxiety is frequently produced by fear for another asthma attack, associated with difficulty to breathe and fear of dying (Stern 1981: 18). The inference is that anxiety build-up in asthmatic individuals might be ascribed to external and internal threats to the well being and quality of life.

Anxiety is a normal and universal emotion that is essential for human functioning. Tense emotional states are marked by physical symptoms such as tension, tremor, sweating, palpitations and increased pulse rate. It is non-specific, diffuse and anticipatory in nature (Nagrai 1997: 39). Nagrai (1997: 41, 43) argues that a child's personality development is likely to be affected by his/her limited tolerance for excessive stress and anxiety, coupled with a restricted repertoire of coping mechanisms.

### **1.5.9 Stress**

According to Pruet (2003: 133) no definition is able to do justice to the concept *stress*. Lazarus and Folkman (in Vollhardt 1991) define the concept *stress* as the relationship between a person and his/her surroundings, which he/she perceives as overwhelming and taxing on his/her coping skills.

Stern (1981: 20) conceptualises *stress* as a type of emotional arousal (fear or anxiety), or a form of physical exertion. Even pleasing experiences can give rise to stress when the body's ability to cope is exhausted, for example taking part in a pleasant sports event (Pruet 2003: 133).

## 1.6 PROBLEM STATEMENT

Based upon the rationale of this research project, the research problem can be formulated as follows:

*Which insights into the psychobiology of personality could be applied as a tool in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma?*

### 1.6.1 Sub-questions

- Do asthmatic individuals portray a specific psychobiological personality profile?
- In what unique ways do these psychobiological personality traits impact on (a) Cognition and decision-making, (b) mood and anxiety, and (c) self-esteem?
- In what unique ways do personality traits play a role in asthmatic individuals' sense of alienation versus identification across different social settings?
- In what unique ways do personality traits contribute to asthmatic individuals' sense of guilt proneness and subjective anxiety?
- In what unique ways do personality traits play a role in asthmatic individuals' orientation towards change, lifestyle modifications, compliance with treatment regimes, and self-care?
- In what unique ways do personality traits play a role in asthmatic individuals' sense of self-sufficiency (reliance of self) versus group-dependence (reliance on others, e.g., carers)?
- In what unique ways do personality traits contribute to tense or relaxed temperaments among asthmatic individuals?
- In what unique ways do personality traits play a role in asthmatic individuals' adjustment to altered health status?
- Which personality traits support health protective behaviour among asthmatic individuals?
- Which personality traits support treatment compliance among asthmatic individuals?

- Which personality traits support lifestyle modification compliance among asthmatic individuals?
- Which personality traits are consistently found to buffer the distress response and promote resilience among asthmatic individuals?

### **1.6.2 Research hypothesis**

The research hypothesis can be formulated as follows:

*Insights into the psychobiology of personality of asthmatic individuals can be applied in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma.*

## **1.7 PURPOSE OF THE STUDY**

The purpose of this research project is to get new insights into the psychobiology of personality of asthmatic individuals, which might be applied by health care practitioners as a tool in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma.

## **1.8 THEORETICAL FRAMEWORK AND PARADIGMATIC PERSPECTIVE**

This research design is firmly embedded in a positivistic paradigm. Positivism is based upon the utilization of research methods and practices derived from the natural sciences and application of these to the social sciences (Miller & Brewer 2003: 235). Research findings are interpreted in terms of quantifiable units, and deviations are reported as significant deviations (Cohen, Manion & Morrison 2002: 8). Data is viewed to be linear and objective in nature, as well as relatively free from researcher contamination or bias. Reality is perceived as external and scientific data is objective and quantifiable, follows the medical approach, experimental in nature and seen as irrefutable or refutable (Miller & Brewer 2003: 236-237).

In addition, this research project is firmly embedded in the affective neuroscience, particularly theories dealing with the psychobiology of personality. Affective

neuroscience forms the paradigmatic conceptual bridge needed for this research project, since this approach can yield clear empirical predictions in both directions - from medical to social science and vice versa, and it facilitates productive interaction between the psychosocial and biological sciences (Panksepp 1998: 304). This paradigmatic conceptual bridge might facilitate insights into the psychobiology of personality of asthmatic individuals, and which might be applied in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma.

Because the 16-PF is based upon neo-psychoanalytical perspectives, constructs derived from Erikson's neo-psychoanalytic theory (1963) will also be employed during data interpretation (in Corey 1991: 102). This theory bases its conceptualisation of personality on ego-psychology, "... which does not deny the role of intrapsychic conflicts but does emphasize the striving of the ego for mastery and competence throughout the human life span" (Corey 1991: 102). Erikson acknowledges the contributions of various factors to personality development, e.g., environmental, genetic, psychobiological and intrapsychic factors, and atypical personality development might manifest in the following ways:

- A negative self-concept;
- Subjective feelings of insufficiency and incompetence;
- Subjective feelings of inferiority within interpersonal relations;
- Value and moral conflicts;
- Complicated identity formation;
- Unwillingness to assimilate change;
- Lack of initiative and volition; and
- Inappropriate dependency.

These factors are embedded into the psychobiology of personality, and might significantly impact on psychological and physiological health states of individuals living with asthma.

## **1.9 RESEARCH DESIGN AND METHODOLOGY**

This research project represents quantitative research. Quantitative research is deductive in nature and the research hypothesis, which flows from the research problem, directs the scientific inquiry (Breakwell, Hammond & Fife-Schaw 1995: 13), leading to hypothesis testing. This approach deals with relations, correlations and covariance of variables. Pertaining to this research project, the quantitative mode of inquiry is non-experimental, implying an *ex post facto* comparative survey at hand of a standardized personality questionnaire.

The research methodology determines the way the research is conducted and the material used.

### **1.9.1 Methods and materials**

As discussed within the preceding paragraph, this project follows a quantitative mode of inquiry; therefore the 16-Personality Factor Analysis Questionnaire (Cattell 1989) will be utilized. This questionnaire is standardized for administration with South African populations aged 18 and beyond, and is scored and interpreted at hand of standardized norms. This scale provides information related to:

- Extraversion versus introversion;
- Cognition and decision-making;
- Adaptation;
- Control and deference in social relations (e.g., care-giver/patient relations);
- Emotional status and possible mood disorders;
- The content and action of moral values;
- Feeling versus thinking modes of evaluating experience;
- Alienation versus identification in different social settings;
- Intuiting and sensing as contrasting perceptual modes;
- Self-esteem and self-presentation in settings of diverse nature;
- Guilt proneness;

- Orientation towards change (e.g., lifestyle modifications and treatment compliance);
- Self-sufficiency (reliance on self) versus group dependency, i.e., reliance on others such as care-givers or medical personnel;
- Investment in maintaining a socially approved self-image;
- Tense and relaxed temperaments, as well as subjective levels of anxiety.

### **1.9.2 Sampling**

Only grade 12 learners (adolescents) from a school in Gauteng that have already reached the age of 18 will be selected as research participants, including both genders. The following principles were considered for purposes of sample taking:

- The assumption that personality development has reached relative stability at the age of 18 years, which enhance reliability and validity;
- The 16-PF may be administered with individuals 18 years and older;
- The population is of mixed gender;
- This school is located within a suburb of average to high-average socio-economic income, suggesting relative homogeneity;
- None of the learners are in boarding school, since research findings implicated the development of a poor self-concept among boarding school residents;
- The population consists of white Afrikaans speaking learners;
- Being learners from one single school, the expected conduct of behaviour and social-normative rules are expected to be homogeneous;
- Because only grade 12 learners are included in the sample, it is expected that the educational climate will be homogeneous.

### **1.9.3 Selection of research participants**

Focused sample taking was done in the sense that all learners were requested to complete a self-reporting questionnaire. A single stimulus question pioneered sample taking, namely:

- Have you been diagnosed with chronic asthma?

All respondents who confirmed that they were diagnosed with chronic asthma were selected as participants. The 16-PF data, as well as their self-reporting schedule will be selected from the bulk of data to form the research sample. A normal distribution curve for the 16PF Questionnaire with the prescribed standard deviation of 1.0 and a mean value of 5.5 is used as the control, to which the results of the research group will be compared.

#### **1.9.4 Nature of participation**

The management of a high school in Gauteng requested that a battery of psychometric tests be administered with the grade 12 learners for purposes of career counselling and informed *consent by proxy* was obtained from management towards utilization of the data for purposes of further research. All research participants gave written informed consent themselves as well. A registered Educational Psychologist employed by the school administered the various tests.

After having discussed the research project with all the grade 12 learners, learners being diagnosed with chronic asthma and willing to participate in this study were requested to fill out an additional self-reporting schedule, using identification numbers that match their 16-PF profiles. All research participants who confirmed that they were diagnosed with chronic asthma were included in the sample. The 16-PF data, as well as their self-reporting schedules were selected from the bulk of anonymous data to form the research sample. The researcher was responsible for scoring the answer sheets, for conversion of raw scores into sten scores, and for compiling and interpreting the personality profiles as part of this research project.

#### **1.9.5 The role of the researcher**

A registered Educational Psychologist employed by the school administered the various tests. The researcher was responsible for scoring the answer sheets, for conversion of raw scores into sten scores, and for compiling and interpreting the personality profiles as part of this research project.

### **1.9.6 Data collection strategies**

Certain principles were considered for purposes of sampling and data collection. A registered Educational Psychologist made the data, according to these principles, available for this study. This data was collected in the form of self-reports and 16-Personality Factor Analysis Questionnaires. The above-mentioned registered Educational Psychologist has collected the data at a high school in Gauteng for the purpose of career counselling. Because only grade 12 learners are included in the sample, it is expected that the educational climate will be homogeneous. Focused sample taking was done in the sense that all learners were requested to complete a self-reporting questionnaire. Certain pioneering questions were asked in the self-report schedule with the notion that the data may be used for future research. The answer to the question, “have you been diagnosed with chronic asthma”, determined the sample size and relevance of the data for my research. All the research participants who confirmed that they have been diagnosed with chronic asthma were selected as research participants.

### **1.9.7 Data analysis and Interpretation**

A summary of the sample’s raw scores, a frequency table of the sten scores and the mean values will be calculated. P-values will be calculated at the 1% and 5%-level of reliability. A normal distribution curve for the 16PF Questionnaire with the prescribed standard deviation of 1.0 and a mean value of 5.5 will be used as the control, to which the results of the research group will be compared. Sample distribution curves will be compared to the normal distribution curve for all of the deviant mean scores on the 16PF questionnaire. The information gained from the 16-PF data is expected to enable the researcher to identify possible temperamental differences and tendencies in the basic personality profiles of asthmatics versus non-asthmatics.

### **1.10 ETHICAL CONSIDERATIONS**

The ethical principles of the University of Pretoria, the HPCSA, and the Board for Psychology will be adhered to. In addition, certain general protections will be implemented to ensure that these concerns are properly addressed. First, approval of the

research project by the review board of the Department of Educational Psychology will be sought, and respective ethical statements will be submitted to the ethical committee. The purpose of seeking approval is to ensure that the research procedures provide for the adequate protection of the research participants' rights, welfare and dignity, in keeping with the Ethical Principles of HPCSA. To safeguard those who participate in psychological research and to clarify the responsibilities of researchers, these ethical principles include general guidelines for conducting research, which will be adhered to. This means that participants will be protected from both physical and psychological harm. These principles also emphasize the researcher's responsibility for the research participants' welfare, because the researcher ultimately must ensure that the welfare of the research participants is given priority over any other consideration, including research design.

Many other ethical issues extend beyond protection of the participants, including the proper way to give credit to other researchers and co-workers. These concerns will be adhered to, as required by the Ethics Committee of the Faculty of Education.

## **1.11 CHAPTER PLANNING**

**Chapter one** consists of the orientational introduction and actualisation of the research problem, the problem statement, the research hypothesis, as well as the research methodology and research design. Ethical considerations are also included.

**Chapter two** describes the link between psychological health states and physiological health states, and includes a critical review of treatment regimens affecting asthmatic individuals both ways.

**Chapter three** represents an in-depth literature review linking neurobiology with personality development.

**Chapter four** describes the empirical research and related findings. Based upon the findings, the research hypothesis will be accepted or rejected.

**Chapter five** gives an overview of the research findings, as well as deductions and conclusions derived at. Relevant recommendations will be made, and shortcomings inherent to the design will be pointed out.

### **1.12 LIMITATIONS AND POSSIBLE CONTRIBUTIONS**

The existing body of knowledge covering the relation between psychobiological factors and personality development among individuals diagnosed with chronic asthma is relatively restricted. The majority of these sources dealing with asthma only reflect on the negative affect flowing from asthma as a chronic illness, without considering the neurochemistry involved in personality development. The size of the sample poses another limitation. However, this project is explorative in nature, which might prompt further research into this phenomenon.

### **1.13 SYNOPSIS**

In this chapter the main objectives of the research and the research design are presented. The empirical investigation is governed by the following research question:

*Which insights into the psychobiology of personality could be applied as a tool in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma?*

With this research project the aim is thus to provide insights into the psychobiology of personality as a tool for improving psychological and physical health states of individuals living with chronic asthma. Personal experience, as well as reading an article by Naudé and Pretorius (2003) on the effects of asthma medication on the cognitive and psychosocial functioning of asthmatic learners, raised awareness of the research problem.

Rees and Kanabar (2001: 4-6) claim that the prevalence of asthma is gradually on the increase in most countries. Gustafson and co-workers (2002: 2) state that the prevalence of childhood asthma has doubled during the recent decade. According to these researchers the frequency of asthma diagnoses has risen globally and it has become the most common chronic disease in childhood and adolescence. Chronic asthma holds psychological

implications for the patients and their families. The quality of family interaction is often determined by adjustment to this chronic illness (Duff 2001: 350-357). Accommodating changes in the family lifestyle, coupled with greater financial burdens due to additional medical expenses, might compromise quality of life (Gustafson, Olofsson, Anderson, Lindberg & Schollin 2002: 2,7).

According to Okele, Wu, Krishnan and co-workers (2004: 1) the emotional well being of some asthmatic individuals are compromised by feelings of depression, as well as by increased asthmatic morbidity associated with poor control of asthma symptoms. Kang and Fox (2000: 1) found that acute stress may induce significant neuroendocrine and immune changes that can affect pulmonary function in children with and without asthma. These negative physiological and psychological health states lead to increased use of health care services, consultations with health care practitioners, and school absenteeism.

In addition, empirical findings suggest that chronic illness habitually result in compromised emotional and cognitive functioning among chronically ill (Naudé & Pretorius 2003), which might affect personality development. Stern's (1981: 37) recommendation of "seeing the whole person in his/her context" promotes an understanding of how illness affects personality development. The body of variables includes (but is not limited to) genetic predispositions, immunological deficits, innate proneness to allergies, temperamental differences, and the psychobiological make-up of the individual, might predispose development of a certain personality type (Vila et al 2000).

It is envisioned that insights into the psychobiology of personality might lead to better informed planning of more comprehensive and effective health care management programs that also provide emotional support and stress relief. Emotional support and stress relief might reduce psychological and physical symptoms, alter neuroendocrine and immune functioning, delay disease progression, and might reduce morbidity and mortality and thus improve quality of life.

The information presented in chapter two is aimed at achieving a deeper understanding of the connectedness and integration between the soma and the psyche, which presents a challenge for asthma treatment.

## **CHAPTER TWO**

### **THE LINK BETWEEN PSYCHOLOGICAL AND PHYSIOLOGICAL HEALTH STATES**

#### **2.1 INTRODUCTION**

As discussed in the preceding chapter, this research project is based upon certain main aspects involved in the treatment of asthma, considering the numerous challenges that asthmatics and their families face. Chapter one reflected on the connectedness and integration between the soma and psyche, which connectedness has to be considered when planning optimal treatment regimes. Within this chapter these challenges will be discussed and reflected upon.

#### **2.2 THE CHALLENGE OF ASTHMA TREATMENT**

Bisgaard and Szeffler (2005: 3) noted that surveys conducted in the United States and Europe confirmed the significance of the burden associated with asthma, being a major recurrent respiratory illness among children and adolescents globally. According to the guidelines published by the Global Initiative for Asthma (GINA), optimal asthma control is marked by minimal and infrequent exacerbations, no emergency visits to the hospital, minimal use of (rapid-acting)  $\beta_2$ -agonists, no limitations on life-style activities, less than 20% variation on daily peak expiratory flow (PEF), near normal PEF and minimal adverse medication side-effects (GINA guidelines in Peters et al 2006: 3). Bisgaard and Szeffler (2005: 3) state that goals set for child asthma therapy are often not met. Similar studies in Europe, Asia and North America confirmed this notion, suggesting that levels of asthma control often do not meet the goals of the GINA guidelines. In fact, it was determined that patients' asthma conditions were frequently poorly controlled (Peters, Ferguson, Deniz & Reisner 2006: 5). Asthma affects 300 million people worldwide, which number is expected to increase by a further 100 million cases in 2025, and an expected mortality rate of approximately 239 000 deaths per year. The resulting burden of disability is equal to the disability factor of osteoarthritis, cirrhosis, diabetes and schizophrenia. The inadequate

control of asthma might cause serious problems, e.g., high risk of serious morbidity, mortality and limited therapeutic options (Peters et al 2006: 2). The level of asthma control directly impacts on the individual's quality of life, since the asthmatic individual then experiences minimal chronic symptoms.

Many asthmatic children have normal range forced expiratory volume (FEV1) values when their condition is stabilized (Bisgaard & Szefer 2005: 5), while inadequate control of severe, persistent asthma is associated with a high risk for exacerbation of symptoms, repetitive hospitalisation, mortality, and severely impaired quality of life. Currently the management of asthma is planned according to disease severity in a stepwise approach (Peters et al 2006: 2).

Medical treatment should progress stepwise until optimal control is reached, with progression to the next step of pharmacological treatment only if optimal control is not achieved or lost, despite appropriate treatment (Peters et al 2006: 3). Treatment of asthma in children is considered to be complicated when the dose thresholds of the medication in use are exceeding 800 µg of BDP, 800 µg of budesonide or 400 µg of fluticasone (Peters et al 2006: 3).

### **2.2.1 Factors complicating adequate control of asthma**

The following factors might complicate adequate control of asthma, e.g., unpredictability of the course and prognosis, the diagnosis of asthma due to co-morbid conditions, the use of substitute describing names/labels, the nature of treatment regimes, environmental threats and stress. Each of these factors will be discussed in more detail within subsequent paragraphs.

#### **2.2.1.1 *Unpredictability***

The risk of severe asthma exacerbation is unrelated to the severity of symptoms and to asthma severity classification, which gives rise to unpredictable disease progression, course, prognosis and treatment. The diagnosis and options for medical treatment of mild persistent asthma (assuming this might also apply to other categories of severity) is further

compromised by a lack of serious respiratory incidences and changes of severity over time (Bisgaard & Szefer 2005: 3-6).

Furthermore, it is difficult to determine the true burden of mild persistent asthma in children and adolescents due to the lack of reliable information and statistics on current treatment status and disease progression. The reliability of this information is also subject to the reliability of source information, e.g., information provided by caregivers, similarity of symptoms produced by other recurring infections, reliance on symptoms for severity categorization, ambiguity of severity categories, and differences in assessment criteria, i.e., following National Asthma Education and Prevention Program (NAEPP) versus GINA guidelines. These preceding factors might complicate classification and treatment of asthma (Bisgaard & Szefer 2005: 3-6). The lack of, or the unreliability of information on anyone of these preceding factors might hinder optimal and proper treatment regime planning and development, which in effect lowers the patient's quality of life.

#### ***2.2.1.2 Diagnosis of asthma complicated by co-morbidities or substitute names***

Certain co-morbid conditions like rhinitis and gastroesophageal reflux disease (GERD) and a variety of environmental factors such as smoking seem to be aggravating causes for the onset and worsening of asthma, as well as complicate the manageability thereof (Peters et al 2006: 4). Epidemiological studies suggest that the majority of individuals with asthma also suffer from rhinitis. Similarity of the pathological and physiological features that mark both conditions, i.e., asthma and rhinitis, might complicate the correct diagnosis. However, an effective approach to manage rhinitis also seems to improve asthma and therefore these two conditions are often only vaguely discriminated. Oesophageal acid, as found in GERD, also causes adverse respiratory responses, including decreases in airflow and in oxygen saturation, coupled with increases in respiratory resistance, minute ventilation, and respiratory rate. Interestingly, it was found that therapy for GERD, drug related or surgery, significantly improved asthma symptoms (Peters et al 2006: 4). Rees and Kanabar reported that asthma, with its accompanying airway narrowing, is difficult to differentiate from the similar pathological symptoms associated with chronic bronchitis and emphysema in smokers (Rees & Kanabar 2001: 1). In addition, during the recent past there had been a tendency to name asthma in children by substitute names such as

wheezing bronchitis. This often lead to inappropriate treatment, i.e., the condition not being considered as serious as it should have been (Rees & Kanabar 2001: 2).

#### **2.2.1.3     *The nature of treatment regimes***

According to Bibi, Feigenbaum, Hessen and Shoseyov (2006: 6) asthma treatment aims at controlling symptoms and preventing long-term airway damage. However, when only mild non-continuous asthmatic symptoms are experienced, as is the case in mild intermittent asthma, the need for and nature of medicinal treatment is not always obvious. Bibi et al (2006: 2) found that there is a substantial threat for airway remodelling in these children, although current practice guidelines do not require that preventative anti-inflammatory medication be prescribed routinely for children with mild intermittent asthma. This might lead to decreased health and probably also the onset of chronic asthma with accompanied decreased quality of life.

#### **2.2.1.4     *Environmental threats***

Various environmental factors such as exposure to tobacco smoke, allergen sensitisation, viral infection, occupational agents, aspirin-sensitivity and air pollution are associated with the onset of asthma, but their role in the development of severe asthma is still unclear (Peters et al 2006: 4). Having a feline pet was a significant variable affecting low lung function ratios in the study of Bibi et al (2006: 5). Peters and co-workers found that approximately 50% of patients diagnosed with severe asthma were allergic to common aeroallergens, which suggested that 2% of all asthma patients have uncontrolled, severe, and persistent allergic asthma (Peters et al 2006: 6).

#### **2.2.1.5     *Stress***

Asthma is often associated with anxiety and depression; therefore patients with severe asthma often do not use their medicine correctly, resulting in reduction of asthma control. Stress might also increase exacerbation of asthmatic symptoms, and might trigger the onset of asthma and atopy. In addition, stress may affect neuroimmunoregulation and the oxidative stress pathways (Peters et al 2006: 5).

## **2.2.2 Stressors that cause and exacerbate asthma**

Liccardi, Cazzola, Canonica, Passalacqua and D'Amato (2005: 3) state that respiratory allergies develop through complex interaction between genetic, maternal and environmental factors and that the westernised lifestyle plays an important role in the increase of atopic diseases. It is accepted that atopy is the main cause for bronchial spasm, especially in children (Liccardi et al 2005: 3). Rees and Kanabar (2001: 6) report that changes in indoor environment, smoking, as well as dietary and weight changes are but a few of these stressors that might promote the development of asthma in susceptible individuals. Each of these stressors is now discussed in more detail.

### **2.2.2.1 *Environmental stressors***

Exposure of individuals to allergens poses a serious threat and is often associated with the development of respiratory symptoms and asthma, as well as with the deterioration of asthma status (Liccardi et al 2005: 3). Asthma symptoms may be induced by different levels of allergen and by non-specific agents. A modern lifestyle marked by closed doors and windows that allow little airflow might increase the duration and intensity of exposure to mites, pets, and cockroach by-products, as well as to indoor chemical products (Liccardi et al 2005: 3). All of these factors are associated with exacerbated asthma symptoms.

### **2.2.2.2 *Mite infestation***

Rees and Kanabar (2001: 6) report that changes in indoor environments, such as homes with central heating, soft furnishings, and exposure to dust mites might be at extreme levels. Mites live on human epithelial derivatives found on bed linen, carpets, curtains and mattresses, and are the most important sources of mite allergens. Thus, the time spent in bed during sleep is thought to be a high risk factor (Liccardi et al 2005: 8). Results from a study conducted by de Boer et al (cited in Liccardi et al 2005: 8) demonstrated that not even new mattresses are without allergens. With favourable indoor conditions, especially coupled with a damp climate, new mattresses easily become infested by dust mite. Results from studies on mite-impermeable covers for bedding to avoid mite-infestation confirmed that this strategy might benefit some patients with asthma, although clinical effect might be marginal (Liccardi et al 2005: 9).

Regular and intensive vacuum cleaning is effective in reducing the amount of mites or animal allergen in carpets, but not all dust can be removed and sometimes vacuum cleaning even increases the level of airborne allergen. Double thickness dust bags, polyethylene filters and electrostatic filtration systems seem to reduce the possibility of increased airborne mite allergens during vacuum cleaning (Liccardi et al 2005: 13). Due to the thickness of mattresses, effective vacuuming of mattresses is dubious; thus, using mite-impermeable covers for mattresses, pillows and duvets are thought to be more effective (Liccardi et al 2005: 8).

A washing temperature of at least 55°C for 12 minutes, or at temperature exceeding 60°C for 8 minutes, is sufficient to kill more than 80% of mites, while a temperature of 120 to 140°C is needed to kill the more tough mites. Cold water washing with detergents and even with Jig™ might remove mite and cat allergen, but does not kill mites. Live mites can relocate themselves on mite-free items during the washing process. Using a soluble form of benzyl benzoate or some essential oils such as eucalyptus oil might be quite effective. Dry cleaning of blankets is less effective to reduce mite infestation than washing blankets in hot water (Liccardi et al 2005: 10-11).

Mites are not insects and many insecticides, at the concentration it is used in houses, do not kill mites. The efficacy of insecticides as potential mite killing agents are influenced by factors such as the method and time of application, the formulae type (e.g., liquid, moist powder, foam, spray, etc.), local conditions (e.g., type and thickness of carpets) and the removal of dead mites and their by-products afterwards. The results of most studies suggest that only repeated application could prevent mite re-infestation, while such repeated application might potentially be toxic, especially to children. The control of indoor humidity to reduce mite growth, e.g., using natural, dry, outdoor ventilation, dehumidifiers and air conditioners, was found to be marginal in its clinical efficacy (Liccardi et al 2005: 11-13).

Recent findings contradicted the assumption that feathers are allergenic. However, feathers provide an ideal breeding place for dust mites and therefore increase the risk of allergen exposure. Modern bedding manufacturing includes the washing and hot drying of feathers to kill mites and to de-nature some mite allergens. One such study demonstrated

that synthetic pillows contained higher concentrations of allergens than feather pillows, probably because of the organic volatile compounds and more permeable covers of the synthetic pillows (Liccardi et al 2005: 10).

#### **2.2.2.3 Problems with pets**

Airborne dispersed allergens such as from domestic animals might within minutes trigger respiratory difficulties in sensitive individuals (Liccardi et al 2005: 6). The allergens produced by cats and dogs are known as Fel d 1 and Can f 1 respectively, are easily airborne and pose a threat to cat/dog sensitive individuals. The clothes of pet owners indirectly spread pet allergens to public places, especially allergens from furry pets like cats, dogs and rabbits (Liccardi et al 2005: 14-15).

Removal of furry pets from the home should be the first and most desirable option, but it often happens that sensitive pet owners or their families refuse to give up a loved pet, or they deny that the pet might be the primary source of asthmatic symptoms. There is no documented report on the clinical effect of pet removal. Significantly reduced levels of cat and dog allergens (Fel d 1 and Can f 1) might be accomplished through pet removal, but it is unlikely that allergens would be removed entirely, so that highly sensitive individuals may still experience respiratory symptoms for a long time afterwards (Liccardi et al 2005: 14).

Liccardi et al (2005: 15) conducted some research on the cleansing of cat allergens present on clothing. These researchers found that washing out with water was completely effective, but that dry-cleaning did not completely remove the allergens, and that the allergens could be transferred to other clothing during the dry cleaning process. Liccardi et al (2005: 15) consider the possibility of bathing domestic animals regularly as impractical and damaging to the lipid film on the animals' fur. However, the use of an air filtration system might remove a significant bulk of airborne pet allergen (Liccardi et al 2005: 15).

#### **2.2.2.4 Air pollution**

Durban, one of South Africa's densely packed industrialized cities, is also one of the most polluted areas in southern Africa. Results from a study that investigated the prevalence of

asthma in the air polluted south-central Durban demonstrated that 12% of adults and 10% of children were diagnosed with asthma, but the actual rate of wheezing was found to be 37 to 40%, shortness of breath was 16 to 28%, and related respiratory symptoms such as chronic cough was found to be 33 to 35%, chronic phlegm was 31 to 32%, frequent blocked or runny nose was 44 to 50% and sinusitis was 16 to 27% of the population. These results are similar to results recently found among other urban populations of Africa, although asthma was rare among children in this continent up to the late 1970s. It seems that places like Durban are fertile ground for asthma due to high risk factors such as high humidity, high air pollution levels, high incidence of respiratory problems, overcrowding, malnutrition, and low socio economic status (Nriagu, Robins & Gary et al 1999: 748). Rees and Kanabar (2001: 4) associated the higher prevalence of asthma among rural groups after having moved to urban areas with higher exposure to allergens such as mites, fungal spores, infectious agents, and pollution and dietary changes.

#### **2.2.2.5 Allergen avoidance**

Preventative measures, including during the gestational period, are crucial in avoiding harm (Liccardi et al 2005:3). Substance and food avoiding strategies are highly effective, while still controversial in respiratory allergies, especially the avoidance of house dust mites. Even if allergen concentrations could be determined, individuals show unique reactions and various degrees of bronchial responsiveness to different allergen concentrations. The time it takes to bring about certain health change also differs from individual to individual, which makes research planning and measuring difficult. Complicating factors include the heterogeneity of asthma severity classification, confusing pharmacological treatment, multiple sensitisations, and simultaneous employment of several avoidance procedures, outcome considerations, allergen sampling methods, and the duration of the studies (Liccardi et al 2005: 3, 5).

However, symptomatic benefit could be achieved by air filtration of irritant particles such as tobacco smoke and pet allergens, but it does not reduce mite allergens that are normally found in settled dust (Liccardi et al 2005: 11). Some requirements for optimal filtering efficiency include factors such as low resistance to airflow, cleaning efficiency, low maintenance and durability (Liccardi et al 2005: 11). Workers suffering from occupational asthma might experience complete recovery or partial symptom relief when the work

environment is changed (Liccardi et al 2005: 4). The allergen avoidance approach might be successful, provided that one specific allergen is responsible for spawning specific symptoms, the individual must be involved in treatment and must be receptive of advice and patient education, and the protocol should be comprehensive and should include exposure of the individual outside the home environment (Liccardi et al 2005: 2). Several avoidance methods might manifestly reduce the allergen levels, but clinical findings do not confirm symptomatic improvement (Liccardi et al 2005: 1). Allergen avoidance procedures are subject to the clinical phase of the allergic airway disease, as well as to the degree of bronchial and nasal infection. These factors might affect the clinical outcome of allergen avoidance procedures.

#### **2.2.2.6 *Aeroallergen avoidance during pregnancy***

There is a rising interest in allergen avoidance during the prenatal period and early infancy, since the effect of the environment on airway functionality starts early in life. Allergen avoidance during pregnancy and early postnatal phases might prevent development of allergen sensitisation and bronchial asthma later on. The majority of researchers warn about the deleterious effect on lung function in newborns if the foetus is exposed to maternal smoking and other allergens during the early gestational period. Maternal smoking during early pregnancy particularly affects proliferate responses later in pregnancy (Liccardi et al 2005: 3-6). However, primary preventive methods have been difficult to assess and are questionable. Preliminary results on the effect of allergen avoidance are encouraging, but no certain answers to the clinical effect of allergen avoidance in reducing the risk of developing respiratory allergies are available (Liccardi et al 2005: 7). The parents' compliance towards mite and pet allergen reduction regimes are of utmost importance, including prevention of passive smoking (Liccardi et al 2005: 8).

### **2.3 PERSONAL, SOCIAL, AND ECONOMIC BURDENS OF ASTHMA**

Asthma affects various aspects of life negatively and as such asthma might be viewed to be an indirect stressor in the life of the asthmatic. Peters et al (2006: 7) equated this adverse impact on personal quality of life to the level of disability caused by diabetes. Individuals with chronic and uncontrolled illness experienced more debilitating consequences regarding sleep pattern, employment, learning, exercise, and daily activities. In addition,

they need hospitalisation and are frequently absent from work or school due to illness. Female patients are more inclined to uncontrolled, severe asthma and more likely to have a higher body mass index (Peters et al 2006: 7), suggesting potential obesity, anxiety and a negative self-esteem. Anxiety and a negative self-esteem might be ascribed to a body mass index that deviates from the accepted norm.

Individuals with inadequately controlled, severe and persistent asthma experience enduring and diverse medical needs, e.g., severe exacerbation of symptoms that need specialized medical treatment. Asthmatic individuals, especially those with treatment-resistant asthma, often present with co-morbid conditions that might include psychiatric conditions such as depression, anxiety, or phobic responses. In addition, psychiatric conditions might contribute to non-compliance with treatment regimes (Peters et al 2006: 6). Bibi et al (2006: 6) noted that non-compliance and non-adherence to treatment regimes are common causes for deterioration of asthmatic status among children.

Indirect costs owing to lost productivity and absence from work, coupled with medical expenses and the costs involved in personal health care might burden primary and secondary healthcare systems, as well as the broader society in general, considering that 15 to 20% of any population is likely to be diagnosed with asthma. Uncontrolled and severe asthma might particularly contribute to this burden, because due to the severity of this condition, additional (and often costly) emergency services, as well as intense treatment regimes are required to control exacerbating symptoms (Peters et al 2006: 9).

### **2.3.1 Physiological stressors**

During the recent past the genetic link involved in asthma has been recognized, which included an association between asthma, rhinitis and allergic eczema. Atopic individuals are inclined to rhinitis and asthma (Rees & Kanabar 2001: 4). There has been considerable development in the field of genetics, inter alia that differences in asthma severity correlate with the frequency of the RANTES-28G allele in the genetic polymorphisms of children. Higher frequency of the RANTES-28G allele is associated with near-fatal asthma (Bisgaard & Szeffler 2005: 7). Environmental factors probably interact with this genetic predisposition to transform it into an asthmatic condition. Bisgaard and Szeffler (2005: 6) reported research results demonstrating that mild asthma apparently does not typically

develop into more severe asthma, that a decline in lung functioning tend to occur in younger or preschool-age children rather than in older children, and that youngsters with more severe asthma are running a greater risk for developing lung functioning deficits throughout childhood and into adulthood.

The concept 'airway remodelling' refers to changes that take place in the airway following chronic airway inflammation, which changes include a thickening of the basement membrane, the deposition of sub epithelial collagen, and the hypertrophy of smooth muscle and mucous gland. Rasmussen et al (cited in Bibi et al 2006: 2) demonstrated that airway remodelling could be determined by measuring the forced expiratory volume/ forced volume capacity (FEV/FVC) ratio (long function test), with a low ratio (below 80%) being highly suggestive of airway remodelling. Bibi et al (2006: 2) reported research results suggesting that even individuals with mild asthma should undergo regular pulmonary function testing, and if deterioration in the FEV/FVC ratio is found, they should be treated with regularly inhaled steroids to prevent airway remodelling. These research results also demonstrated that long-term inhaled steroids significantly reduced and prevented airway remodelling, resulting in improved or sustained lung function among paediatric asthma patients. Bibi et al (2006: 2) concluded that steroid inhalants might assist towards prevention of irreversible remodelling of the airways. These researchers found reduction of lung function to be greater at an earlier age, therefore it is believed that remodelling of the airways starts early in the course of asthma and that it does not occur uniformly over time (Bibi et al 2006: 2).

Vigorous exercise causes a narrowing of the airways (Rees & Kanabar 2001: 16); therefore exercise could be a risk factor for setting off an asthma attack or triggering a worsening of the asthma status. This reality poses more than a mere practical problem, because asthmatic children might be prevented from taking part in sports and games with their peers. Children might, out of fear of an asthma attack, withdraw from participation in any activities and they might therefore become passive and lonely individuals, which might adversely impact on the quality of their social and physical health.

### **2.3.1.1 *Chronic obstructive pulmonary disease (COPD)***

Dyspnoea, exclusion from physical activity, and reduced quality of life are major symptoms of both asthma and chronic obstructive pulmonary disease (COPD). Dyspnoea, which results in physical inactivity, mainly originates from the individual's conscious sensing of own difficulty to breathe. The respiratory muscles of asthma and COPD patients have to work harder than normal due to increased ventilation requirements during physical exertion, and due to their inefficient breathing patterns, because hyper inflated lungs cause airway obstruction (McConnell 2005: 1-2). Campbell (cited in McConnell 2005: 2) reported a longer than expected time lapse between the central motor outset and the mechanical response during breathing, which causes a discomforting breathing sensation. This longer time lapse might be caused by inappropriate changes in muscle length and/or muscle tension during breathing. Campbell therefore introduced the term 'length-tension inappropriateness', which he claimed to convey the sensation of dyspnoea to consciousness. According to McConnell (2005: 4) hyperinflation or limited expiratory flow causes respiratory muscle overload, i.e., the functional weakening of the respiratory muscles, forcing respiratory time to shorten and to generate expiratory pressure. The preceding evidence supports the idea that asthma significantly reduces quality of life; consequently the individual with asthma might present with significant impairment emotionally and socially.

### **2.3.1.2 *Treatment to improve the respiratory muscle function***

In order to optimise treatment of dyspnoea in asthmatic and COPD patients, it seems that the focus should be to enlarge the respiratory muscles' functional capacity and/or to reduce the workload upon respiratory muscles induced by hyperinflation. However, the role of rehabilitation in asthma management is unclear and has received little attention in the past, but there is evidence that exercise training reduces dyspnoea, improves lung function and aerobic fitness and thus quality of life (McConnell 2005: 9).

Physical exercise training (PET) reduces the demand for ventilation, which decreases the workload upon respiratory muscles, while respiratory muscle training (IMT) increases the capacity of the respiratory muscles to generate and sustain respiratory activity (McConnell

2005: 5). Bronchodilators reduce hyperinflation and thus diminish muscle effort, which improves dyspnoea. PET and pulmonary rehabilitation (IMT) are non-pharmacological treatment regimes and IMT is safe to implement in a home-based setting. It improves exercise tolerance and enhances quality of life (McConnell 2005: 1).

It is also true that intense physical exercise might trigger bronchi constriction in approximately 90% of individuals with asthma, which serve as reason for the reluctance of asthmatic patients to take the risk of physical exercise (McConnell 2005: 9). Low levels of aerobic fitness are reported in patients with asthma, which imply long-term health concerns for children with asthma. It is also noted that women, possibly because of their weaker respiratory muscles than men, experience higher levels of dyspnoea, more frequent hospitalisation and poorer quality of life.

A comparative study involving male and female asthmatics demonstrated that the respiratory muscle strength of females who received IMT matched that of males; consequently their shortness of breath decreased, with a lesser need for  $\beta$ 2-agonists. Weiner and colleagues (in McConnell 2005: 10) replicated this study with similar findings. However, IMT is contra-indicated for a group of asthmatic patients with abnormally low perception of dyspnoea and blunted hypoxic sensitivity, where further reduction in the intensity of dyspnoea sensation is life threatening (McConnell 2005: 11). IMT thus shows potential for decreasing breathing difficulties and for improving quality of life, while the need for medication is reduced, at least for patients diagnosed with mild asthma.

### **2.3.2 Psychological stressors**

The general assumption is that psychological aspects affect the onset and progression of medical illnesses, just as illness might affect the psychological state and emotional well being of the individual. This notion emphasizes the unison and interactivity of body and mind (Kaplan & Sadock 1998: 797). Findings from a study into the mortality associated with asthma suggest that certain psychosocial factors contribute to poor asthma control. These factors include social isolation, marital problems, alcoholism, anxiety, and depression (Peters et al 2006: 6). Rich, Lamola and Woods (2006: 748) report that morbidity and mortality among adolescents continue to increase, although hospitalisation and death represent but a small portion of the negative effects associated with poor asthma

control. Asthma control seems to be determined by aspects such as parental and social support, personal attitudes and characteristics like emotional capacity, treatment compliance such as taking medicine, participation in related therapies and preventative measures, accessibility of medical care and availability of medicine.

### ***2.3.2.1 Stress, anxiety and depression***

Stress represents an internal response to external stressors or to demanding situations (Sue, Sue & Sue 1994: 228). When these stressor demands are in excess of the stress level needed for optimal physical functioning, it is described as distress. Acute and/or enduring distress is not conducive to health and causes anxiety that might initiate and exacerbate illness. Psychological factors affecting medical conditions are described in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) (APA 2000). This category is defined by the presence of a medical condition and one or more psychological factors that relate to the onset, exacerbation, or delay in the recovery from this medical illness, or that interferes with treatment thereof. Various psychological factors, e.g., anxiety or denial, might increase the risk of adverse outcome in the progression of asthma (Kaplan & Sadock 1998: 797; Sue, Sue & Sue 1994: 228).

Kullowatz, Kanniess, Dahme, Magnussen and Ritz (2006: 1) report that patients with chronic diseases run a higher risk for the development of mental disorders, and they particularly associated depression and anxiety with asthma. Mrazek (cited in Kullowatz et al 2006: 2) hypothesized that accompanying stress associated with chronic illness probably triggers the development of anxiety and depression among individuals diagnosed with asthma. Barlow and Durand (1995: 258) noted that anxiety and depression are closely related and that a depressed individual usually is anxious as well, but the inverse is not usually true. Barlow and Durand (1995: 258) listed symptoms specific to depressive and anxious states, including a tendency to anticipate the worst outcome, worry, poor concentration, irritability, hypervigilance, crying, guilt, fatigue, poor memory, sense of worthlessness and insomnia. Kullowatz et al (2006: 2) found that additional psychiatric disorders such as depression and associated anxiety states might influence health care use and quality of life among asthmatics by significantly increasing the intake of steroids, while marginal increases in hospitalisation were also noted. These researchers advise that

routine screening for depression should be an important part of health care and management in individuals diagnosed with asthma.

The individual diagnosed with asthma might experience a number of stressors that could be directly related to asthma as a medical condition, and these stressors usually cause emotional turmoil and distress, expressed as anxiety. According to Barlow and Durand (1995: 258) the accumulation of negative events and disappointments (failures) may produce a pessimistic view of the world, which may produce depression. Barlow and Durand (1995: 258) furthermore conclude that depression rises during adolescence, and depression is usually more prevalent during this phase than during adulthood. Adolescents diagnosed with asthma might have mixed feelings stemming from their growing need for independence, coupled with the growing social demand for self-sufficiency; yet to the contrary, their medical condition necessitates continuous dependency on medication, more than usual amounts of care, nurturance and supervision, especially when taking part in sports or doing demanding activities. Instead of achieving independence and self-sufficiency, these adolescents are turned into chronic recipients of care. A major developmental task associated with adolescence is attainment of a sense of autonomy, which includes identity formation and planning towards autonomous future subsistence. Considering mandatory dependence on care and medication, coupled with seemingly imperfection of the physical self, it is clear that enduring feelings of failure might compromise the adolescent's sense of autonomy.

Adolescents are acutely aware of the self and their need for social acceptance by peers reaches peak level during adolescence. Duff (2001) observed a loss of identity, a loss of independence, and isolation from the peer group among adolescents suffering from chronic asthma, resulting in subjective depreciation of the self, leading to depression and anxiety. The sickness 'image' of asthmatics causes them to feel different from their peers and their health state adaptations might limit their participation in peer group activities, which frequently result in withdrawal and isolation. These and other stressors (threats) concerning their health and future life planning might extensively trouble some asthmatic individuals, causing them to develop depression and associated anxiety. Vila and co-workers (2000: 9) speculated on a probable higher incidence of anxiety spectrum disorders amongst asthmatic children. This was confirmed by the findings of Rich et al (2006: 748) that many young asthmatic patients experience imagined or real limitations in their

lifestyle, their educational achievement, their social success, and self-esteem, which are detrimental to their quality of life. Sue et al (1994: 225) reported that stress and anxiety, resulting from the individual's subjective sense of helplessness, might play a role in the 'sudden death syndrome', suggesting a heightened mortality risk among infants diagnosed with asthma.

The well being and quality of life of an individual with asthma might be reciprocally influenced by his/her functional status and by treatment regime effectiveness. This suggests that the optimal management of asthma, which is closely associated with improvement in quality of life, is at least partially dependent on efficient control of anxiety, panic and depression. Rich et al (2006: 750) explored the possibility that children and adolescents with asthma would show increased symptom awareness and improved environmental hazard avoidance (management of environmental threats) after a video intervention assessment (VIA). These researchers found significant improvement in overall asthma-specific quality of life and activity levels, and some improvement on emotional level, measured with the *Paediatric Asthma Quality of Life Questionnaire* (PAQLQ) (Rich et al 2006: 750).

### **2.3.3 Psychosocial stressors**

Severe asthma might also affect family life negatively and might adversely influence the family's social activities and participation in community life. It was found that almost 80% of siblings complained about limited activity due to a diagnosis of asthma in one of the family members. Interestingly, Gustafson and colleagues (2001: 7) found that children who often missed school on account of asthma tended to experience reduced asthma severity. These researchers ascribed this reduction in asthma severity to a negative school environment. However, they also concluded that a *laissez faire* parenting style and handling of asthma related school absenteeism might be associated with symptom reduction and less psycho-social difficulty in youngsters diagnosed with asthma (Gustafson et al 2001: 8), implicating that lesser parental stress and anxiety might be a significant moderating factor to be considered when planning intervention.

Naudé and Pretorius (2003: 707) noted that decreased psychosocial functioning might cause emotional and behavioural difficulty, compromised peer group relationships and/or

diminished academic performance among children diagnosed with chronic, severe asthma. These researchers further noted functional impairment of diverse nature, such as limited physical participation, avoidance of social activities, lowered academic performance, as well as variables that adversely affect learning, such as decreased concentration and memory, as well as school absenteeism. These findings implicate reduced psychosocial functioning, and thus poor quality of life associated with asthma.

### ***2.3.3.1 The burden of a chronic medical condition on family relations***

In chapter one it was argued that the parents as caregivers and their asthmatic children as recipients of this care might experience deeper oxytocin-induced emotional bonding and attachment. This special kind of caregiver/care recipient interaction between parents and children might ultimately influence the psychobiology of the asthmatic child's personality. When chemical systems, e.g., the oxytocin system associated with joyous interaction and social bonding, show significant imbalances, the individual might experience meaningful emotional difficulty. However, the inverse might also be true. Oxytocin-induced emotional bonding between the asthmatic child and his/her primary caregiver might extend to include pro-social behaviour across situations.

The emotional, social, and financial burden, coupled with the accompanying role overload that mark caregiving for children with severe, chronic asthma may strain family interaction. Parents often experience increased caregiving distress, e.g., additional household cleaning as a preventative measure, scheduling administration of medication such as nebuliser agents, regular visits to medical practitioners, leaving the caregiver with less free time to spend with family and friends and to fulfil other family obligations, coupled with additional financial strain due to costly treatment regimes often not covered by medical aid funds, and most profoundly parents' anxiety about the mortality risk associated with asphyxia.

Asthmatic children, due to disease-related demands, also tend to become too dependent on their caregivers, mostly the mothers. This dependency might partially be mediated by intensive caregiving, and partially by the impact of medication on the brain opioid system. The brain opioid system, which inhibits social dependence and separation distress, is activated when people share positive and friendly interaction with friends, or when

children share loving interaction with their parents. However, when this opioid system is inhibited by continued high-level drug administration of a specific nature, the assumption is that such children might become more attention seeking and more dependent on the loving interaction with their parents and other loved ones.

Duff (2001: 350) stated that the quality of family interaction in asthma is often determined by family members' degree of emotional adjustment to this chronic illness. Accommodation deficiencies in the family's lifestyle will result in stressful family interactions. These strains might change the affective atmosphere in the primary family circle, thereby affecting the way the asthmatic child is nurtured and emotionally supported as is confirmed by Vila et al (2000: 2), who argued that anxiety resulting from a chronic, severe illness may be associated with the pathogenesis of atypical and unhealthy family interactions. Caring for a chronically ill child could become an overwhelming obligation, which might affect personality development in the offspring. Excessive familial stress and anxiety might inhibit proper coping styles to alleviate stress and cause adverse disease progression with compromised quality of life among individuals diagnosed with asthma.

#### **2.3.4 Possible connections between personality and medicine use**

Gustafson and colleagues (2001: 8) noted that the frequency of medicine administration is related to certain personality traits in individuals. These researchers further noted that high consumption of medication is associated with increased psychosocial difficulty and thus also with lower quality of life in individuals diagnosed with severe asthma.

#### **2.3.5 Asthma medication protocols**

The medical treatment of asthma is tailored according to asthma status severity. Asthmatic individuals usually need inhaled corticosteroids and long-acting  $\beta_2$ -agonists (LABA's), while individuals with severe, persistent asthma often require additional controller medication like anti-leukotrienes, oral LABA's, oral corticosteroid and/or anti-IgE (monoclonal antibody omalizumab) therapy (Peters et al 2006: 1).

Global Initiative for Asthma (GINA) guidelines classify asthma status severity into four groups, namely intermittent, mild persistent, moderate and persistent or severely persistent,

according to the following variables, i.e., symptoms, daily medication regimen, activity limitations and pulmonary function (Peters et al 2006: 2; Bisgaard & Szefler 2005: 4). The most basic recommendation is that individuals with intermittent asthma should receive rapid-acting inhaled  $\beta_2$ -agonists, individuals with mild persistent asthma should receive rapid-acting inhaled  $\beta_2$ -agonists and low-dose inhaled corticosteroid (ICS), individuals with moderate or severe asthma should receive inhaled long-acting  $\beta_2$ -agonists (LABAs) with ICS (Peters et al 2006: 2).

Various authorities extend on the categorization of severe, persistent asthma. The European Respiratory Society (ERS) uses the concept of ‘therapy-resistant’ asthma, where asthma is not optimally controlled, despite high-dose ICS. The American Thoracic Society (ATS) uses the term ‘refractory’ asthma to include individuals whose asthma status is severe, corticosteroid dependent/resistant, difficult to control, brittle or irreversible. Individuals with refractory asthma have to use additional controller medication daily, although they might still experience persistent and rapidly deteriorating airway obstruction with reduction in steroid dose, or they might have had a near fatal asthma episode in the past (Peters et al 2006: 3). These treatment regimes illustrate the high risk involved in developing dependent personality traits, coupled with anxiety and depression due to high levels of corticosteroid administration.

### **2.3.6 Medicine groups**

Because chronic administration of medication is implicated in the pathogenesis of certain psychiatric difficulties associated with asthma, e.g., corticosteroids and impaired memory, it is necessary to also critically revise the medicine groups involved in asthma treatment. These groups consist of steroids, rapid-acting  $\beta_2$ -selective stimulants, long-acting  $\beta_2$ -stimulants, leukotriene receptor antagonists, and anti-IgE. Each of these groups is now discussed in more detail.

#### **2.3.6.1 Steroids**

The process whereby corticosteroids suppress activated inflammatory genes in the asthmatic airways is complex and includes interaction with glucocorticoid receptors (GR-pathways) and the reversal of histone acetylation. The histone cores of these inflammatory

genes get acetylated and are thus activated by pro-inflammatory transcription factors, namely Factor- $\kappa$ B and activator protein-I, to cause inflammation of the airways (Barnes, 2006: 2). In keeping with general opinion, Barnes (2006: 2) emphasizes that corticosteroids are the most effective anti-inflammatory drug for chronic inflammatory diseases. Severe and difficult to control asthma, as with COPD, is a steroid-resistant condition and therefore difficult to control due to abnormalities in the GR signalling pathways. Furthermore, smoking most commonly causes resistance to the anti-inflammatory effect of corticosteroids (Barnes 2006: 2, 5).

Bisgaard and Szefer's (2005: 3-6) research findings confirmed that the morbidity associated with mild persistent asthma in children could be significantly reduced by administration of inhaled steroid therapy (ICS). The use of ICS was also found to be effective in the prevention of exercise-induced symptoms (EIA), e.g., bronchoconstriction in children with near-normal pulmonary function (Bisgaard & Szefer 2005: 8). Administration of steroids, however, does not produce an immediate functional effect as with administration of bronchodilators or  $\beta$ 2-stimulants. An initial increase in the FEV can be seen after six hours, but reduced obstruction to airflow may take days (Sommers 2002: 211).

The daily use of aerosol steroids prevents chronic inflammation in the lungs. It acts topically in the inflamed bronchi to clear up the asthma symptoms and it removes the need for  $\beta$ 2-agonists. The use of an air chamber or a spacer in the administration of the steroids improves delivery to the bronchi (Sommers 2002: 211). The small concentration of steroids in aerosols sometimes necessitates the use of oral steroids (prednisolone) to get poor-responsive inflammatory reactions under control. The smaller aerosol particles produced by corticosteroid metered dose inhalers with hydrofluroalkane propellants will also reach inflammation in the small airways more effectively (Barnes 2006: 5). However, anxiety, mood disorders and impaired memory have been associated with high dose administration of corticosteroids, particularly if intake is systemic (not by means of inhalation).

### 2.3.6.2 *Rapid-acting $\beta$ 2-selective stimulants*

$\beta$ -adrenoceptor agonists such as ephedrine, act by mimicking the effects of adrenaline and have been used since 3 000 BC in Chinese herbal medicines to relieve breathing difficulties (Sears & Lötvall 2005: 153).  $\beta$ 2-selective agonists act as bronchodilators that are used in emergency rooms and as day-to-day reliever medication to relax bronchospasm in asthma (Sears & Lötvall 2005: 152). It shows functional effect within 15 to 30 minutes after inhalation and provides relief for four to six hours (Sommers 2002: 212), thus inadequate night-time relief (Sears & Lötvall 2005: 152). As a single treatment regime, without being supplemented by steroid treatment, it is indicated only in mild intermittent asthma with symptoms not more than twice per week, nocturnal asthma not more than twice per month, and to prevent and treat exercise-induced asthma (Sommers 2002: 212). A few of the  $\beta$ 2-agonists drug examples are hexoprenaline (Ipradol™), salbutamol (Ventolin™ and Volmax™) and fenoterol (Berotec™) (Sommers 2002: 27). Small concentrations  $\beta$ 2-selective agonists administered near to the lungs by an inhaler can rapidly mediate bronchodilation, while higher concentrations of  $\beta$ 2-selective agonists administered by infusion further away from the lungs are needed to get the same level of bronchodilation (Sommers 2002: 28). The use of fenoterol inhaler is preferred to the use of isoprenaline, because of its superior bronchoprotection, its longer maximum effect and its smaller effect on heart function. The use of salbutamol (albuterol) is popular, due to its fast functional onset and greater selectivity between  $\beta$ 1- and  $\beta$ 2-receptors, thereby overcoming many of the limitations inherent to administration of other stimulants. Terbutaline also acts rapidly and it is used for ‘as-needed’ medication (Sears & Lötvall 2005: 158).

### 2.3.6.3 *Long-acting $\beta$ 2-stimulants*

The long-acting  $\beta$ 2-stimulants are used to give relief for at least 12 hours versus the 4 to 6 hours associated with administration of short-acting or  $\beta$ 2-selective agonists. This group includes salmeterol (Serevent™), a partial agonist and formoterol (Foradil™), a full agonist (Sommers 2002: 212). Salmeterol has a slower reaction onset, less total bronchodilator capacity at high dose, and are less likely to develop tachyphylaxis to bronchodilation (Walters, Wood-Baker & Walters 2005: 384). Formoterol has long lasting effects, i.e., greater than 12 hours, and a fast onset, i.e., one to three minutes from

inhalation. Its use results in more than 80% of maximal  $\beta_2$ -receptor activation (Sears & Lötvald 2005: 152, 159). Long-acting  $\beta_2$ -stimulants are used in the treatment of nocturnal asthma, or sometimes moderately persistent asthma, where the individual is already using high doses of aerosol steroids. Seretide™ is a combination steroid/ $\beta_2$ -stimulant (salmeterol/fluticasone) drug that seems to be more effective than doubling the fluticasone dose (Sommers 2002: 212). Inhaler administration is the preferred therapy versus oral preparations with its more pronounced systemic effects (Sommers 2002: 28, 212).

#### **2.3.6.4     *Leukotriene receptor antagonists***

Leukotrienes are powerful compounds that inhibit the mediation of inflammation by the cysteine containing leukotrienes, namely LTC<sub>4</sub>, LTD<sub>4</sub> and LTE<sub>4</sub>. Leukotrien receptor antagonists provide symptomatic relief in asthma, but are not as effective as aerosol steroids in the treatment of inflammation, to improve lung function, or to delay disease progression. In aspirin induced asthma, montelukast (leukotrien receptor antagonist) is the treatment of choice. The combination of leukotrien antagonists and antihistamines is indicated for the treatment of asthma and allergic rhinitis (Sommers 2002: 212-213).

#### **2.3.6.5     *Anti-IgE***

Peters et al (2006: 14) noted that individuals with ‘difficult to control asthma’ are in need of a new therapy to improve clinical outcomes, and which is not adding to the burden of adverse side effects of medication. Anti-IgE is the most recent additional treatment option for inadequately controlled severe and persistent asthma (Peters et al 2006: 1).

The anti-IgE monoclonal antibody (omalizumab) binds with serum IgE to block its binding to mast cells and basophilic cells to inhibit allergen induced bronchi-constriction. It has been proven beneficial to reduce asthma symptoms, exacerbations and emergency visits, to decrease corticosteroid use, to treat other IgE-mediated concomitant diseases like rhinitis and to improve lung function, symptom scores and thus quality of life (D’Amato 2006: 302; Peters et al 2006: 1). According to D’Amato (2006: 306) omalizumab has a reassuring safety profile with no cases of anaphylactic reactions and immune complex diseases.

### **2.3.7 Medication as an additional stressor**

The adverse side effects associated with asthma medication are now discussed, in order to indicate the link between asthma and possible affective and personality traits associated with asthma, i.e., steroids and  $\beta$ 2-stimulants.

#### **2.3.7.1 Steroids**

Treatment is often symptomatic – more severe symptoms necessitate aggressive treatment regimens with higher dosages of medication, which usually include some cortisone derivatives, resulting in an upsurge of side effects. High doses of inhaled steroids or oral steroids produce more pronounced side effects. Barnes (2006: 5) expresses his concern about local and systemic side effects, especially in children.

One of the systemic side effects is the inhibition of ACTH and cortisol secretion. The possible suppression of the hypothalamic-pituitary-adrenal axis may occur after high doses or prolonged periods of steroid use. It was further found that even low doses of steroids (400 $\mu$ g/day) might affect indices of bone metabolism (serum osteocalcin and urinary pyridinium cross-links) in some individuals, although the clinical effect of this is not clear (Barnes 2006: 5). Some local side effects of inhaled steroids are mostly oral candidiasis and dysphonia (coarse voice), as well as weakness of the voice due to atrophy of the vocal cords (Barnes 2006: 5; Sommers 2002: 211).

Brown, Khan and Nejtek (1999) ascribed the following behavioural symptoms to the prolonged administration of cortisone derivatives: depression (sadness and suicidal ideation), lability (mood swings), mania or hypo mania (incidents of elevated mood), increased energy, insomnia, agitation, irritability, rapid speech, delusional beliefs and disorganized thought processes. Both adults and children were found to suffer from these symptoms. Lewis and Smith (cited in Naudé & Pretorius 2003: 700) reported that the onset of psychiatric symptoms might be sudden - even during the first week of corticosteroid therapy.

Fluticasone (Fluxotide™) is the steroid aerosol with the greatest potential for unwanted systemic effects, because of its fat-solubility and long half-life. Its plasma half-life of 14

hours versus a sometimes 12-hourly inhalation routine causes it to accumulate (Sommers 2002: 211).

### 2.3.7.2 $\beta$ 2-stimulants

Most of the side effects inherent to  $\beta$ 2-agonists can be avoided by inhalation therapy instead of oral therapy. Intolerance to  $\beta$ 2-agonists is caused by receptor down regulation and desensitisation by high doses and/or the prolonged use of LABA's (Sears & Lötval 2005: 162-163; Adler, Uziel, Mei-Zahav & Horowitz 2006: 281). Adler and colleagues (2006: 281) found that the use of formoterol induces tolerance to the bronchodilating effect of salbutamol.

The  $\beta$ 2-selective agonists can in addition to  $\beta$ 2-receptors, also stimulate  $\beta$ 1-receptors to increase cardiac output and to cause arrhythmia. Sears and Lötval (2005: 155) also stated that the presence of  $\beta$ 2-receptors in the heart ventricles (40% of  $\beta$ -receptors) and in the heart atria (55% of  $\beta$ -receptors) poses a threat for cardiac side effects. Besides for isoproterenol, these drugs though have a lower affinity for  $\beta$ 1-receptors so that only higher than therapeutic dosages may prove a risk for tachycardia. The rapidly improved blood flow caused by higher cardiac output in badly ventilated areas of the lungs may however worsen the ventilation-perfusion imbalance (Sommers 2002: 28).

Isoprenaline proved to be highly effective, but its extensive ability to interact with  $\beta$ 1-receptors, thus causing cardiac side effects, might limit its usefulness (Sears & Lötval 2005: 157). The side effects of  $\beta$ 2-stimulants further include tremor, increases in glucose and lactate, decreases in serum potassium and serum calcium, and in some rare cases tachycardia, palpitations and arrhythmias (Sommers 2002: 28; Sears & Lötval 2005: 162). Sears and Lötval (2005: 162) further noted that the use of fenoterol, due to its superior role in bronchodilation, is associated with delayed diagnosis of the severity of an asthma attack, leading to increased mortality. In keeping with this observation, Walters and colleagues (2005: 384) noted an association between regular LABA-use and near-death emergencies and mortality among asthmatic individuals, poorer clinical outcomes and increased degrees of airway reactivity.

**TABLE 2.1: Side effects associated with asthma medication**

<b>Pharmacological classification</b>	<b>Active ingredients</b>	<b>Brand or proprietary name™</b>	<b>Side Effects</b>
Glucocorticoids	Beclomethasone Propionate	Becotide™ Disk haler Becotide™ Rotocaps Beclate™ Inhaler Cyclosin™ Cyclocaps	Suppression of pituitary-adrenal function; fluid and electrolyte disturbance; hyperglycaemia; glycosuria; upper respiratory tract infection; nervousness; headache; insomnia; mood changes; rhinitis; increased asthma symptoms; pharyngitis (Snyman 2005:1487).
	Budesonide	Budeflam™ Inhaler Inflammide™ Inhaler Pulmicort™ Turbohaler	
	Fluticasone propionate	Flovent™ Inhaler Flexotide™ Inhaler	
	Ciclesonide	Alvesco™ Inhaler	
Methylxanthines	Theophylline	Euphyllin Retard™ Tabs Microphyllin™ Caps Neulin™ Tabs	Headache; palpitation; dizziness; Nausea; hypotension; precordial pain; tachycardia; restlessness; agitation; emesis; seizure (Snyman 2005:599).
	Aminophylline	Genasma™ Caps Aminophyllin™ Injection	
Sympathomimetic ( $\beta_2$ Agonists)	Salbutamol	Ventolin™ Inhaler Asthavent™ Inhaler Venteze™ Inhaler Volmax™ Tabs	Tachycardia; hypertension; nervousness; tremor; palpitation; nausea; vomiting; headache; sweating; taste disturbance; urticaria; muscle cramps (Snyman 2005:167).
	Salmeterol	Serevent™ Inhaler	
	Terbutaline	Bricanyl™ Turbo haler	
	Fenoterol	Berotec™ Inhaler	
	Formoterol	Foradil™ Dry Oxis™ Turbo haler	
	Hexoprenaline	Ipradol™ Inhaler	
Anticholinergics	Ipratropium bromide	Atrovent™ Inhaler	Headache; nausea; cough; urine retentions; paradoxal bronchoconstriction; local irritation (stuffy nose); blurred vision; hypotension; metal taste; dry mouth (Snyman 2005:188).
	Tiotropium	Spiriva™ Inhaler	
Leukotriene receptor antagonists	Montelukast	Singulair™ Tabs	Headache; gastro intestinal disturbance; skin reaction; edema; bleeding; drug induced hepatitis; dental pain; blood dyscrasy (Snyman 2005: 194).
	Zafirlukast	Accolate™ Tabs	

## 2.4 QUALITY OF LIFE

The effective self-management of asthma to a certain extent depends on awareness of the disease. Many adolescents struggle to manage their asthma condition, thereby adversely affecting several aspects of their lives, which might lead to reduction in quality of life. The *Paediatric Asthma Quality of Life Questionnaire* (PAQLQ) is a previously validated scale that measures asthma-specific quality of life in three domains: activity limitations, symptoms, and emotional functions (Rich et al 2006: 748).

## 2.5 SYNOPSIS

In this chapter a variety of factors involved in the progression of asthma that needs to be controlled in order to improve the asthma condition were discussed. Stress might be beneficial for daily functioning; yet very high or chronic stress resulting from poor life circumstances such as economical difficulties, the burden of a chronic medical condition and social stress and anxieties tend to be contra-productive and difficult to control. Other factors that adversely affect the asthma condition are vague diagnoses due to the use of substitute names and co-morbidities, environmental threats such as mite infestation, pollution, pet allergen and aeroallergen, and adverse side-effects brought about by medication administration. Asthma treatment aims at controlling symptoms and preventing long-term airway damage (airway remodelling) (Bibi et al 2006: 2). The treatment of asthma might be complicated due to uncertain disease progression, difficulty to diagnose both the condition and the severity of it, difficulty to control life stressors and allergens, as well as non-adherence to treatment schedules. In chapter 3 the link between neurobiology and personality development will be discussed.

## **CHAPTER THREE**

### **LINKING NEUROBIOLOGY WITH PERSONALITY DEVELOPMENT**

#### **3.1 INTRODUCTION**

In chapter two a variety of physiological and psychological factors, environmental threats and medicinal side effects involved in the progression of the asthmatic condition, as well as the need to control asthma progression were discussed. In this chapter the neurobiology and associated aspects that affect the process of personality development will be discussed.

#### **3.2 NEUROBIOLOGY AND PERSONALITY DEVELOPMENT**

It seems that neurobiology is at the centre of personality development. The basic premise is that neurobiological function and development (also through the process of learning) directly impacts on personality formation. Furthermore, it stands to reason that personality influences adjustment and behaviour. It follows that personality is partly predetermined or at least influenced by neural development. However, it is extremely difficult to link observed personality traits to neural functioning, since various aspects of the developing human brain still proves difficult to fully conceptualise. However, it is possible to link the pituitary-adrenal-stress-response circuit to personality changes through evaluation of stress levels and the associated personality traits.

According to Panksepp (1998: 25) all mammals are born with a variety of capabilities that necessitates no previous learning, but which make further learning possible. Two of the major functional axis systems found in human brains are the visceral axis (i.e., hypothalamus to limbic stream of feelings) and the somatic axis (i.e., thalamic- neocortical stream of thoughts). These two functional axis systems, through brain circuits or pathways, integrate primal emotional impulses with cognitive appraisals, plans, and outer world representations to find expression in motor behaviour (Panksepp 1998: 61-62).

Communication between the periphery and the brain, within the axis systems, takes place via both neural and humoral pathways (Dantzer 2004: 1). Humoral pathways are pathways used to transport hormones between the brain and different parts of the body, where the hormonal effects and changes take place, or other hormones are excreted to further potentiate a diverse range of reactions and functions. According to Panksepp (1998: 24) brain circuits control the basic genetic emotional behaviour tendencies. Affective and sensory experiences, resulting from emotive behaviour, are closely linked to brain processes that integrate and generate emotional behaviour. Specific hormones activate certain action circuits of these brain processes, e.g., neurochemistry is responsible for activating the pituitary adrenal stress response circuit (Panksepp 1998: 24). Thus, from a mixture of individuals' innate behavioural tendencies and learned experiences the brain develops distinct patterns of action behaviour, e.g., the stress response circuit used in certain situations (Panksepp 1998: 24). It is proposed that certain behaviour is part of or becomes part of the behaviour repertoire of asthmatic children, which leaves them vulnerable to certain personality changes, or which may modulate personality development. Chronic stress as found in asthmatic individuals continuously initiate the pituitary adrenal stress response circuit, which result in cognitive and emotional responses (Du Preez 2003), affecting personality development.

### **3.2.1 Cognitive and emotional behaviour development**

Neural plasticity refers to changes in the synaptic connections and dendrite arborisation in the brain. The process of neural plasticity is subject to experience and is advanced by cortical stimulation (Panksepp 1998: 27). According to Panksepp (1998: 26) there are no emotions without thoughts and these thoughts evoke emotions. It is currently accepted that emotional abilities regarding information and survival needs initially originate from instinctive operational systems of the brain. Command processes refer to the ability of specific stimulated brain regions to activate coherent emotional behaviour patterns. When emotions are experienced, sensory information from the body is integrated by different parts of the brain, causing physiological changes that have behaviour implications. The resultant bodily changes regulate the emotional systems by feedback mechanisms (Panksepp 1998: 27). These processes therefore develop intuitive cortical systems, resulting in increased complexity (cortical maturity). Cortical maturation is a function of

the interaction between lower level and higher level brain regions, resulting in improved ability to reason and to make decisions and behavioural choices.

When overload of affective systems takes place, or when it operates outside the normal operational ranges, acute stress might result in psychiatric disorders (Panksepp 1998: 25). Enduring emotional over-activity might lead to mania, paranoid schizophrenia, anxiousness, obsessive compulsiveness and posttraumatic stress disorder (Panksepp 1998: 27). It is believed that asthmatic children are sometimes overexposed to illness-related stress, and due to impact of this chronic illness on asthmatic individuals and family life. These stressful life circumstances might leave asthmatic individuals vulnerable to cognitive and emotional difficulties, which might affect personality development.

### **3.2.2 The effect of emotion on personality development**

Based upon Thomas and Chess's parent interviews (in Zuckerman 2005: 5) temperament is moulded by emotion/"quality of mood", which constitutes but one of nine behaviour categories that impact on temperament and personality development. These researchers view "quality of mood" on a continuum, the one pole representing pleasant, joyous, and friendly qualities, and the opposite pole associated with adverse qualities such as unpleasant, sad and unfriendly experiences. According to James in Panksepp (1998: 42) affective feelings result from cognitive interpretations of energetic bodily responses that originate from a variety of emergencies. These cognitive interpretations of affective stimuli are influenced by spoor memories, which are based upon prior experience within similar contexts/situations. Spoor memories are persistent neural traces of emotional experiences/trauma that are well remembered (Panksepp 1998: 27). The intensity of these spoor memories will also be reflected in the threshold and the intensity of the emotional behaviour responses within a novel context. The *threshold of responsiveness* and the *intensity of reaction* are two other behaviour categories of Thomas and Chess's model of temperament (in Zuckerman 2005: 5), and these need to be incorporated when exploring personality development. Feelings result from cognitive interpretations; therefore integration with higher-level cortical regions is needed, where spoor memories of these experiences are stored to influence consequent personality development. Chronic stress activates neurotransmitters, affecting various developmental processes in the brain, including behaviour expression and the development of certain personality traits. Stress is

furthermore a beneficial day-to-day phenomena/function of the brain, if experienced in moderate intensity.

### **3.3 STRESS AS FUNCTION OF THE BRAIN**

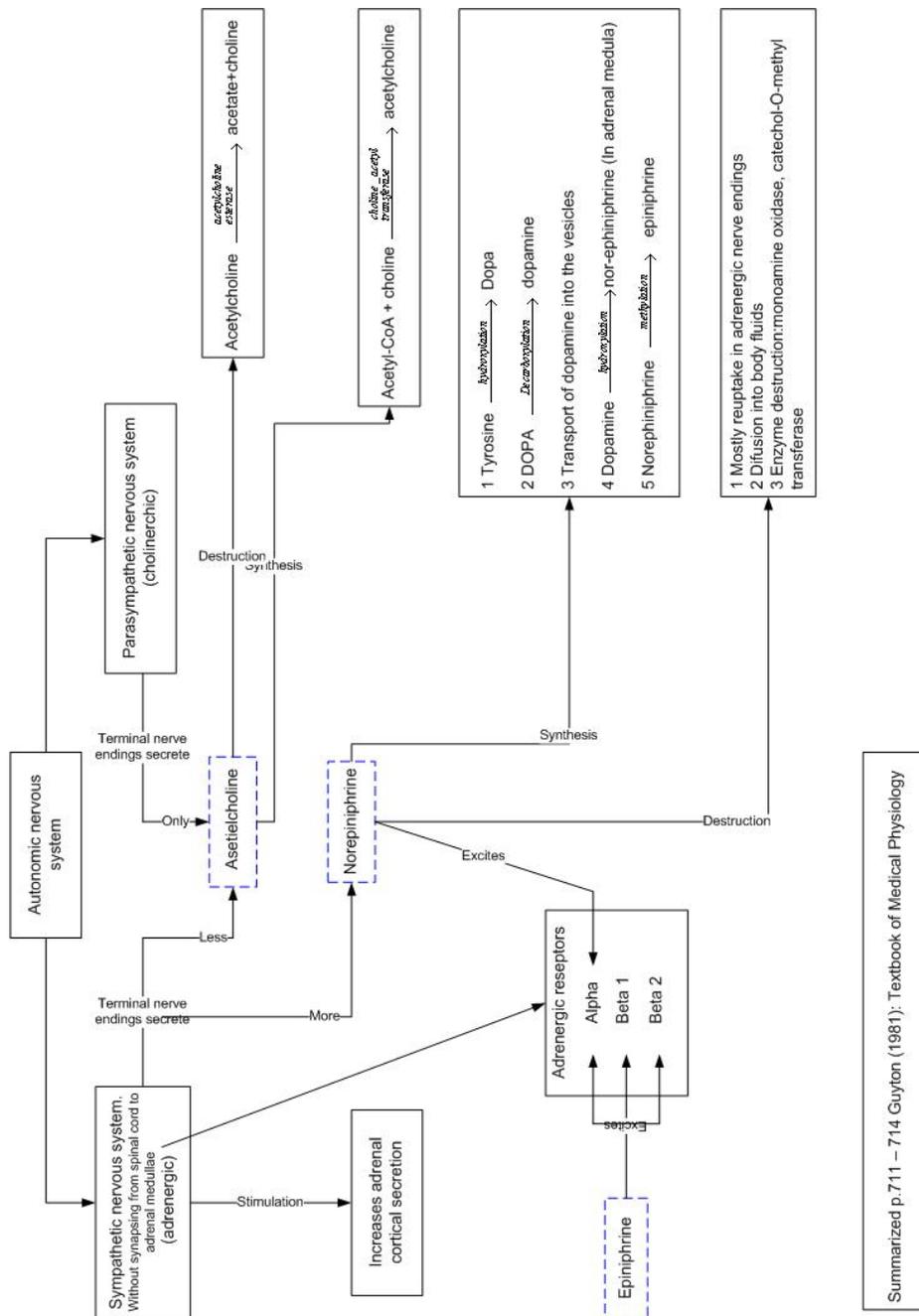
It is accepted that each person shows a unique neural reaction to stress, which is influenced by the individual's innate genetic traits, e.g., the personal threshold potential, which limit the amount of stress that can safely be adapted to, the personal perception of and interpretation of a stressful situation, or emotional and cognitive appraisals. Whether a person thus perceives an event as stressful depends on the context of the event and on personal resources, psychological defences and coping mechanisms (Kaplan & Sadock 1998: 582). This unique stress reaction determines the intensity and nature of subjectively experienced stress.

### **3.4 THE AUTONOMIC NERVOUS SYSTEM AND STRESS-RELATED NEUROTRANSMITTERS**

The autonomic nervous system comprises of both the sympathetic and parasympathetic nervous systems. The sympathetic nervous system is mostly sensitised in reaction to physiological or psychological stress, resulting in certain bodily changes to take place. With enduring stress stemming from chronic illness, these changes might negatively impact on physiological functioning, e.g., neuroendocrinological functioning, and on general physical, cognitive and emotional development.

Figure 3.1 is a summarised graphic explanation of the autonomic nervous system, branching into the sympathetic and the parasympathetic nervous systems. With activation of the nervous system, both the branched systems get activated, although the sympathetic nervous system (SNS) has more pronounced effects on the surrounding tissues and vessels, through neurochemical transmitter activity, e.g., norepinephrine (noradrenalin), epinephrine (adrenaline) and Acetylcholine. The nerve endings of the SNS terminate on effector sites in organs such as the adrenal medullae, where it activates cell bodies, e.g., alpha-,  $\beta$ 1- or  $\beta$ 2-cells or other chemical substances. The direction of neurotransmitter activation and activation of other substances after emotional/stress arousal and associated

functions/effects, as well as chemical substance metabolism and reuptake are noted in figure 3.1 below.



**Figure 3.1 Autonomic nervous system and stress related neurotransmitters**

Figure 3.1 demonstrates the activation of the sympathetic nervous system and its effects on effector organs/sites as discussed under subsequent headings.

### **3.4.1 The sympathetic nervous system (SNS)**

When stress activates the nervous system it mostly affects the sympathetic nervous system, which will be discussed in subsequent paragraphs. This section is divided into two subheadings, namely *the sympathetic stimulation of the adrenal medullae* and *the effects on the body organs by direct sympathetic stimulation*.

#### **3.4.1.1 Sympathetic stimulation of the adrenal medullae**

Stress causes sympathetic stimulation, which in turn impacts on the bodily functions of a person experiencing stress (Guyton 1991: 716-717). It is known that too high levels of stress have severely negative effects on bodily functions, as well as on cognitive and emotional development. Sympathetic stimulation causes large quantities of adrenaline (80%) and noradrenalin (20%) to be released into the blood stream, from where it carries to all the body tissues. Even minute activation of the SNS might stimulate a large portion of the SNS, resulting in mass discharge to effector sites and surrounding tissues. Both ways of stimulation, i.e., directly by the sympathetic nerves and indirectly by medullar hormones, support each other in producing the same effect. Stimulation through the sympathetic nerves takes a shorter time to reach the effector sites, while hormones carried by the bloodstream take longer to reach their effector sites, although its effect remains for longer periods. Noradrenalin and adrenaline particularly increase the metabolic rate of body cells, although a minority of cells are innervated directly by sympathetic fibres. Direct sympathetic stimulation of body organs produces quick effects.

#### **3.4.1.2 Effects on the body organs by direct sympathetic stimulation**

According to Guyton (1991: 715-716) direct sympathetic stimulation might result in the following:

- Formation of concentrated glandular secretions, although it reduces the rate of secretion;
- Vasoconstriction of most blood vessels, especially near the abdominal viscera and the skin of the limbs;

- Stimulation inhibits peristalses of the gastrointestinal tract and increases the tone of the sphincters, resulting in delayed movement of food through the tract;
- Stimulation increases all cardiac activity, including the metabolic rate;
- Especially when drugs have paralysed the sympathetic alpha effects, beta stimulatory effects might cause vascular dilation;
- It increases both heart propulsion and resistance to flow, which increases blood pressure. The rapidly improved blood flow caused by higher cardiac output in badly ventilated areas of the lungs may worsen the ventilation-perfusion imbalance (Sommers 2002: 28). With  $\beta_2$ -selective agonist administration cardiac output is increased and might cause arrhythmia, which might pose a real threat for heart failure in stressful situations (Sears & Lötvall 2005: 155);
- Mild dilation of the bronchi, coupled with blood vessels constriction, might result in mildly lowered lung pressure, which might result in poor oxygen absorption. This negatively impacts on the asthmatic individual's already diminished ability to absorb oxygen;
- Stimulation might also produce metabolic effects, causing glucose to be released from the liver, coupled with an increase in blood glucose concentration and glycogenolysis in muscles, muscle strength, basal metabolic rate, and in mental activity.

Circulating adrenaline and noradrenalin produce almost similar effects on the different organs as direct sympathetic stimulation, but the effects last ten times longer, as it takes longer to diffuse out of the blood stream. The effects of adrenaline are much stronger on cardiac activity (factor in cardiac diseases) and tissue metabolism, while noradrenalin causes stronger constriction of the blood vessels of the muscles (major segment of all vessels of the body), coupled with elevated arterial pressure. Constricted blood vessels of the muscles imply lower blood supply to the thorax muscles that support breathing through the lungs, weakening muscle function, while less blood supply to the lungs decreases oxygen exchange from the lungs into the blood. This lowered oxygen supply to the body may sensitise the asthmatic to become more stressed, resulting in the exacerbation of asthma symptoms. Adrenaline, secreted by the adrenal medulla, often increases the excitability of the entire body and the metabolic rate as much as 100% above the normal rate, resulting in exhaustion of the bodily reserves (Guyton 1991: 715-716).

### 3.5 ANXIETY

Panksepp (1998: 62) describes anxiety as an open program system that is highly permeable to and thus influenced and changeable by environmental events. Anxiety is a diffuse, unpleasant sense of apprehension, often accompanied by autonomic symptoms like headaches, perspiration, palpitations, tightness in the chest, mild stomach discomfort, and restlessness, coupled with fear and nervousness (Kaplan & Sadock 1998: 581). Anxiety might be a symptom of many medical and mental disorders, especially depressive disorders. Being aware of such physiological and psychological sensations, some people feel ashamed and fear that other people will notice it too, which can increase anxiety (Kaplan & Sadock 1998: 581).

Anxiety within the normal ranges is nevertheless also a beneficial response to threatening situations, such as on the first day of school, when infants are separated from their parents, or if faced with an illness. An individual might experience chronic anxiety (sometimes associated with chronic stress) if there is no adaptive balance between the external (pressures of the outside world) and internal (personal impulses) worlds, and if these imbalances persist long enough (Kaplan & Sadock 1998: 582).

Deshmukh, Toelle, Underwood et al (2006: 1) report an increased prevalence of anxiety disorders, especially panic disorder and panic attacks among asthma patients. Chronic anxiety is thus very much part of the asthmatic child's life, especially when the asthmatic condition is not stabilised and when asthma attacks and asphyxia are feared and occur regularly. Another factor that might cause anxiety is when the diagnosis of asthma is not accepted and the child's special needs are not accommodated within the family and community. Chronic anxiety culminates in an intensive stress burden and if not relieved, might result in pathological anxiety. The high intensity of stress affects personal functioning on various levels, i.e., hormonal induced neurological changes that result in the development of distinctive personal behaviour and characteristics. This interaction or integration between hormonal-neurological changes and associated personality changes comprises the key concepts of psychobiology of personality.

### **3.5.1 Pathological anxiety as a cause of personality distortion**

Feelings of anxious and apprehension depend on certain factors such as whether the asthma condition is stabilised, the context of an acute episode (asthma attack), personal resources, psychological defences and coping mechanisms (Kaplan & Sadock 1998: 581). Kaplan and Sadock (1998: 583) further claim that anxiety tends to cause confusion and distortion of perception of time, space, people and meanings of events. The distortions can interfere with learning by lowering concentration, reducing recall and by impairing the individual's ability to make associations.

Neural activity can also induce a type of extreme anxiety, namely posttraumatic stress disorder (PTSD) (Panksepp 1998: 212). Kaplan and Sadock report that the level of stress experienced in PTSD is extreme enough to affect almost any person (Kaplan & Sadock 1998: 617). Symptoms are the re-experiencing of the trauma, i.e., asthma attack, hyper-arousal, depression, anxiety, and cognitive difficulties such as poor concentration (Kaplan & Sadock 1998: 617).

Anxious people might justify their fears and responses by selecting certain facts in their environment, which might result in distorted perception, thereby helping to maintain high levels of anxiety. More attention is usually given to pharmacological treatment of asthma, so that the psychological implications are ignored or not given proper attention. Due to selective thinking as discussed, anxious persons (asthmatics) might thus fail to take the necessary precautions to adjust to anxiety, and experience a false sense of reassurance (Kaplan & Sadock 1998:583).

Anxiety sometimes gets confused with or is viewed similar to fear. However, anxiety is an alerting signal that warns of impending danger that might be unknown, internal, vague, or conflicting and for which precautions can be taken, while fear is a response to a known, external, definite, or non-conflicting threat (Kaplan & Sadock 1998: 581).

### **3.6 FEAR RESPONSES**

According to Panksepp (1998: 206) fear potential or the anticipation of possible harm to oneself is a genetic function expressed through neural function. These coherent operational neural systems developed through fight and flight behaviour that aims at survival in the face of perceived danger. Panksepp (1998: 212) further states that there is a clinical distinction between, and a difference in brain mechanisms or neurochemical systems that modulate panic attacks (separation anxiety) versus everyday anticipatory anxiety (fearful anxiety). It seems that asthmatics may experience vague feelings of anxiety for pending danger because of their asthmatic condition, but rather real feelings of fear for asthma attacks when it regularly occur as in uncontrolled asthma leading to anticipatory or fearful anxiety. Such fear and anxiety produce stress through the activation of the stress cycle that is not beneficial to one's health.

### **3.7 EFFECTS OF THE STRESS CYCLE ON THE NEURO- ENDOCRINOLOGY FUNCTIONS**

When a person perceives a series of sensory events as stressors, the hypothalamus-pituitary-adrenal system (HPA axis) is activated. The stressors or emotional triggers are directed onto the paraventricular nucleus (PVN) of the hypothalamus, from where corticotrophin-releasing factor (CRF) is secreted and the CRF-neurons descend towards the anterior pituitary gland to trigger ACTH-release into the blood stream (Naudé et al 2004: 444; Panksepp 1998: 118).

The ACTH in the bloodstream reaches the adrenal cortex, where the release of mainly two categories of corticoids, namely mineralocorticoids and glucocorticoids are triggered. Mineralocorticoid disturbances have a debilitating effect on the nervous system by influencing the electrolyte concentration of the extra cellular fluids and by the increased conversion of stored proteins and fats to glucose for action (Naudé et al 2004: 444; Guyton 1991: 944). Cortisol, the principal glucocorticoid (Guyton 1991: 944), promotes the release and usage of energy in the body. In the event of chronic stress the asthmatic patient might run out of bodily reserves, which will slow down metabolic processes, including a

decrease in important chemical substances essential for important body functions. The muscular, heart, lung and brain functions might be impaired.

Another major stress related neural pathway starts at the hypothalamus, descends down to the spinal cord, from where it activates, via sympathetic afferents, the secretion of epinephrine and norepinephrine from the adrenal medulla. Epinephrine and norepinephrine accelerate the brake-down of liver glycogen to provide blood sugar for action (Panksepp 1998: 119), and furthermore causes the activation or inhibition of the sympathetic nervous system, which mediates an array of changes in the Executive Emotional System (EES) (Naudé et al 2004: 444). Naudé et al (2004: 437-460) reported the disruption of the Executive Emotional System (EES) as a cause of frontal lobishness among stressed children. Symptoms of frontal lobishness include tactlessness, disinhibition, moria (silliness), coarseness, perseveration, social imperception, and decreased attentiveness (Naudé 2004: 438). Additional to these acknowledged symptoms, Naudé et al (2004: 437) reported depressed explicit-declarative memory (especially semantic memory), as well as poor error detection and restoration, despite elevated social knowledge (episodic memory). The negative implication of aforementioned symptoms on personality development and thus quality of life is obvious. Naudé et al (2004: 444) concluded that the child's immature brain is functionally subject to environmental stress, and in response shows specific patterns of moulding, which can add to developmental disorders, and which might influence behaviour and personality development. This information promotes insight into the interactional changes between the neurological and hormonal consequences of stress and personality development, constituting the psychobiology of personality.

### **3.7.1 The neuro-endocrinology of anxiety**

Anxiety and stress affect neuro-endocrinological functioning. The activity of neurotransmitters during anxiety and stress results in a succession of events in the brain that includes structural neural changes. Changes in the limbic systems are evident, e.g., in the amygdala and the locus coeruleus, which function in close association with each other and which function in close association with the hippocampus and the hypothalamus (Goleman 1995: 205). These neural changes might result in impaired cognitive and emotional functioning (Goleman 1995: 205). Changed cognitive and emotional

functioning may affect personality development and patterns of behaviour inherent to personality. These changes, if present in anxious asthmatic children, might influence cognitive and emotional behaviour and social development in school, at home and in their interaction with their peer group. Children's behaviour elicits good or bad reactions from others in their environment, which impact on their self-concept formation, an intrinsic part of their identity formation and personality development. Elevated anxiety is thus a contributing factor in the psychobiology of personality. It is hypothesised that fear responses or anticipation anxiety adds to elevated anxiety levels with similar effects on personality formation in asthmatic children.

### **3.7.2 The neuro-endocrinology of fear responses**

The mammalian brain has fear centres where fear responses are triggered. These areas form part of the FEAR circuit, where fear responses are integrated and interpreted. The FEAR circuit is stimulated from the lateral and central zones of the amygdala, through the ventral anterior and medial hypothalamic areas down to the mesencephalic peri-aqueduct grey (PAG), where the most prominent functions take place. Freezing, as well as flight behaviour and physiological symptoms like increased heart rate and elimination behaviour emerge as a function of this circuit (Panksepp 1998: 207-208).

Panksepp (1998: 207) claims that the worst thing that could happen to people is to be overcome by sudden fear and to always have a feeling of anxiety, because it creates a feeling of insecurity. Fearful anxiety is characterised by generalised apprehensive tension, tendency towards autonomic symptoms like tachycardia, sweating, gastrointestinal symptoms, and increased muscle tension. Anticipatory anxiety produces a need to escape the situation that intensifies the anxiety (Panksepp 1998: 212).

If anticipatory anxiety creates a need to escape difficult contexts or situations, it can be expected that anxious asthmatic children might feel a need to escape from challenging or inconvenient situations such as school after being absent, or when they have missed out on some work etc., because of their emotional discomfort. Will their level of cognitive appraisals contribute to escaping behaviour or will it contribute to perseverance?

### **3.7.3 The effect of stress on the neuro-endocrinology of cognitive function and development**

According to Du Preez (2003), when chronic stress continuously activates the limbic system, the emotional brain shows enduring reactions to stress, even before the thinking brain (the neo-cortex) could become aware of it, which compromises reasoning, conceptualising, abstraction and recalling abilities. Du Preez's findings seem to correspond with frontal lobishness and it contributes to the belief that frontal lobishness might originate from chronic stress. Calam, Gregg, Simpson et al (2003: 1) reported that behaviour problem scores of children in their research group were associated with three or more attacks of wheeze. Thus, it could be that asthmatic children might be vulnerable to behaviour problems, which indicate difficult temperament, which might result in learning and attention difficulties.

Stress induces elevated levels of norepinephrine, dopamine and glutamate in the hypothalamus and the frontal cortex (Naudé et al 2004: 445). Very high levels of norepinephrine cause memory impairment, which is reinforced by the elevated glutamate concentration (Naudé et al 2004: 445). The elevated glutamate concentration contributes to hippocampal atrophy that has detrimental effects on learning, memory and attention (Naudé et al 2004: 445). High stress levels found in asthma patients may thus impair memory, delay academic achievement and cause difficult behaviour.

Cortisol feedback to the hippocampus during stress influences cognitive potential to promote cognitive strategies in coping with stressors (Panksepp 1998: 118). Excessive amounts of cortisol secretions exhaust metabolic resources for the hippocampal neurons to a level where neuron function is impaired and neurons die prematurely (Panksepp 1998: 118). This so called neurotoxic effect might have a serious impact on cognitive functioning, since brain cells cannot be replaced (Panksepp 1998: 118). This stress induced neurotoxic effect and the hippocampal atrophy discussed in the previous paragraph, might have irreversible effects on the relative stable temperament of stressed asthma child patients, and thus cause irreversible changes and damage to the development of the child's personality. According to Bruner (cited in Bosacki 2003: 141) children's ability to act competently are influenced by what they can accomplish. Thus academic difficulty might influence their perception of their competency on various levels of

functioning. Neuroanatomy of memory, which will be discussed under the next heading, is important for memory functioning in humans, since memory affects various areas of functioning such as emotional, social and cognitive competence.

### **3.7.3.1 *Neuroanatomy of memory***

In keeping with what was previously reported, continued activation of the limbic system due to enduring stress might lead to compromised reasoning, conceptualising, abstraction and recalling abilities (Du Preez 2003). Naudé et al (2004: 437-460) reported frontal lobishness among emotionally stressed children (abuse-related) due to the disruption of the Executive Emotional System (EES). Some symptoms of frontal lobishness include decreased attentiveness, depressed explicit-declarative memory (especially semantic memory), as well as poor error detection and restoration despite elevated social knowledge (episodic memory) (Naudé et al 2004: 437). It seems that highly stressed asthmatic children may experience similar symptoms as discussed under the previous heading.

### **3.7.3.2 *The interactional involvement of the hippocampus, amygdala and the prefrontal cortex in memory***

No single part of the brain is solely responsible for memory, although damage to the hippocampus results in clinically significant and long lasting memory impairment (Zola-Morgan & Squire 1993: 550). There are different kinds of memories that are supported by different kinds of brain systems. Implicit non-declarative memory is a heterogeneous collection of non-conscious abilities that includes skills, habits, priming and some forms of classical conditioning (Zola-Morgan & Squire 1993: 547). Explicit declarative memory refers to personal recollections of events, facts, and categories (Naudé et al 2004: 438). Declarative memory however is partially processed by the structures of the medial temporal lobe. The medial temporal lobe structures (hippocampus and adjacent anatomically related entorhinal, perirhinal and parahippocampal cortices and the midline diencephalons) and the medial thalamus are components of a memory system that is essential to the formation of long-term declarative memory. Effective memory depends on this system at the time of learning and for a lengthy period thereafter, until a more permanent memory is established, presumably in the neocortex (Zola-Morgan & Squire 1993: 557). Naudé et al (2004: 441) agrees with Zola-Morgan and Squire (1993: 550-557)

that the hippocampus is a critically important part of the brain regarding the formation and consolidation of new explicit declarative long-term memories.

Furthermore, the hippocampus, coupled with the medial prefrontal cortex, is important in terms of emotional regulation. In post-traumatic stress disorder (PTSD) found in children, the right portion of the hippocampus showed reduced activity, and in adults, research findings showed atrophy of the hippocampus (Naudé et al 2004: 441). This atrophy of the hippocampus is explained by elevated secretion of amino acids and glucocorticoids. High glucocorticoid concentrations result in high levels of extra cellular glutamate, which, although beneficial for proper mediation of memory and cognitive processes, if in excess, can cause damage to receptive neurons and is associated with hippocampal atrophy. Thus, functional impairment or changes in activity of areas in the hippocampus might result in memory impairment, poor regulation of behaviour and emotion, inability to activate stored information and the inability to learn from past experiences (Naudé et al 2004: 442-443). These symptoms will decrease the conscientiousness of a person to keep to a schedule, such as asthmatics adhering to their treatment regimes and regular medicine use.

Short-term memory and non-declarative memory function independently from the medial temporal lobe and the medial thalamus, whereas declarative memory depends on an interaction between the prefrontal cortex and these structures (Zola-Morgan & Squire 1993). Stress adversely influences the function of the prefrontal cortex, through functional inhibition of the anterior cingulate gyrus, which leads to impaired error detection and functional impairment of the orbitofrontal cortex leading to the inability to regulate behaviour and to apply knowledge to relevant social situations. The functional impairment described above implies that even with adequate understanding and with sufficient social knowledge, functioning might be compromised in various ways, i.e., social evaluation of situations, application of knowledge in other situations, detection and restoration of mistakes and regulation of emotional behaviour (Naudé et al 2004: 442-443). Carelessness with looking after oneself, in detecting mistakes in schoolwork, difficulty in understanding others and perceived subtle social cues (deficits in emotional intelligence) and emotional difficulties such as depression and anxiety are characteristic behaviour in asthmatics with above mentioned deficits. Vila et al (2000: 9) reported that researchers found elevated anxiety and affective disorders in asthmatic patients. They further established that

asthmatics diagnosed with psychiatric disorders also revealed a poor self-esteem and social incompetence.

### 3.7.3.3 *The basal ganglia*

Another structure thought to be linked to memory and attention is the basal forebrain. The nucleus basalis (located in the basal forebrain) relates specifically to functions of attention (Zola-Morgan & Squire 1993: 555). Abnormalities and functional impairments of the frontal lobes and basal ganglia have been linked to the disruption of inhibitory control in various developmental disorders, such as Attention Deficit/Hyperactivity Disorder (ADHD), Obsessive Compulsive Disorder (OCD) and Tourette syndrome (Naudé et al 2004: 444).

Other components of the basal forebrain can influence memory functions by virtue of their anatomical projections to the hippocampal formation (Zola-Morgan & Squire 1993). Naudé et al (2004: 443) proposed that the limbic circuit with its projection zones in the medial prefrontal cortex (anterior cingulate gyrus and medial orbitofrontal cortex) as being one of five parallel, basal ganglia thalamocortical circuits. These circuits seem to carry different types of information, which are processed and supported in the frontal lobes and which are represented as a variety of behaviours (Naudé et al 2004: 444). Thus, with hippocampus damage, especially in highly stressed children such as asthmatic children, it is possible that a variety of behaviours can be detrimentally influenced.

The limbic circuits thus represent emotionally relevant information, and mediate appropriate approach and avoidance behaviours. Naudé et al (2004: 444) proposed that the functions of these circuits underlie inhibitory control. Such control deficits in developmental disorders reflect a disruption in the development of the basal ganglia thalamocortical circuits, which is in keeping with Panksepp's description of EES (Naudé et al 2004: 444). Asthmatic children having inhibitory control deficits might be non-observant of social cues about their behaviour and less able to learn from their mistakes.

### 3.8 THE IMMUNE SYSTEM

In order to understand certain implications of stress on immune functioning, a short discussion of some basic aspects/processes of the immune system is given. Immunity can be described as the capacity of the human body to resist almost all types of organisms or toxins that tend to damage the tissues and organs. The immune system forms antibodies and sensitised lymphocytes that attack and destroy specific organisms or toxins (called pathogens) (Guyton 1991: 74). Cellular elements of the immune system include lymphocytes, macrophages, monocytes, eosinophils, neutrophils, basophiles, mast cells, and dendritic cells that mostly circulate via the blood and the lymphocytes via lymphatic circulation. These cells have a short life span and function as antigen presenting cells when pathogens are detected. They are also attracted to sites of infection and inflammation; they participate in the elimination or isolation of microbes, and are active in tissue repair as well as interact with each other (Pruett 2003: 134).

There are mainly two immune responses to defend the body against pathogens, namely innate immunity and acquired immunity. The difference in the functional responses of innate and specific immunity is ascribed to the difference in sensitivity to noradrenalin and adrenaline (Kimura et al 2005: 1). Innate immunity is non-specific, does not exhibit a memory response and is mediated mostly by large granular lymphocytes such as neutrophils, eosinophils, basophiles, macrophages and natural killer (NK) cells. These cells kill virus-infected cells or tumour cells by direct anti-microbial action and secrete cytokines, which causes inflammation (Pruett 2003: 134).

Acquired immunity, a product of the lymphoid tissue, is specific and exhibits a memory response. Several cytokines, as well as interaction between three different cell types e.g. antigen presenting cell, Th-cells, and B-cells or T-cells, are involved in the function of acquired immunity. Acquired immunity has two response processes, i.e., cell mediated and humoral immunity processes. With the cell-mediated response, the major effector cells are Th1, which produce cytokines that activate macrophages for increased microbicidal activity, and Tc-cells, which produce cytokines that are cytotoxic to cells infected with viruses and other intracellular parasites (Pruett 2003: 134; Guyton 1991: 74-76).

In the humoral immunity response, the major effector cells are B-lymphocytes, which as matured cells are antibody-secreting plasma cells (Pruett 2003: 134). The involvement of Th2 and Th1 cells are necessary to affect the magnitude of response and determine the immunoglobulin isotype that the mature B lymphocyte plasma cell will secrete. If the Th1 cell concentration is bigger in the Th1/Th2 balance, the IgG2a isotype is favoured in the mouse, where the predomination of Th2 favours IgG1, IgA, or IgE isotypes. O'Leary (1990: 366-368) reported that the functional capacity of immune cells tends to be reduced with acute stress and that chronic or prolonged stress may result in prolonged immunosuppression. Irwin, Daniels, Bloom et al (1987) give recognition to the finding of cell-mediated immune changes (decrease in T cell and K cells) in people with distressing life experiences and major stress disorder.

### **3.8.1 Emotional modulation of the immune function**

Leriche (in Dantzer 2004: 4) explained health as a quiet immune system that does not interfere with the neural processing of external information. O'Leary (1990: 363) claimed that for centuries it was believed that psychological factors like emotional experience, personality and coping styles, could affect disease susceptibility, as well as the course of disease. O'Leary (1990: 369) further reported that inhibited or stressed power motivation of people whose need to influence others is stronger, compared to those whose need to affiliate with others and they tend to show frequent illness and poorer immune functioning (lower IgA levels). Lower IgA levels contribute to ill health (O'Leary 1990: 369). The deduction here is that self-sufficient (factor Q2+ of 16PF) asthmatics might be more vulnerable to immunosuppression and poor health outcomes, than group dependent (Q2-) asthmatics.

#### ***3.8.1.1 Affects of stress on the immune system***

Stress responses are characterized by activation of the hypothalamus-pituitary-adrenal cortex (HPA-axis) (Pruett 2003:135), causing the secretion of cortisol from the adrenal cortex, resulting in immune suppression in a stressful situation (Kimura et al 2005: 1). The secretion of cortisol only starts 15 minutes after the initiation of a stressful task; therefore Kimura et al (2005: 1) furthermore concluded that stimulation of the autonomic nervous system causes immediate immunomodulation.

Activation of the HPA- axis leads to the release of the adrenal hormones, mineralocorticoids, glucocorticoid, epinephrine, and norepinephrine (Pruett 2003: 135). Activation of the sympathetic nervous system leads to the release of norepinephrine from adrenergic nerve terminals, including those in the spleen, thymus and other lymphoid tissues (Pruett 2003: 135). The peripheral circulation concentration of other neuroendocrine mediators is changed, with implications for the immune system. In response to stress, the concentration of glucocorticoids (cortisol), catecholamines (epinephrine and norepinephrine), endogenous opiates, ACTH, bombesin, and prolactin increases, while the concentration of GH, melatonin, and testosterone decreases (Pruett 2003: 135). Cells of the immune system can interact with most of the neurotransmitters and hormones involved in the stress responses (Pruett 2003: 137), which might leave them vulnerable to stress.

Several studies on stress in laboratory settings pointed to the enhancement of innate immunity (NK cell activity), and suppression of specific immunity (activity of B cells and CD4 cells), in acute psychological stress situations (Kimura et al 2005: 1). Sympathetic activity, namely the secretion of adrenaline or noradrenalin from the sympathetic glands activates NK cells on the vascular endothelium, which results in increased NK concentration in peripheral blood (Kimura et al 2005: 7). In response to immunological stimulation, the cytokines furthermore exert a powerful effect on the neuroendocrine system. The pro-inflammatory cytokines IL-1, TNF- $\alpha$ , and IL-6, can most prominently activate the HPA axis and thus produce other effects on the nervous system like the induction of sleep and “sickness behaviour”. Increased sleep and sickness behaviour, in addition to asthmatic’s uncomfortable disease symptoms, might debilitate their health status and probably increase feelings of helplessness and dependence on medication and/or caretakers, increasing tender-mindedness.

Mild, acute stress prepares the immune system for possible action through modifying the levels of neuroendocrine mediators. Chronic psychological stress however tends to have a damaging effect. Such stress responses over a long period can sufficiently suppress immune functioning, might increase the risk of infectious diseases, might diminish the efficacy of vaccines, and might contribute to inflammation processes and immune system activity. The intensity, duration and type of stressor, determine the type of reaction (Pruett

2003: 137). It seems that stressed people like asthmatics may be vulnerable to opportunistic diseases and not fully susceptible to the benefits of vaccines. In short, they might develop feelings of helplessness and being out of control (Q3-).

### **3.8.2 Effects of stress-related immune changes on quality of live**

Pruett (2003: 144) states that, as a result of poor well-being, there is an association between stress, stress-induced immunomodulation and infection. It will not be stretching the truth to propose that stress induced changes in the immune system adversely affect stressed people's quality of life, especially if stress is of enduring nature. Research results imply, in accordance with past arguments, that significant changes or alterations of important immunological parameters have the potential to affect the immunological system's resistance to infections. The summary of research examples below demonstrate the vulnerability of the immune system's function to neuroendocrine changes caused by chronic stress (Pruett 2003: 134) as probably found in people with chronic, especially uncontrolled asthma.

Catecholamines (epinephrine and norepinephrine) can cause significant changes in the functioning of the immune system, as several cell types in the immune system, e.g., the spleen and other lymphoid organs, have adrenergic receptors from where norepinephrine is released directly into the extra cellular fluid of the spleen, affecting immune functioning. Norepinephrine has the strongest role in mediating rapid leukocyte concentration changes during stress (Pruett 2003: 138). Immune responses to these mediators lead to rapid changes in the concentration of neutrophils, monocytes, and lymphocytes (particularly NK cells). In a study of stress, caused by trauma or burn injury, the NK cell activity was suppressed and a mixture of cortisol, epinephrine and glucagons, representing blood levels in trauma patients, pointed to the same effect. This lowered NK cell activity lowers the body's potential to direct and fast action against harmful substances (Pruett 2003: 140).

Some mediators like growth hormone (GH) prolactin (PRL), insulin-like growth factor-1 (IGF-1) and thyroid hormone are required at normal levels, controlled by a feedback mechanism to maintain normal immune functioning or normal development of cells of the immune system (Pruett 2003: 137). The different hormones control the activity levels of target tissues, e.g. thyroid hormone increases rates of chemical reactions in all cells;

growth hormones promote growth by affecting metabolic functions, especially protein formation; insulin controls glucose metabolism; and prolactin promotes mammary gland development and milk production (Guyton 1991: 5, 919). In mice, lower than normal concentration of thyroid hormone also leads to decreased B-cell development (Pruett 2003: 137). This information implies a general immunosuppressive effect, and more specifically lowered acquired immunity, because of the possible decrease in the B-cell concentration.

In a study where 200 human subjects were exposed to a common cold virus, it was found that people experiencing chronic psychological stress, more easily developed the condition. A meta analysis of research conducted before 1993 confirmed this detrimental effect of psychological stress on a variety of immunological measures. Increases in the cytokine production after stress may contribute to cardiovascular disease, type-2 diabetes, osteoporosis, frailty and functional decline. Thus, psychological stress is closely associated to various autoimmune conditions (Pruett 2003:136) that are unfavourable to personal quality of life.

The immunosuppressive and anti-inflammatory qualities of glucocorticoids are well known. Glucocorticoids are the major mediators of stress-induced immunosuppression and inhibition of the corticosterone function does not always prevent immunosuppression (Pruett 2003: 140-141). According to Pruett (2003: 142) the stress response caused by significant restraint, a potent stressor for rats, is often considered an equivalent of psychological stress in humans. Glucocorticoid was implicated as an important mediator involved in some of the restraint-induced immuno-modulation for example, the suppression of the expression of MHC class II proteins, which correlates with the risk of infection. There is accumulating evidence suggesting that chronic elevations in glucocorticoids may contribute to degenerative changes in the brain, e.g. thymocyte apoptosis and subsequent thymic atrophy (Pruett 2003: 142-144), which stresses the therapeutic importance to stop the up-regulation of glucocorticoids during stress.

In various restraint-induced experiments with mice the below mentioned processes were observed. Corticosterone mediated a decrease in resistance against Theiler's virus, a decrease in changes in leucocyte trafficking and initiated inflammation. Catecholamines mediated decreased activation of specific immunity and endogenous opiates. Adrenergic

receptors and dopamine receptors seemed to be involved in the suppression of NK cell activity and the balance of Th1 and Th2 cytokine production. Prolactin decreased rats' resistance to dimethylbenza(a)anthracene-induced tumours (Pruett 2003: 142). All of the above changes imply the weakening of the immune system defence mechanisms so that the chronically ill person, who is stressed, is left vulnerable to opportunistic diseases and inflammation.

Cytokines target the brain to instigate the so-called "sickness" response, which refers to fever, hypothalamic-pituitary-adrenal activation and sickness behaviour that develop in sick individuals. The peripheral cytokines act indirectly by triggering the production of cytokines in the brain parenchyma, which demonstrates the brain's vulnerability to peripheral events, like inflammation and its responsiveness so that somatic symptoms like in asthma and the accompanying symptoms can actually be aggravated (Dantzer 2004: 2).

Thus, research results show that various stress-induced mediators are involved solely or in combined action to produce the observed changes in the different immune parameters that influence the function of the immune system. Knowledge of the production and the role of pro-inflammatory cytokines and their messengers in the central nervous system improved our understanding of the implications it has on a person's personal state of health and the perception of his health, which affects his sense of independence and self-sufficiency. The above-mentioned research confirms the wide variety of non-specific symptoms that may significantly decrease the asthmatic patient's quality of life.

### **3.9 PEACEFUL EXISTENCE TO NEGATIVE STRESS**

A peaceful existence within a well organised and caring support system is often not within the reach of many people, especially due to the fact that we live in a money-driven and fast-living world. It however seems that the encouragement of physical closeness, touching and the free flow of intimacy decreases aggression in human societies (Panksepp 1998: 257). Therefore it is essential to develop effective social skills that enable people to reach out and to interact in a friendly and social acceptable way, which may secure personal support and a functional place in ones community. The building of healthy relationships that construct such a support system however starts with the basic parental bonding and attachment processes, which include contact and comfort. Insecure bonding,

loneliness and rejection increase stress and worsen illness and illness symptoms (Panksepp 1998: 112). Friendly social interaction and bonding relieve stress and promote the development of essential skills needed for wholesome personality development.

The recognition of family and friends reflect social memories. Brain chemistry helps strengthen and consolidate memories of positive social experiences. Soon after encountering strangers the consolidation process takes place. Arginine-Vasopressin (AVP) and lower doses of opioids strengthen social memories. It was found that the hippocampus, which is a key brain area for the consolidation of memory, has high oxytocin and AVP sensitivity, but that high doses of oxytocin impairs the consolidation of such memories (Panksepp 1998: 256). Hippocampal atrophy, discussed with headings 3.7.3.1 and 3.7.3.2, may thus also affect this process so that stressed asthmatic children experience difficulty to consolidate these memories of positive social experiences.

Chemical substances in the functional circuits of the brain interact in different processes to promote and control bonding and the related processes. Both opioids and oxytocin inhibit aggression and separation distress. Oxytocin dramatically reduces irritability and aggressiveness and thus promotes a happy family life conducive of mental and physical health (Panksepp 1998: 112).  $\beta$ -endorphin is released from a clustered group of neurons in the medial hypothalamus. It reduces negative emotional arousal, produces an overall calming effect, and modulates an anti-stress reaction. Recently more attention is focused on cholecystokinin (CCK), a peptide transmitter with believed potential to mediate panic attacks and that operates in both the cortical and subcortical neuronal areas (Panksepp 1998: 112).

The central corticotrophin releasing factor (CRF)-circuits in the brain help to organize and coordinate various emotional responses. Corticotrophin releasing factor (CRF) from the CRF neurons in the paraventricular and the supra-optic nuclei control the release of ACTH, which facilitates negative emotional arousal (Panksepp 1998: 112). The release of ACTH that takes place during stressful experiences, thus leads to the facilitation of negative arousal in stressed asthmatics. Elevated levels of  $\beta$ -endorphin and opioid may thus serve to negate the effects of tension and the consequent release of ACTH creating a 'peaceful existence' effect.

### **3.9.1 Social bonding and separation distress**

The importance of social bonding is an accepted fact. Naudé et al (2004: 445) pointed out the importance of the cingulate gyrus for its involvement in social communication, social emotion, the urge to speak and social motivation, which are all critical aspects of social bonding. Panksepp (1998: 272) noted that the brain areas that mediate feelings of social bonding are the cingulate cortex, septal area, bed nucleus of the striaterminalis, preoptic area, dorsomedial thalamus, and peri-aqueduct grey (PAG). Neurochemical mediator substances that promote bonding are oxytocin and possibly vasopressin. Contact comfort is another critical aspect of social bonding and is probably mediated by the brain opioid system (Panksepp 1998: 272). The tolerance and coping with the uncertainty of the asthma condition and its progress and the challenges it places on the whole family, but especially on the parents of the asthmatic child will be easier if proper bonding and contact comfort are established between parent and child. This special bonding process may increase social trust (L- on 16PF), lower tension in buffering against above uncertainties and needs of the patient and his family. It will help the patient and his/her parents to reach out to sources in their environment and establish the necessary support system to be empowered i.e. clinical services, support groups and educational facilities.

### **3.9.2 Social dependence and separation distress**

The PANIC circuits of the brain assist people in creating the emotions they experience as a result of social isolation and loss of social comfort Panksepp (1998: 266). The arousal of the PANIC circuits is a major force that guides the construction of social bonds. This arousal motivates individuals to find companions that could facilitate feelings of security that are neurochemically based within the brain. A powerful sensory signal of care that reinforces social bonds is touching, which appears to activate endogenous opioid systems.

Separation-induced crying emerges from neural systems, e.g. the PANIC system from the primitive distress mechanisms in the midbrain PAG (Panksepp 1998: 266-267). This distress mechanism in the midbrain mediates pain and feelings of coldness, which affirms that separation distress is related to perceptions of pain. The PANIC system is well represented in the medial diencephalon, especially the dorsomedial thalamus and farther forward in the ventral septal area, the preoptic area, and many sites of the bed nucleus of

the stria terminales (areas that figure heavily in sexual and maternal behaviours). In some higher species the anterior part of the cingulate gyrus as well as some sites of the amygdala and scattered ones in other areas, including the hypothalamus are also involved. According to Panksepp (1998: 266-268) there is remarkable resemblance between the neuroanatomy of the PANIC, the corticotrophin releasing factor (CRF) and  $\beta$ -endorphin systems.

Asthmatic children are sometimes lonely children and may see themselves as socially rejected. This feeling of rejection comes about when they are not free to or are denied the opportunity to take part in general activities that their peers pursue out of fear of an asthma attack, or because of their different life style marked by dependence on supervision and daily medication. Limitations that are brought about by their illness may isolate them from social interaction, which is worsened in the case of emotional repercussions such as depression, morbidity and other emotional disorders.

Social isolation may limit asthmatic children's experience of relevant social skills and thus inhibit their social skills development. For example, "a child who has been excluded from peer play might not acquire a response repertoire that includes competent responses, known as solution-generating skill deficits" (Dodge, Lansford, Burke et al 2003). The child may develop low self-efficacy for the outcomes of his/her own behaviour. According to this theory, these processed skills deficits and biases are most likely to lead to dysfunctional behaviour such as aggression and to distrust of people's motives (Dodge et al 2003).

According to Evoy (1983) child rejection takes place in an active or passive way. Through his studies he established that children felt rejected either by things that were said and done, or by being neglected, or by others' indifference towards them. Children's experiences of active rejection caused suppressed and deeply hurt feelings. These feelings included a sense of non-belonging, not being wanted and of conditional acceptance of whom they were. Clinical findings of Evoy (1983) showed that rejected children would prefer that their parents (and perhaps significant others) hurt them, rather than ignore them. Asthmatic children, more than healthy children require more parental care and supervision to assert pharmacological and health care routines, which may be taxing. If they feel left out in the decision making process and need or want more attention that the parents can

offer, they may easily feel rejected and even develop attention-seeking behaviour resulting in more feelings of rejection.

### **3.9.3 Loneliness**

Evidence collected via research with experimental stressors over the past decade suggests that stress could lead to hippocampus shrinkage and atrophy that are accompanied by deficits in explicit-declarative and contextual memory performance, i.e. poor memory retrieval (Naudé et al 2004: 455). Naudé et al (2004: 455) further explained that deficits in memory access and retrieval contribute to impaired evaluation of social situations, and impaired application of previously learned information in new situations and thus the loss of social competence (as in ESS).

At birth, people are dependent on the quality of their social bonding to survive. People feel accepted and comfortable when they interact within a friendly group of people, because human beings are sociable creatures by nature. If this group consists of relatives or close friends, relationships and interactions are more intimate. The most troubling and deepest emotional pain, called sorrow or grief, is felt when losing someone dear. This sorrow can verge on panic. Loneliness or sadness is equal to a less acute, but more persistent form of this feeling of sorrow (Panksepp 1998: 261). The atmosphere in the family and amongst friends seem to support and guide the development of the asthmatic child's personality traits to contribute to tense or relaxed temperaments and the sense of alienation versus identification across different social settings.

The emotional systems of the brain directly mediate social feelings and social bonding. Several emotional systems like the PANIC system direct our emotional inclinations. The PANIC system that controls separation distress emerges in part from pre-existing pain systems (Panksepp 1998: 261). The affective components of the integrated emotional system (the PANIC system) that mediates the formation of social attachments are behaviours and feelings of separation distress on one end and social reward or contact comfort on the other end. This system is aroused when children are separated from their support systems (Panksepp 1998: 261-262). Asthmatic children with low self-esteem (Q3 on 16PF) and who cannot trustingly (L+ on 16PF) reach out to others and feel accepted may become critical and lonely.

Naudé et al (2004: 445) reported that victims of child abuse experienced negative emotions such as loneliness and social bonding. This is in accordance with my observation of a child who suffers from asthma. She suffered only sporadic asthma attacks during seasonal asthma, before she developed chronic asthma. As a toddler, she seemed content to be playing alone and at times, she even avoided peer interaction, which culminated in frequent feelings of loneliness throughout her life. Eventually, after chronic asthma had been diagnosed, her medical condition had been stabilized and with improved health, it became obvious that she was more willing and eager to interact with her peers. This example clearly illustrates the vulnerability of this asthmatic child to loneliness, limited social learning opportunities, less contact comfort and attachment opportunities.

It seems that some asthmatic children also tend to become more dependent on support systems, while others feel different or ashamed and therefore isolate themselves. Above-mentioned behaviours emerge from various pressing factors. The asthmatic child or person needs extra care, he is dependent on medication to manage his condition, he needs help in case of an asthma attack and supervision when playing sports or if in a situation that might trigger an asthma attack, which incidents might cause him/her to feel at risk and feeling different from others. The experience of being a burden to others, leads to feelings of shame and guilt.

#### **3.9.4 “Insecure base” during childhood**

Securely attached children are generally outgoing, confident and receive social support from their parents and other caregivers and tend to go about life with optimism and enthusiasm (Panksepp 1998: 264). According to Panksepp (1998: 264) experts agree that a “secure base” is fundamental for optimal personality development in children. Insecurely attached children seem to be more separated from loved objects than they want to be. Kaplan and Sadock (1998: 625) noted the association between separation from loved ones and anxiety. According to Panksepp (1998: 264) these insecure children are timid and struggle with new situations, tend to be uncertain and clinging, and they need more than the usual amount of attention. Some do not engage in social contact and avoid social situations (Panksepp 1998: 264). A variety of symptoms or behaviours were traced back to negative attachment (Kaplan & Sadock 1998: 625). Some of these are failure to thrive,

separation anxiety disorder, avoidant personality disorder, depressive disorder, academic problems, and borderline intelligence.

Rejection in connection with shame is understood as the transformation of the person (subject) into an object of rejection. When a children feel rejected by significant others or by their peers, they can experience a primitive physiological response, the shame response, that may vary in intensity. The intensity of shame determines the behaviour that follows (Herbert & Thomas 1998). They further stressed that it can be externalised as anger, directed towards others (withdrawal) or directed inwardly, against the self in the form of self-hatred (Herbert & Thomas 1998: 2). Research findings suggest that the pain associated with shame is located in the brain, in the region of the cingulate gyrus (Herbert & Thomas 1998: 2). Shy, passive children who are actively disliked by their peers might be overly anxious and uncomfortable around peers, almost meeting the diagnostic criteria for social anxiety (Welsh 2001). Asthmatic children, especially adolescents may experience disappointment and fear to loose internal control (Randolph & Fraser 1999: 82). Shame might be experienced for these felt inabilities and their increased dependence upon parents, health care workers and medication in a life phase when autonomy is priority.

### **3.9.5 Attachment**

Brain opioids were the first brain chemicals discovered to powerfully alleviate the mild form of separation distress that we call loneliness. Opioids are secreted when friendly social interaction takes place. Several opioids are important in the control of social emotions, involved in social attachments and both nurturing and erotic love (Panksepp 1998: 263).

The experience of nurturing love between parents and children is essential and socially expected. Nurturing love between parents and children emerges from the opioid and oxytocin brain systems that promote parental attachment. Brain opioids and  $\beta$ -endorphin, endogenous opiate-like molecules most powerfully inhibit separation-distress. Individuals who do not experience the satisfaction of nurturance and attachment in their lives will be tempted to succeed by pharmacological means such as with opiate addiction, which can lead to social isolation (Panksepp 1998: 263). Boyd, McCabe and Teter (2006: 278) report

that students who misused their asthma medication sometime during their life were more likely to misuse illicit drugs such as marijuana, alcohol and to smoke cigarettes. The expectation therefore is that asthmatic individuals might be prone to addiction of some kind, and this proneness will be investigated empirically.

### **3.9.6 Contact comfort**

Panksepp (1998: 271) reflected on the possibility that a person detects social touch by means of specialized receptors on the skin. Child's play goes hand in hand with contact sensations like in rough and tumble play, but it frequently happens that the asthmatic child is deprived of this very type of play, and consequently also of human touch. Panksepp further states that the pleasure of play is in the sensation of touch, which produces substantial amounts of social motivation. Such social motivation is functionally used and expressed in the many beneficial effects of social play. Play facilitates certain kinds of learning, the development of physical skills, and further allows young children to learn how to effectively fit into the structures of their community and how to identify people whom they can befriend (Panksepp 1998: 271, 280). The lonely or isolated asthmatic child, who does not play with his/her peers, acquires limited experience, which in turn might affect his/her social ability to bond, to make effective social choices and to learn the 'know-how' of being a productive member of society.

Panksepp (1998: 272) reported that animals stop crying when gently touched – this is also true for human beings, e.g., a crying baby who is comforted by the mother's touch. Babies do thrive if they experience love, care and physical affection, thus the contact comfort of the mother or caregiver is essential in establishing a secure base and trust in others to support him/her. This trust in others will be related to factor L, trust versus suspiciousness on the 16-PF Questionnaire.

Research findings demonstrated that opiate receptor antagonists reduce the ability of animals to become peaceful and that the administration of opioids reduces the desire to be touched (Panksepp 1998: 272). It is thus safe to hypothesise that asthmatic children who are cuddled and touched often will show higher secretion of opioids, will be less emotionally needy and thus probably less clingy and attention seeking. Children with asthma are expected however to be more needy, due to being chronically ill, constantly in

need of medication, dependent on nurturance and assistance to cope with the limitations originating from their condition, coupled with feelings of uncertainty and distress.

### **3.9.7 Maternal bonding and nurturance behaviour**

The subtle feelings of social solidarity and warmth, e.g. acceptance, nurturance and love are the result of interactive systems of brain circuit processes involving oxytocin, opioid and prolactin. These systems promote maternal behaviour and even more subtle social processes and are seated within the subcortical area of the visceral nervous system, including the cingulate cortex, the septal area, the bed nucleus of the stria terminales, and the preoptic and medial areas of the hypothalamus along with their respective mesencephalic projection areas (Panksepp 1998: 249).

Over centuries pregnant women sometimes doubt their ability to nurture and love their first-born children. However, innate physiological and psychological changes prepare the mother's body for birth and her brain for nurturance. Due to elevated oestrogen levels, there are remarkable increases in the amount of receptors in the different brain areas, as well as an increased number of hypothalamic neurons that begin to manufacture oxytocin, which increase the responsiveness and sensitivity of the brain's oxytocin circuit (Panksepp 1998: 251). Oxytocin helps deliver mammalian babies, helps feed them by triggering milk letdown and also serves to facilitate maternal moods and related action tendencies, while prolactin promotes maternal nurturance (Panksepp 1998: 251). This behaviour is motivated by the primitive emotional systems. Circuits in the mother's brain and care-soliciting circuits in infants are closely intermeshed with those that control sexuality in limbic areas of the brain. The female brain is more prepared than the typical male brain to care for infants, although there are exceptions depending on early brain organisation, early rearing experiences, prevailing cultural rules, and individual philosophical perspectives. Due to the human ability to conceptualise social rules, human mothers and fathers however seem to be able to take care of a child equally well (Panksepp 1998: 246-249). Imbalances in oxytocin, opioid and prolactin might cause difficulty to bond, e.g. post partum depression, psychosis and an inability to share the emotions of others (Panksepp 1998: 249). These dimensions of parenting, mothering and nurturance by one or both parents, altogether contribute to the asthmatic child's perception of security, acceptance,

nurturance, which in time contribute to various characteristics of the child's temperament. Some of these characteristics are trust, a healthy self-esteem and emotional stability.

Bonding is the process through which the child and mother sense their mutual relatedness and interdependence, implying the child's dependence upon the mother for nurturance and the mother's feelings of nurturance and love towards her child (Weiss 1998: 1). According to the Darwinian principle these motherly feelings of tenderness and selfishness are instinctive (Weiss 1998: 1). Weiss, on the other hand, criticized conventional conceptions of parenting, especially the social construction of 'maternal bonding' and the uncritically accepted 'motherly love', which he called a myth. He stressed that it cannot be taken for granted that parents take home their newborn baby after birth and care for it and love it without also experiencing feelings of uncertainty, regret or feelings of resentment (Weiss 1998: 1-2). I argue, in accordance with Weiss's concerns, that parents of chronically ill children might not be psychologically and emotionally ready to provide in such children's needs, resulting in the development of insecurely bonded and needy children. Neglected children will not experience confidence and social efficacy (poor self image), but rather consistent feelings of resentment and emotional distress, which can lead to depression and personality changes. These characteristics in asthmatic children implicate more stress, increased symptoms and exacerbations.

### **3.10 SYNOPSIS**

Based upon the preceding literature it follows that any type of emotional arousal is accompanied by autonomic and endocrine system responses. The effects of the endocrine system are slower but last longer than the effects of the nervous (sympathetic and parasympathetic) system responses. These effects involve biological changes, changes to the autoimmune system, and due to crossing of the blood brain barrier (BBB) these neurochemical substrates also have an effect on the brain, which might result in psychological/mental as well as personality changes. If these biological and psychological effects continue for a substantial period of time as with chronic stress, these changes might result in mental or mood disturbances, as well as psychosomatic and autoimmune diseases. Furthermore, the psychobiological development of personality has a neurochemical basis. Rees and Kanabar (2001: 12) pointed out that although asthma is primarily a genetic

disorder, the symptomatology of asthma might be exacerbated by a susceptible personality structure.

The question implicated in chapter one is: ‘What are the factors associated with asthma that might affect personality development?’ The human nature is complex and it thus requires that the person in totality, his context and all the variables contributing to personality development be considered to understand how illness affects personality development as evidenced by the following:

- Zuckerman (2005: 247) noted that environmental stressors such as physical discomfort, loss of control, financial strain, role changes, death anxiety, social stigma, and general life uncertainty affect physiology, neurotransmitters, hormones, and even neurons, sometimes in more than transient ways.
- Vila et al (2000) pointed out a few personal and personality variables of importance, including but not limited to genetic predispositions, immunological deficits, and innate proneness to allergies, temperamental differences, and the psychobiological make-up of the individual.
- Kang and Fox (2000: 1) established that acute stress might induce significant neuroendocrine and immune changes that negatively affect pulmonary function in children, with and without asthma. Such effects complicate living, e.g. worsen the asthma condition, increase the use of health care services, and increase school absenteeism and lead to higher stress levels.
- Vila and co-workers (2000: 2) reported a higher incidence of behavioural disturbances among asthmatic individuals, compared to non-asthmatic populations, such as denial, overly compensating behaviours, depression, embarrassment, and a lack of confidence.
- Stern (1981: 11) proposed that asthma be called ‘a disease of dependency’. Although Stern did not single out any specific personality type, he reported on feelings of being singled out, a strong fear of death, inhibited demonstration of anger and self-assertion, higher personal goal setting, often higher verbal intelligence accompanied by poorer performance ability, over-anxiousness, limited self-confidence and feelings of guilt.

Following the preceding there are a variety of factors that might complicate the live of the child living with chronic asthma. It seems that the impact of these factors, especially

elevated stress, on the child's personality development is inevitable and undeniable. In chapter four the main objectives of the research, research design, research methodology and the analysis and interpretations of the research findings will be discussed.

## **CHAPTER FOUR**

### **RESEARCH DESIGN, METHODOLOGY AND FINDINGS**

#### **4.1 INTRODUCTION**

Within this chapter the main objectives of the research, the research design, and the empirical investigation, as well as the analysis and interpretation of the research findings are discussed.

The aim with this research project is to provide insights into the psychobiology of personality as a tool for improving psychological and physical health states of individuals living with chronic asthma. Medical illnesses, acute and chronic, are often accompanied by a number of disease-related stressors or events that produce stress. Apart from physical discomfort, loss of control, financial strain, and role changes (Andersen 2002: 590-610; Antoni 2003: 173-188) it also affect physiology, neurotransmitters, hormones, and even neurons, sometimes in more than transient ways (Zuckerman 2005: 247).

If treatment and lifestyle modification planning is done together with a thorough understanding of the psychobiology of personality, it might improve emotional support and stress relief. Emotional support and stress relief can reduce psychological and physical symptoms, alter neuroendocrine and immune functioning, delay disease progression, and reduce morbidity and mortality.

This research project thus builds on a general stress-coping model in order to compile a psychobiological personality trait model for asthmatics. This model will contribute to the efficacy of treatment plans and lifestyle modification interventions to improve quality of life.

#### **4.2 RESEARCH QUESTION**

The empirical investigation is governed by the following research question:

*Which insights into the psychobiology of personality could be applied as a tool in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma?*

#### **4.3 SUB-QUESTIONS**

In order to fully address the research question, the following sub-questions were formulated:

- Do asthmatic individuals portray a specific psychobiological personality profile?
- In what unique ways do these psychobiological personality traits impact on (a) Cognition and decision-making, (b) mood and anxiety, and (c) self-esteem?
- In what unique ways do personality traits play a role in asthmatic individuals' sense of alienation versus identification across different social settings?
- In what unique ways do personality traits contribute to asthmatic individuals' sense of guilt proneness and subjective anxiety?
- In what unique ways do personality traits play a role in asthmatic individuals' orientation towards change, lifestyle modifications, compliance with treatment regimes, and self-care?
- In what unique ways do personality traits play a role in asthmatic individuals' sense of self-sufficiency (reliance on self) versus group-dependence (reliance on others, e.g., carers)?
- In what unique ways do personality traits contribute to tense or relaxed temperament among asthmatic individuals?
- In what unique ways do personality traits play a role in asthmatic individuals' adjustment to altered health status?
- Which personality traits support health protective behaviour among asthmatic individuals?
- Which personality traits support treatment compliance among asthmatic individuals?
- Which personality traits support lifestyle modification compliance among asthmatic individuals?
- Which personality traits are consistently found to buffer the distress response and promote resilience among asthmatic individuals?

#### **4.4 RESEARCH HYPOTHESIS**

The following research hypothesis will be tested:

*Insights into the psychobiology of personality of asthmatic individuals can be applied in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma.*

#### **4.5 PURPOSE OF THE STUDY**

The purpose of this research project is to get new insights into the psychobiology of personality of asthmatic individuals, which might be applied by health care practitioners as a tool in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma.

#### **4.6 RESEARCH DESIGN**

This research project represents quantitative research. Quantitative research is deductive in nature and the research hypothesis, which flows from the research problem, directs the scientific inquiry (Breakwell 1995: 13), leading to hypothesis testing. This approach deals with relations, correlations and covariance of variables. Pertaining to this research project, the quantitative mode of inquiry is non-experimental, implying an *ex post facto* comparative survey at hand of a standardized personality questionnaire.

#### **4.7 RESEARCH METHODOLOGY**

The research methodology determines the way the research is conducted and the material used.

##### **4.7.1 Materials**

As discussed within the preceding paragraph, this project follows a quantitative mode of inquiry; therefore the 16-Personality Factor Analysis Questionnaire (Cattell 1989) was utilized. This questionnaire is standardized for administration with South African

populations aged 18 and beyond, and is scored and interpreted at hand of standardized norms. This scale provides information related to:

- Extraversion versus introversion;
- Cognition and decision-making;
- Adaptation;
- Control and deference in social relations (e.g., care-giver/patient relations);
- Emotional status and possible mood disorders;
- The content and action of moral values;
- Feeling versus thinking modes of evaluating experience;
- Alienation versus identification in different social settings;
- Intuition and sensing as contrasting perceptual modes;
- Self-esteem and self-presentation in settings of diverse nature;
- Guilt proneness;
- Orientation towards change (e.g., lifestyle modifications and treatment compliance);
- Self-sufficiency (reliance on self) versus group dependency, i.e., reliance on others such as care-givers or medical personnel;
- Investment in maintaining a socially approved self-image;
- Tense and relaxed temperaments, as well as subjective levels of anxiety.

#### **4.7.2 Sampling**

Only grade 12 learners (adolescents) from a school in Gauteng that have already reached the age of 18 were selected as research participants, including both genders. The following principles were considered for purposes of sample taking:

- The assumption that personality development has reached relative stability at the age of 18 years, which enhance reliability and validity;
- The 16-PF may be administered with individuals 18 years and older;
- The population is of mixed gender;
- This school is located within a suburb of average to high-average socio-economic income, suggesting relative homogeneity;

- None of the learners are in boarding school, since research findings implicated the development of a poor self-concept among boarding school residents;
- The population consists of white Afrikaans speaking learners;
- Being learners from one single school, the expected conduct of behaviour and social-normative rules are expected to be homogeneous.

#### **4.7.2.1**     *Selection of research participants*

The above-mentioned sampling principles under heading 4.7.2 and a single stimulus question, namely: “Have you been diagnosed with chronic asthma?” pioneered sample taking. Because only grade 12 learners are included in the sample, it is expected that the educational climate will be homogeneous. Focused sample taking was done in the sense that all learners were requested to complete a self-reporting schedule.

#### **4.7.2.2**     *Nature of participation*

The management of a high school in Gauteng requested that a battery of psychometric tests be administered to the grade 12 learners for purposes of career counselling and informed consent was obtained from management towards utilization of the data for purposes of research also. A registered Educational Psychologist employed by the school administered the various tests.

All research participants who confirmed that they were diagnosed with chronic asthma were included in the sample. The 16-PF data, as well as their self-reporting schedules were selected from the bulk of data to form the research sample. The researcher was responsible for scoring the answer sheets, for conversion of raw scores into sten scores, and for compiling and interpreting the personality profiles as part of this research project.

#### **4.7.3**     **Data collection strategies**

Certain principles were considered for purposes of sampling and data collection. A registered Educational Psychologist made the data, according to these principles, available for this study. This data was collected in the form of self-reports and 16-Personality Factor Analysis Questionnaires. The above-mentioned registered Educational Psychologist has

collected the data at a high school in Gauteng for the purpose of career counselling. Because only grade 12 learners are included in the sample, it is expected that the educational climate will be homogeneous. Focused sample taking was done in the sense that all learners were requested to complete a self-reporting questionnaire. Certain pioneering questions were asked in the self-report schedule with the notion that the data may be used for future research. The answer to the question: Have you been diagnosed with chronic asthma, determined the sample size and relevance of the data for this research. All the research participants who confirmed that they have been diagnosed with chronic asthma were selected as research participants.

#### **4.7.4 Data analysis**

The 16-PF data, as well as the self-reporting schedules of the selected research participants were uncovered from the data pool to form the research sample. A summary of the sample's raw scores and a frequency table of the sten scores, the mean values as well as the p-values of the scores for the sample were calculated and presented in this chapter. A normal distribution curve for the 16PF Questionnaire with the prescribed standard deviation of one (1) and a mean value of 5.5 was used as the control, to which the performance of the research sample was compared. A research sample's distribution curve for the different factors was drawn and compared to the normal distribution within the standardization group for all meaningful 16PF factors. These and the individual deviant scores on the different factors, where the mean group scores did not differ from the normal mean, were interpreted and discussed. The information gained from the 16-PF data is expected to enable the researcher to identify possible significant and meaningful temperamental differences and tendencies in the research sample.

#### **4.8 RESULTS OF THE EMPIRICAL STUDY**

The results of the study are now dealt with in the following sequence:

- **Data analysis and interpretation**

*Data analysis*

- Summary of some important questions of the self-reporting schedule.
- 16PF raw scores.
- 16PF sten scores.
- Distribution curves for some of the factors of the 16PF: the research sample's performance compared to the normal distribution curve.

*Interpretation*

- Interpretation of the research sample's respective sten scores coupled with the interpretation of the distribution curves for significant performances.
- Interpretation of factor combinations.

- **Findings and discussions**

- **Conclusions**

- Discussion and creation of a profile with common personality traits as based upon the research sample performance on the 16-PF.
- Rejection or acceptance of hypothesis.

## **4.9 DATA ANALYSIS AND INTERPRETATION**

The data was analysed and interpreted by comparing the frequency distribution of the research sample's sten scores to the normal distribution curve for the individual 16PF-factors.

### **4.9.1 Breakdown of the research sample's data**

The research sample consists of eleven (11) adolescents within the age range 18 to 19 years. In terms of gender breakdown, the research sample consisted of six (6) males and five (5) females.

#### 4.9.1.1 Summary of some important questions of the self-reporting schedule

- Of the cohort only one (1) research participant indicated an anxious father and one (1) indicated a depressive father.
- Of the cohort eight (8) of the research participants reported to be experiencing chronic stress.
- Of the cohort four (4) of the research participants reported that they had been diagnosed with depression (with treatment) before.
- Of the cohort five (5) of the research participants received a diagnosis of ADHD before and were treated with Ritalin during primary school years.
- Of the cohort three (3) of the research participants were diagnosed with migraine prior to this assessment.
- Of the cohort seven (7) of the research participants indicated that they often experiment with alcohol and use alcohol frequently when they interact socially.

#### 4.10 FINDINGS FROM THE EMPIRICAL RESEARCH

The findings are tabularized and discussed in terms of raw scores and sten scores, mean scores, and p-values respectively.

**TABLE 4.1 Summary of research sample's raw scores**

	<b>LOW SCORE DESCRIPTION</b>	<b>Raw score</b>	<b>Mean Raw score</b>	<b>HIGH SCORE DESCRIPTION</b>	<b>Mean Sten score</b>	<b>P- value for N scoring 4 and lower (P&lt;0.05)</b>	<b>P- value for N scoring 7 and above (P&lt;0.05)</b>
<b>MD</b>	Low Motivational Distortion	4; 5; 5; 6; 9; 10; 10; 5; 8; 7; 8;	[77] 7.0	High Motivational Distortion	5.82	0.88672	0.72559
<b>A</b>	Reserved	16; 16; 17; 17; 8; 14; 13; 16; 8; 14; 9;	[148] 13.45	Outgoing	6.55	0.96729	0.27441
<b>B</b>	Concrete thinking	6; 8; 6; 8; 8; 7; 6; 8; 5; 5; 4;	[71] 6.45	Abstract thinking	3.46	0.27441	none
<b>C</b>	Affected by feelings	11; 19; 17; 16; 21; 16; 16; 8; 20; 8; 14;	[166] 15.09	Emotional stable	4.36	0.88672	0.99414

<b>E</b>	Submissiveness	9; 16; 14; 16; 15; 14; 14; 14; 20; 15; 13;	[160] 14.55	Dominance	5.09	0.99414	0.99951
<b>F</b>	Desurgency (sober)	23; 24; 26; 19; 22; 20; 22; 20; 16; 18; 19;	[229] 20.82	Surgency	8.0	none	0.03271*
<b>G</b>	Superego weakness	14; 11; 16; 16; 11; 17; 10; 8; 16; 3; 12;	[134] 12.18	Superego strength	4.18	0.50000	0.99951
<b>H</b>	Shy	21; 20; 18; 20; 21; 21; 16; 19; 14; 11; 12;	[193] 17.55	Adventurous	5.81	0.96729	0.72559
<b>I</b>	Tough-minded	10; 14; 6; 10; 15; 9; 10; 6; 12; 11; 12;	[115] 10.45	Tender-minded	6.64	0.99414	0.72559
<b>L</b>	Trusting	6; 9; 6; 8; 8; 11; 8; 5; 8; 13; 14;	[96] 8.73	Suspicious	6.36	0.99951	0.96729
<b>M</b>	Practical	17; 14; 12; 14; 17; 16; 6; 14; 14; 12; 9;	[145] 13.18	Imaginative	6.55	0.99414	0.27441
<b>N</b>	Forthright	11; 9; 8; 8; 7; 7; 14; 6; 10; 12; 13;	[105] 9.55	Shrewdness	3.91	0.27441	0.99414
<b>O</b>	Self-assured, placid	15; 17; 8; 15; 15; 18; 13; 24; 15; 14; 19;	[173] 15.73	Guilt proneness, Apprehensive	9.0	none	0.00586*
<b>Q1</b>	Conservatism of temperament, tolerant of traditional difficulties	10; 12; 6; 8; 15; 5; 6; 7; 8; 16; 11;	[104] 9.45	Radicalism, Experimenting, Analytical	5.18	0.72559	0.96729
<b>Q2</b>	Group- dependency	6; 9; 10; 6; 9; 7; 10; 9; 10; 10; 14;	[100] 9.09	Self-sufficiency	5.73	0.99414	0.99951
<b>Q3</b>	Weak self- sentiment integration, lax	6; 10; 7; 13; 10; 14; 6; 8; 14; 13; 15;	[116] 10.55	High strength of self-sentiment, controlled	4.46	0.50000	0.96729
<b>Q4</b>	Low ergic tension, relaxed	16; 16; 12; 20; 19; 22; 8; 12; 16; 20; 13;	[174] 15.82	High ergic tension, tense, frustrated, driven	8.64	none	0.00586*

As depicted in table 4.1 the p-values for the Motivation Distortion scale (MD) are respectively 0.88672 and 0.72559, which prove insignificant on  $p < 0.05$ . Significant p-values are found for factors F+ (0.03271), O+ (0.00586) and Q4+ (0.00586) on  $p < 0.05$ . The meaning of these significances will be discussed in subsequent paragraphs.

**TABLE 4.2: Frequency table of the research sample's sten scores**

	<b>LOW SCORE DESCRIPTION</b>	1	2	3	4	5	6	7	8	9	10	<b>HIGH SCORE DESCRIPTION</b>	<b>Mean Sten score</b>
<b>MD</b>	Low Motivational Distortion				4	1	1	3	2			High Motivational Distortion	5.82
<b>A</b>	Reserved				3		1	2	5			Outgoing	6.55
<b>B</b>	Concrete thinking	1	2	3	1	4						Abstract thinking	3.46
<b>C</b>	Affected by feelings	2	1		1	4	1	2				Emotional stable	4.36
<b>E</b>	Submissiveness		1		1	6	2		1			Dominance	5.09
<b>F</b>	Desurgency (sober)					1	1	2	2	3	2	Surgency	8.0
<b>G</b>	Superego weakness	1	1	3	1	1	3	1				Superego strength	4.18
<b>H</b>	Shy			1	2	1	2	4	1			Adventurous	5.81
<b>I</b>	Tough-minded				2		4	1	2	2		Tender-minded	6.64
<b>L</b>	Trusting				1	2	5		1	2		Suspicious	6.36
<b>M</b>	Practical		1		1		2	4	1	2		Imaginative	6.55
<b>N</b>	Forthright	1	2	3	1	1	1	2				Shrewdness	3.91
<b>O</b>	Self-assured, placid						1		1	5	4	Guilt proneness, Apprehensive	9.0
<b>Q1</b>	Conservatism of temperament, tolerant of traditional difficulties		2	3		1	2			3		Radicalism, Experimenting, Analytical	5.18
<b>Q2</b>	Group-dependency				2	1	7		1			Self-sufficiency	5.73
<b>Q3</b>	Weak self-sentiment integration, lax	2	1	1	2		2	2	1			High strength of self-sentiment, controlled	4.46
<b>Q4</b>	Low ergic tension, relaxed						1	2	1	3	4	High ergic tension, tense, frustrated, driven	8.64

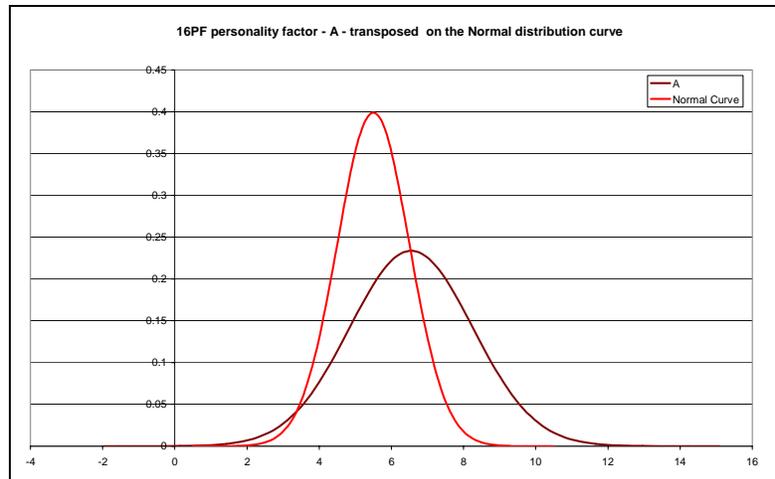
As depicted in table 4.2 the mean sten score on the Motivation Distortion scale (MD) is 5.82, which is relatively high, suggesting that the research participants might be lacking self-knowledge and insight. The following mean sten scores are somewhat elevated: On factor A a mean sten score of 6.55 is calculated, with a clear bimodal tendency.

Meaningfully elevated mean sten scores are also calculated for factor F (8.0), factor O (9.0) and factor Q4 (8.64). The significance of these elevations will be interpreted in subsequent paragraphs.

#### 4.10.1 Distribution curves

The research sample's distribution curves for some of the 16PF factors are visually presented below. These distribution curves are plotted against the normal distribution curve for purposes of comparison.

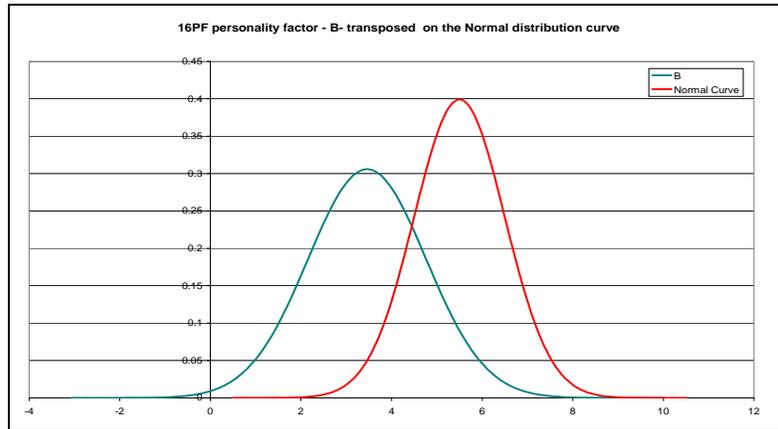
#### FACTOR A



**Figure 4.1: Graphic representation of the research sample's performance on factor A, compared to the normal distribution curve**

As depicted in figure 4.1 and in comparison with the normal distribution curve, the research sample's performance on factor A is inclined to be slightly more to the right with more scores distributed further away from their mean value on factor A.

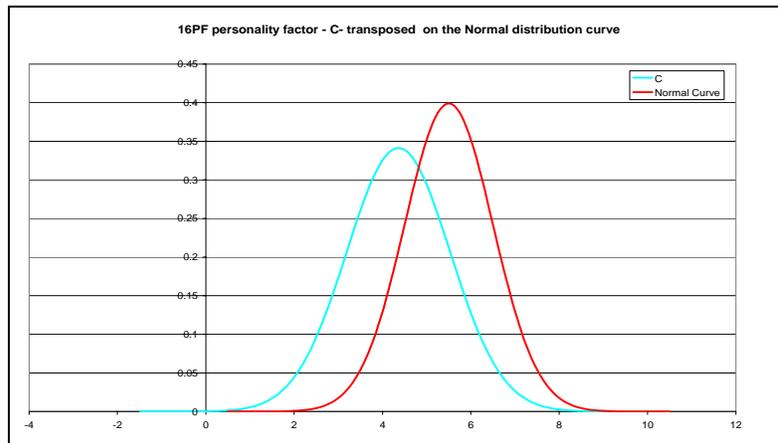
**FACTOR B**



**Figure 4.2: Graphic representation of the research sample’s performance on factor B, compared to the normal distribution curve**

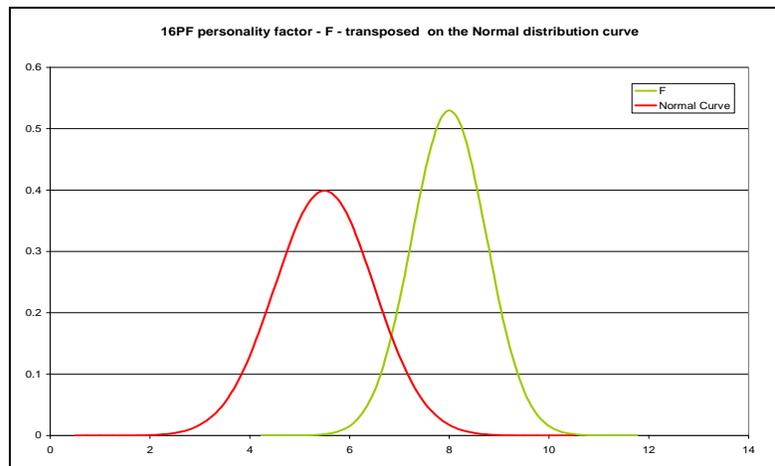
As depicted in figure 4.2 and in comparison with the normal distribution curve, the research sample’s performance on factor B is inclined to be more to the left with more scores distributed further away from their mean value on factor B.

**FACTOR C**



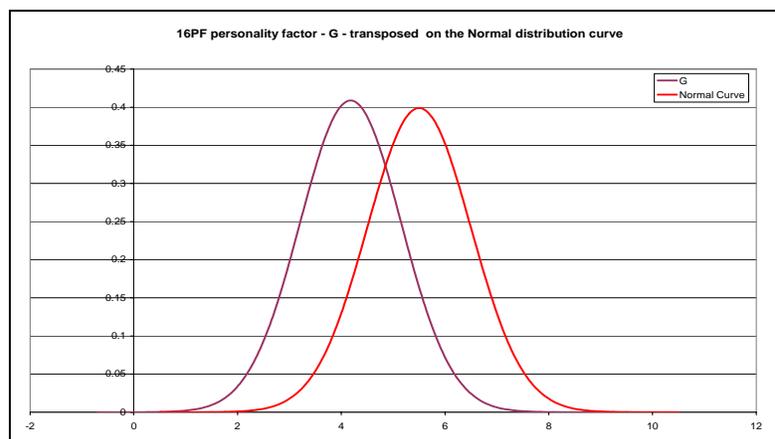
**Figure 4.3: Graphic representation of the research sample’s performance on factor C, compared to the normal distribution curve**

As depicted in figure 4.3 and in comparison with the normal distribution curve, the research sample’s performance on factor C is inclined to be slightly more to the left with a slightly greater variance for the research group scores on factor C.

**FACTOR F**

**Figure 4.4: Graphic representation of the research sample's performance on factor F, compared to the normal distribution curve**

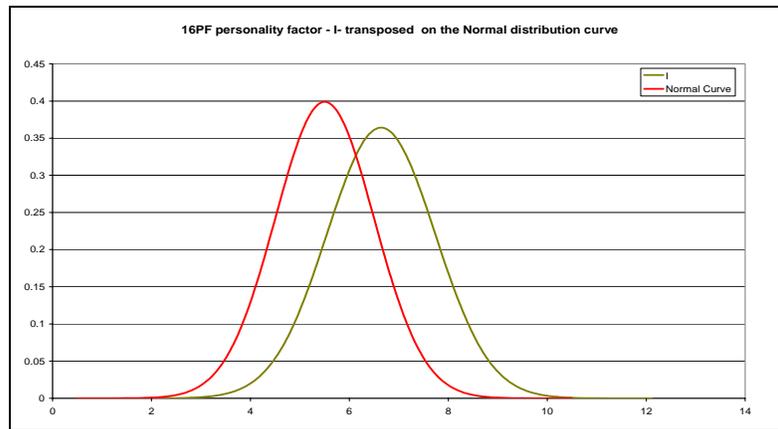
As depicted in figure 4.4 and in comparison with the normal distribution curve, the research sample's performance on factor F is more to the right with scores distributed nearer to their mean value on factor F.

**FACTOR G**

**Figure 4.5: Graphic representation of the research sample's performance on factor G, compared to the normal distribution curve**

As depicted in figure 4.5 and in comparison with the normal distribution curve, the research sample's performance on factor G is inclined to be slightly more to the left with a slightly more reliant distribution result for the research group on factor G.

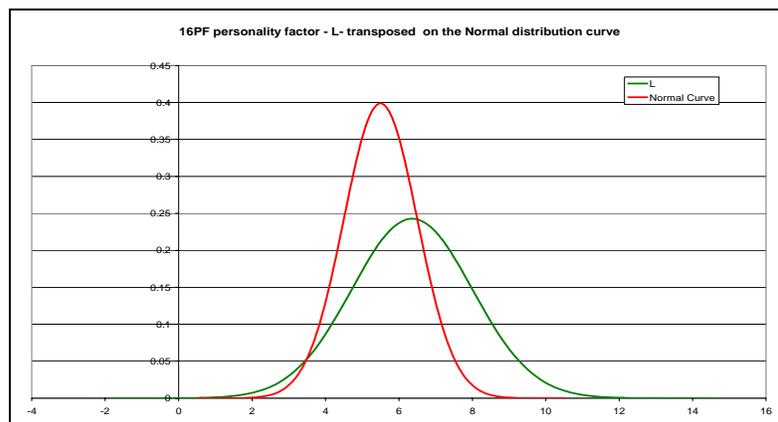
**FACTOR I**



**Figure 4.6: Graphic representation of the research sample’s performance on factor I, compared to the normal distribution curve**

As depicted in figure 4.6 and in comparison with the normal distribution curve, the research sample’s performance on factor I is inclined to be slightly more to the right with more scores distributed further away from their mean value on factor I.

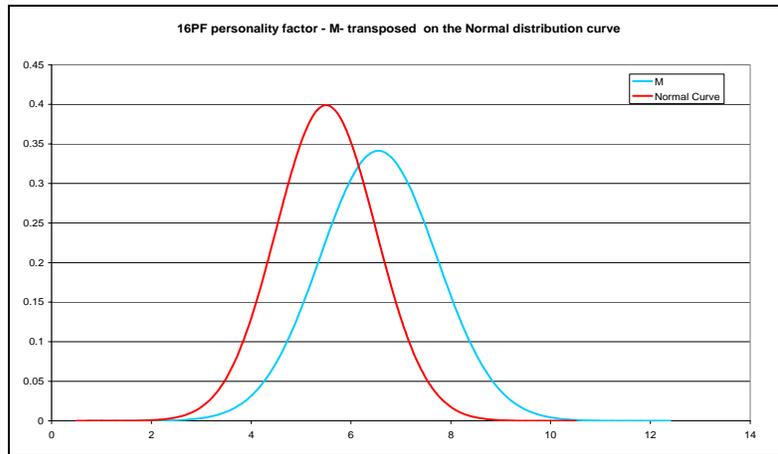
**FACTOR L**



**Figure 4.7: Graphic representation of the research sample’s performance on factor L, compared to the normal distribution curve**

As depicted in figure 4.7 and in comparison with the normal distribution curve, the research sample’s performance on factor L inclines to be slightly more to the right with more scores distributed further away from their mean value on factor L.

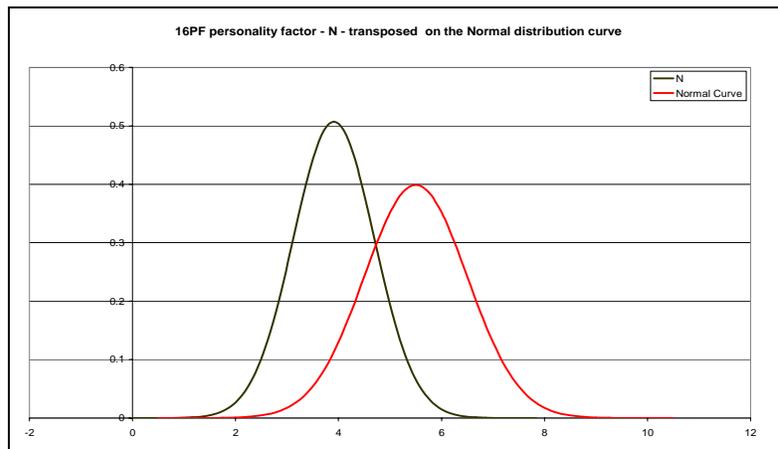
**FACTOR M**



**Figure 4.8: Graphic representation of the research sample’s performance on factor M, compared to the normal distribution curve**

As depicted in figure 4.8 and in comparison with the normal distribution curve, the research sample’s performance on factor M is inclined to be slightly more to the right with more scores distributed further away from their mean value on factor M.

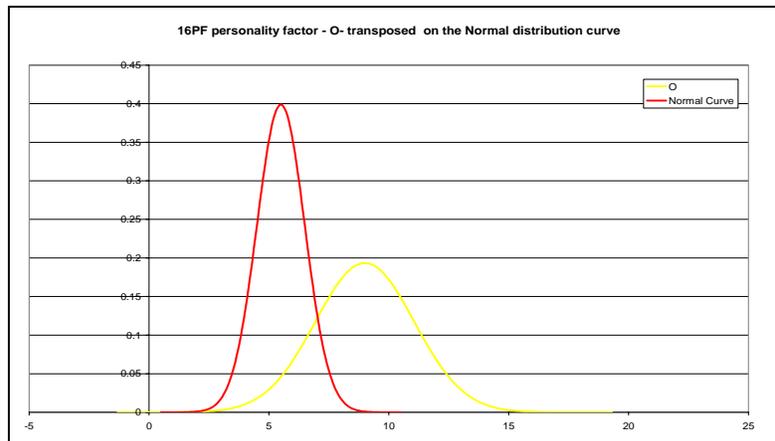
**FACTOR N**



**Figure 4.9: Graphic representation of the research sample’s performance on factor N, compared to the normal distribution curve**

As depicted in figure 4.9 and in comparison with the normal distribution curve, the research sample’s performance on factor N is inclined to be more to the left with a more reliant distribution result for the research group on factor N.

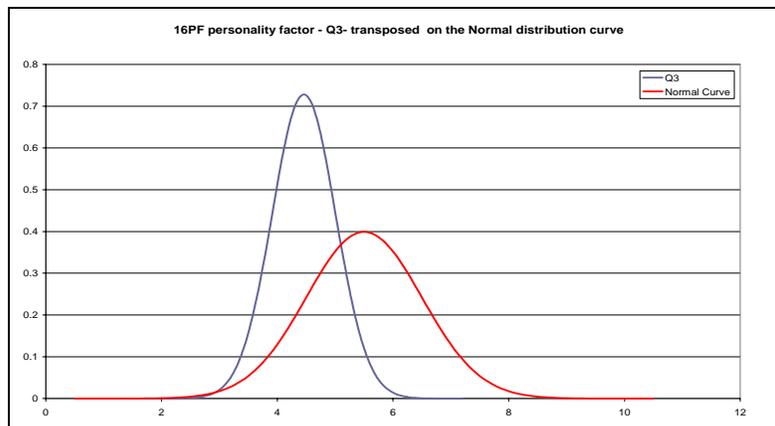
**FACTOR O**



**Figure 4.10: Graphic representation of the research sample’s performance on factor O, compared to the normal distribution curve**

As depicted in figure 4.10 and in comparison with the normal distribution curve, the research sample’s performance on factor O is inclined to be more to the right with more scores distributed further away from their mean value on factor O.

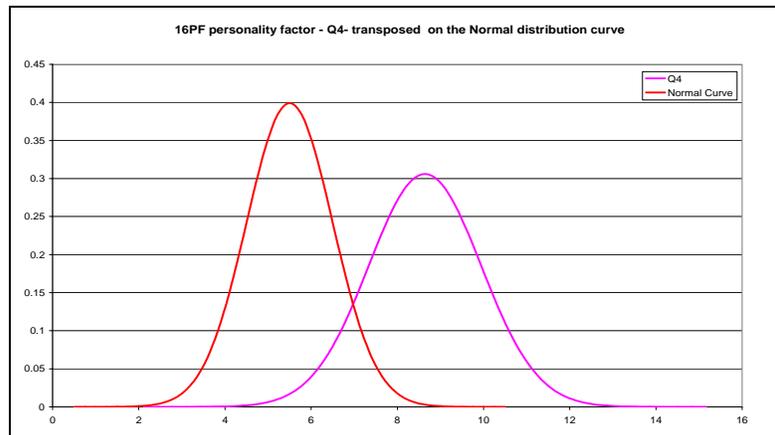
**FACTOR Q3**



**Figure 4.11: Graphic representation of the research sample’s performance on factor Q3, compared to the normal distribution curve**

As depicted in figure 4.11 and in comparison with the normal distribution curve, the research sample’s performance on factor Q3 is inclination to be slightly more to the left with a more reliant distribution result for the research group on factor Q3.

## FACTOR Q4



**Figure 4.12: Graphic representation of the research sample's performance on factor Q4, compared to the normal distribution curve**

As depicted in figure 4.12 and in comparison with the normal distribution curve, the research sample's performance on factor Q4 is more to the right with more scores distributed further away from their mean value on factor Q4.

### 4.11 INTERPRETATION OF THE PRIMARY FACTORS AND OF FACTOR INTERRELATIONSHIPS

The research sample's sten scores achieved on the various 16-PF scales are interpreted at hand of the following aides:

- The 16PF manual;
- The normal distribution curve based on a mean of 5.5 and a standard deviation of one (1) as prescribed for the 16PF questionnaire;
- Relevant research findings on the psychobiology of personality traits, as reported by various researchers in various texts.

Sten scores of 4 and 7 are seen as moderately divergent and for the purposes of this study these will be included in the interpretation of higher and lower scores.

#### **4.11.1 Distribution curves**

In order to better understand how the various distribution curves are interpreted, the following explanations are presented:

The distribution of the values of the research sample's scores further away from the normal distribution mean resulted in a flatter distribution curve, compared to the normal distribution curve, e.g. factors A, L and O, which are much flatter; factors B, C, M and Q4 are moderately flatter and factor I is slightly flatter.

The distribution of the values of the research sample's scores nearer to the normal distribution mean resulted in a more condensed distribution, compared to the normal distribution curve, e.g. at factor F, N and Q3.

The turning point (to the right or to the left) of the mean value depicted by the research sample's performance, relative to the normal distribution curve, indicated a deviation from what was expected in terms of the normal distribution curve, e.g. at factors A, O, I, and F, (right); B, G and N (left); C (slightly left); L, M, Q3 (slightly right).

#### **4.11.2 Interpretation of the Primary Factors**

In subsequent paragraphs primary factors of the 16 PF are interpreted at hand of the research participants' mean sten scores as illustrated by the various distribution curves respectively, as compared to the normal distribution curve. On a sten scale, most people get average scores (usually sten scores that fall in the 4-7 range), but for purposes of this interpretation scores that fall in the range 5-6 are considered average, because scores 4 and 7 deviates one standard score from the normal distribution mean respectively, i.e., one class interval. Scores that fall outside the average range occur with less frequency, while roughly 18% of the normal population scores between stens of 1-3 and another 18% scores between stens of 8-10 (Cattell 1989: 8).

#### ***4.11.2.1 The Motivation Distortion Scale (MD scale)***

The motivational distortion score (MD score) for the research sample indicated that from the cohort (N = 11), five (5) research participants (45.45%) demonstrated an inclination towards subjective, exaggerated reporting on negative symptoms (Cattell 1989). This might be due to restricted self-knowledge and insight. Cattell (1989: 340) interpreted this exaggerated reporting on negative symptoms as "... a willingness to be self-critical, sometimes to the point of appearing less than adequate for some life situations", indicating "a plea for help or an indication of experiencing subjective distress" or/and indicating "an overly critical judgment of oneself, or negative self-evaluation". The inference is that asthmatic individuals might be experiencing significant distress, that they might be overly self-critical, and that they might be experiencing difficulty in handling life situations.

#### ***4.11.2.2 Interpretation of the research sample's performance on primary factor A***

The introversion/extraversion continuum dimension, with extreme manifestations on the extremities of this continuum, was seen by Jung (1928) as the most important dimension of personality, in keeping with Cattell and co-workers' ranking of the 16 PF factors (Cattell, Eber & Tatsuoka 1988). Jung particularly recognized that "normal man is, by definition, influenced as much from within as without" (Zuckerman 2005: 89). Freud and the extraverted American culture of the 1920's regarded introversion as a precursor of neurosis (Zuckerman 2005: 88). Eysenck (Zuckerman 2005: 88) defined the extraversion trait as a measurement of two factors, namely impulsivity and sociability, but after exclusion of the impulsivity determinants, Eysenck viewed extraversion as a combination of sub-traits such as sociability, liveliness, activity, assertiveness, sensation seeking, carelessness, dominance, surgency, and venturesomeness. According to Cattell (1989) factor A measures emotional orientation toward other people, from warmth at the right pole, A+ (affectothymia) to coldness at the left pole, A- (sizo-thymia), and this factor A "makes the largest contribution to the assessment of personality of all the factors in the 16PF" (Cattell 1989: 13). This means that the trait that factor A measures has a broad influence on personality, and that a given person's endowment on it largely determines whether his or her energy will be directed toward social interaction or focused instead on objects and the inner world of ideas.

The research sample's performance on factor A demonstrated a bimodal tendency – some of the research participants are rather introverted (low scores on A), while the majority of research participants are extroverted (high scores on A). Compared to the normal distribution curve the research sample's distribution curve shows a slight tendency for towards extraversion. The research sample's distribution curve shows that more values are distributed further away from the mean value, compared to the normal distribution curve, signalling a greater variance among asthmatic individuals towards this trait.

The clinical relevance of this bimodal distribution is explained as follows: Those asthmatic individuals that performed high on factor A, i.e., that showed affectothymia, might be dependent and intolerant of isolation, adventurous, responsive, frank and outspoken. Zuckerman (2005: 90) reported that extraverts are more optimistic, happy and sensitive to signals of reward. They might take longer to learn from experience, even if punished, because they are less reactive to cortical stimulation than introverts and tend to form reactive inhibition to stimulus repetition. According to Zuckerman (2005) they might feel better at and react more efficiently to high intensity stimulation. This might lead to sensation seeking and to risk taking, which tend to intensify cortical stimulation (Zuckerman 2005: 102-103). High heritability among the sub-traits of extraversion was found, which was explained by additive genetic variance (Zuckerman 2005: 101). Cattell in 1989 reported an environmental component to factor A, i.e., affectothymia evolves not only from the more common learning experiences of modelling, reward and punishment, but also “from the early bonding that occur between caregivers and the child” (Cattell 1989: 13).

Significant male and female differences were noted among the research participants regarding their performance on factor A. From the cohort of six (6) male research participants, three (3) clearly demonstrated affectothymia (A+), while three (3) clearly demonstrated sizothymia. However, from the cohort of five (5) female research participants, all clearly demonstrated affectothymia in keeping with research data reported by Cattell (1989: 13). The inference from this finding is that female asthmatics seem to be, on the whole, more affectothymic (A+), hence more warmly interested in people. But whether this is due primarily to genetic, environmental or disease related influences are at this time not clear. “It seems that once an affectothymic (A+) or a sizothymic (A-) life position is achieved, it rarely changes in a statistically significant way in response to life

events” (Cattell 1989: 14). However, research participants that performed low on factor A might be experiencing compromised social relations, depression, fear to approach people, and various clinical syndromes (see combinations of factor A that follow later). According to Zuckerman (2005: 90,124) anxious individuals tend to show weaker social bravery (social approaching behaviour), with a strongly developed inhibitory system. Depression might further cause temporary reduction in sociability. It is believed that sizothymia primarily stems from an innate proclivity to be more withdrawn (Cattell 1989: 25), but coupled with negative life experiences sizothymia might result in feelings of anxiety and depression. Introverts are aroused by low cortical stimulation and they tend to control cortical arousal by shutting down (Zuckerman 2005: 102-103). In contradiction with asthmatic females who all demonstrated affectothymia, the second inference, although preliminary, is that male asthmatics might be more at risk to demonstrate compromised social relations, and coupled with adverse life experiences, they might be more at risk to develop anxiety and depression.

This second preliminary inference is based upon research findings that demonstrated a significant relationship between extraversion/introversion and the limbic brain areas. With extraversion the putamen and caudate or striate areas and the cingulate gyrus showed higher blood flow, while higher activity was shown in the striate areas for introverts (Zuckerman 2005: 108). Dopamine is the main mediator in the striate areas. The cingulum is the major connection between the frontal cortex and the limbic system, theoretically associated with neuroticism and anxiety (Zuckerman 2005: 108).

#### ***4.11.2.3 Interpretation of the research sample’s performance on primary factor B***

All of the research participants demonstrated low scores on factor B (application of cognitive potential). Compared to the normal distribution curve the research sample’s distribution curve demonstrated a tendency towards concrete thinking. More research participants deviated from the mean value compared to the normal distribution curve, implying a greater factor B variance among the research sample, and altogether indicating a definite decline in cognitive application among research participants.

Factor B is the second largest in the 16 PF contingents, i.e., “with the exception of factor A, it represents the broadest influence on the total personality of all the factors included in

the 16 PF” (Cattell 1989: 30). Unlike the other factors, factor B measures not temperament, but ability, i.e., capacity to perform. “By contrast, there are many instances when average or low scores do not reflect the examinee’s actual intellectual ability. These instances are apt to occur in examinees who are ... depressed, anxious, or preoccupied with their troubles” (Cattell 1989: 32). Because factor B also reflects fluid intelligence, i.e., problem-solving skills, the first inference is that asthmatic individuals’ cognitive applications might be hampered, and that they might experience difficulty in discerning interpersonal relations. Factor B indicates whether the asthmatic individual “... would most likely benefit from insight therapy or some other form of treatment. Furthermore, since one’s level of intellectual ability tends to colour judgments, beliefs, and preferences, as well as social behaviour” the second inference is that asthmatic individuals might show compromised cognitive application in a variety of contexts, in keeping with the findings of Naudé and Pretorius (2003) who reported compromised intellectual functioning among asthmatics in their research sample. They ascribed this decline in cognitive application to affective and social variables, as well as to the negative impact of asthma medication on cognitive functioning.

#### ***4.11.2.4 Interpretation of the research sample’s performance on primary factor C***

The majority of research participants performed towards the lower pole of the factor C continuum (mean sten score 4.36), suggesting that they are affected by feelings, that they get upset easily, and that they might be somewhat changeable. Compared to the normal distribution curve, the research sample’s distribution curve shows a slight tendency towards ego weakness. The factor C variance within the research sample’s distribution curve is only slightly divergent from the normal distribution curve, which points to greater reliability for this factor.

The clinical relevance of low C-scores suggests poor social adjustment, poor self-esteem, and poor physical illness. Cattell (1989) has found positive correlation between low C scores and medical risks, especially associated with cardiovascular system, chronic back pain, agitated depression, depression and anxiety.

According to Zuckerman (2005: 132) serotonin is one of the main regulators of emotion in the brain. Serotonin reuptake inhibitors (SSRIs), which regulate serotonin activity has

therapeutic effects on depression and certain types of anxiety disorders. A low serotonin level is a risk factor for these disorders. Serotonin regulates vital functions such as sleep, appetite, activity, and sexual function (symptoms of depression). Serotonin/5-HT-reuptake is facilitated by the 5-HT transporter/5-HTT. In a certain genotype there can be short and/or long alleles. The genotype with short alleles or mixed with short and long alleles slow down the process of 5-HT reuptake, causing effects such as anxiety, angry-hostility, and impulsiveness. A study with rhesus monkeys showed that peer rearing resulted in the expression of the short allele genotype associated with behaviour difficulties, while rearing by mothers minimize its expressional importance - the expression seems to depend on prolonged early experiences (Zuckerman 2005: 133). Cattell (1989: 45) proposed about factor C as follows: “That individuals differ in ego strength is due to their particular learning experiences and to their genetic endowment. Research evidence indicates that much of the variance of ego strength (.41) is due to heredity”. The first inference is that the psychobiology of individuals diagnosed with asthma might be a causal factor in the development of anxiety and anxiety-related difficulty, in keeping with Cattell’s (1989: 46) observation: “Decreases in C scores occur with chronic illness and disability. Possibly, these decreases reflect the disorganization that occurs in perceptual and cognitive functions when people are anxious and depressed, especially for protracted periods. The decreases may also reflect the stresses that result from coping with increased obstacles to meeting needs which people normally encounter when sick or disabled”. A gender breakdown of the research sample’s performance on factor C indicates that all male research participants performed to the lower pole of the continuum, while all the female research participants performed either at average level, or to the higher pole of the continuum. These gender differences are significant, and the second inference is that male asthmatics might be more at risk for showing ego weakness, coupled with anxiety, depression and poor problem solving originating from ego weakness. The third inference is that there might be a psychobiological base explaining the male asthmatic research participants’ ego weakness.

#### ***4.11.2.5 Interpretation of the research sample’s performance on primary factor F***

The majority of research participants scored to the higher end of the F pole, suggesting that they are surgent and excitement seeking (high stimulus seeking). Impulsivity leads to quick and alert behaviour, coupled with a happy-go-lucky attitude. According to Cattell

(1989: 91) factor F has an extremely strong genetic component to it, with a .65 heritability coefficient. High F-scores also suggest agitated depression (Krug 1980) and pronounced group dependency (Cattell 1989: 95). Karson and O'Dell (1976) proposed that F+ individuals are inadequately socialized. Compared to the normal distribution curve the research sample's distribution curve shows a tendency towards surgency and impulsivity. The variance for factor F in the research sample distribution curve is smaller than in the normal distribution curve, which points to great reliability for factor F. The first inference is that the psychobiology of personality might play a significant role in the way that asthmatic individuals apply themselves socially, i.e., being impulsive, group dependent, and showing a tendency toward agitated depression. A gender breakdown of the research sample indicated that all of the research participants, except for two males who scored at average level, performed to the high end of this pole. Thus, the second inference is that gender does not play a significant role in the way that depression among asthmatics is expressed, i.e., being expressed as agitated depression, which might have a strong psychobiological base.

Agitated depression is often expressed as an inclination to make mistakes without bearing the consequences of social disapproval. It is believed that surgency is an element of behaviour disinhibition (BD). "A certain inherent predisposition is required for succumbing to environmental influences that are inhibiting, as demonstrated by factor F's extremely strong genetic component (.65). ...The psychological basis of this genetically transmitted component may be in the brain's frontal lobe, as there is some evidence that this is the locus of inhibition. Examples that support frontal lobe involvement are the increase in surgent behaviour following frontal lobotomies and decreases in inhibition while drinking, as this part of the brain is affected by alcohol ingestion" (Cattell 1989: 91). In addition, high co-morbidity is observed between BD and bipolar disorder (Hirshfeld-Becker, Biederman & Calltharp et al 2003: 989). The risk for behaviour-disinhibited adolescents to develop bipolar disorder increases with a family history of emotional dysregulation (Hirshfeld-Becker et al 2003: 989). Other temperamental qualities that increase the risk for BD and thus bipolar disorder are novelty seeking, low harm avoidance, high approach and low shyness (Hirshfeld-Becker et al 2003: 989). The close association between high F+ scores and bipolar disorder was already established by Krug (1980) and confirmed by Cattell (1989: 97).

Research findings demonstrated that impulsive extroverted individuals had more high amplitude alpha activity (lower arousal) in the frontal brain sites (Fink et al in Zuckerman 2005: 106). These individuals showing lower arousal feel better at and react more efficiently to high intensities of stimulation, as associated with high scores on factor F. This can lead to sensation seeking and to risk taking, which intensifies cortical stimulation (Zuckerman 2005: 102-103). Could it be that asthmatic individuals are lacking a certain neurotransmitter (excitatory neurotransmitter), which they tend to substitute by excitement-seeking behaviour? Although this question remains to be answered, the third inference is that asthmatic individuals might be lacking cortical stimulation, resulting in excitement seeking behaviour, as indicated by their performance on factor F. The fourth inference therefore is that asthmatic individuals show proneness to develop mood disorders that might be expressed as agitated depression or as bipolar mood disorder, and since there is a strong heritability factor to factor F, these conditions might have a certain psychobiological base.

#### ***4.11.2.6 Interpretation of the research sample's performance on primary factor G***

The majority of research participants score to the lower end of the factor G pole, suggesting superego weakness. Since factor G measures both *content* and *action* of moral development, the research participants as a group revealed immature moral development, as compared to the normal distribution curve. The variance for factor G in the research sample distribution curve is a bit smaller than in the normal distribution curve, which points to great reliability for factor G.

A lower performance on factor G implies avoidance, or a rather passive acceptance of conditions, which is typical of unassertive behaviour. This resembles a self-denying life with implications for healthy emotional functioning. Emotional disorders such as anxiety, depression, learned helplessness and passive-aggression might develop from suppressed frustrations and feelings of powerlessness (Fodor 1992: 7-11). The heritability component of factor G is low (.12), which means that most of the superego's development might be ascribed to exposure to environmental conditions. Thus, the first inference is that the asthmatic research participants' superego weakness might stem from parenting practices associated with caring for a chronically ill child. This inference is in keeping with Cattell's (1989: 99) observation that immature moral development might be ascribed to "...

excessive parental coerciveness during formative years”. Possibly, these persons received so many directives that their development of moral autonomy was stifled. It seemed that having internalised their parents’ injunctions and admonitions and taboos, they continued to respond to these now internally generated instructions by vacillating between obedience and anxious rebellion, as they did as children. The peculiar outcome was that they showed as much conscientiousness, persistence, and effort as G+ examinees. What is being described here is obsessive-compulsive behaviour, especially since it focuses on orderliness, proper conduct, cleanliness, and other forms of behaviour which parents often laud as highly desirable” (Cattell 1989: 128). Considering that caring for an asthmatic child often involves parenting practices characterised by warnings, taboos, restrictions and cleanliness, the second inference is that these parenting practices might result in immature moral development among asthmatics. In addition, the third inference is that asthmatics might be more at risk to developing obsessive-compulsive behaviour associated with anxiety due to specific child rearing practices associated with caring for an asthmatic child.

#### ***4.11.2.7 Interpretation of the research sample’s performance on primary factor I***

The majority of research participants reveal premsia, a condensation for “protected emotional sensitivity” (Cattell 1989:152), implying that they are fidgety, expecting affection and attention, clinging, insecure, seeking help, hypochondriac and anxious about self. Compared to the normal distribution curve the research sample’s distribution curve shows a slight tendency for the group to be sensitive and tender minded, and for employing “feeling” rather than “thinking” functions (mean 6.64). This could be understood in terms of the cohort’s performance on factor B. These results might relate to typical hemispheric specialization, since there is some evidence that the right hemisphere processes information subjectively and emotionally, and is the locus of artistic and spiritual kinds of interests (Cattell 1989: 155). The variance for factor I in the research sample’s distribution curve is only a bit smaller compared to the normal distribution curve, which points to greater reliability for factor I. Apart from the environmental influences, heredity plays a significant role in influencing one’s eventual place on the factor I continuum (Cattell 1989: 156). Cattell in (1982) established that genetics contributes 47% of the variance. In addition, constitutional associations such as correlations between AB blood types and I+ scores have been discovered (Cattell, Young & Hundleby 1964: 397-402). Thus, the first

inference is that there might be a psychobiological base to personality development among asthmatic individuals, particularly in the way that they process information.

A sample breakdown of the research sample indicates that with the exception of one male research participant, all male research participants scored towards the higher end of the factor I pole, whereas more female research participants scored to the lower end of this pole. A high performance on factor I suggests hyper-emotionality, and it is closely associated with stress-related illness, particularly of the coronary vascular system. Thus, the second inference is that male asthmatics might be more prone to stress-related illness, they might appear 'highly strung', i.e., easily upset, they might need more than average amounts of reassurance and support, and they might be particularly prone to coronary vascular disease. To the positive side, male asthmatics might reveal a certain empathetic understanding, which allows them to know through emotional identification just what others are experiencing. However, male asthmatics might find it difficult to communicate their impressions to others, in keeping with their hemispheric specialization that is not naturally aligned with linear linguistic expressions. To the contrary, they might generally enjoy art and metaphor, since these forms lend themselves better to the language of feelings (Cattell 1989: 157). Furthermore, they might be decidedly more introverted. "They shun rough, adventurous or strenuous activities, are disinterested in sports, prefer subjects like art and literature, are neat and fastidious but not well organized, are emotionally dependent, and do not respond well in emergencies" (Cattell 1989: 161). Parenting might play a significant role in personality development as well, since Cattell in 1989 established, "their parents appeared to overindulge their dependency needs" (Cattell 1989: 161).

In contradistinction, the female asthmatic research participants tend to operate by logic and reason (Cattell 1989: 162). They seem to be more unsympathetic, and "they reject their own vulnerable feelings as much as they do those of others" (Cattell 1989: 163). Female asthmatic individuals might have a strong potential for having difficulties in intimate interpersonal relations (Cattell 1989:167), for they seem to be out of touch with tender or vulnerable kinds of feelings and they don't seem to complain or ask for assistance and help. "They may so severely underestimate the severity of illness that others may also discount its significance" (Cattell 1989: 167). Finally, the female research participants' performance on factor I is in keeping with Cattell's findings (1989: 167), who reported lower I-scores in the profiles of a group of asthmatic patients. The third inference is that

female asthmatics tend to repress the significance of the mind-body relationship in health protective behaviour.

#### **4.11.2.8 Interpretation of the research sample's performance on primary factor L**

The majority of research participants tend to feel rather socially alienated coupled with a low self-esteem. Compared to the normal distribution curve the research sample's distribution curve shows a slight tendency for asthmatics to be suspicious. The variance for factor L in the research sample distribution curve is especially larger to the right end, compared to the normal distribution curve, which points to a better chance that individual persons in this group may be more suspicious than what the mean value reflects. A high group performance on factor L suggests that asthmatic individuals' sense of personal boundaries might be so tightly drawn that they feel separate from most others (Cattell 1989: 170). Inherent to factor L+ is a sense of jealousy and deprivation. "The essential component of jealousy is an experience of deprivation, a sense that something meaningful to one's happiness has been denied, with concomitant feelings of sadness, emptiness and even anger" (Cattell 1989: 172).

From a medical point of view L+ scores are important indicators of proneness to stress, and related physical illness (Sherman & Krug 1977). These researchers established a significant relationship between L+ scores and coronary heart disease, as well as general illness.

A sample breakdown of the research sample indicates that with the exception of one male research participant, all male research participants scored towards the higher end of the factor L pole, whereas more female research participants scored to the middle of this continuum. The first inference is that asthmatic individuals might, due to the psychobiology of personality, show greater vulnerability to stress, coronary heart disease, and stress related illness, implying that higher levels of cortisone secretion involved in HPA-axis regulation might play a significant role. The second inference is that male asthmatic individuals might be even more at risk for developing stress related illness.

**4.11.2.9 Interpretation of the research sample's performance on primary factor M**

The majority of research participants show intuitive functioning with imaginative and unconventional behaviour. Compared to the normal distribution curve the research sample's distribution curve shows a tendency for the group to be creative and fanciful. The variance for factor M in the research sample distribution curve is only a bit larger than in the normal distribution curve, which points to greater reliability for factor M.

Indifference to practical matters and absentmindedness makes monitoring and routine work difficult for high scoring individuals. Important details are easily overlooked, in keeping with the cohort's performance on factor B. Just as with factor I, there is a relationship between factor M and hemispheric specialization. "Persons who show a strong tendency to favour the use of the right side of their brains tend to respond emotionally and subjectively (like I+ scorers). M+ scorers' perceptions are diffuse and draw heavily on subliminal information, and these qualities, too, seem right-brained" (Cattell 1989: 192). The first inference therefore is that there might be a psychobiological base to developing certain personality traits among asthmatics.

**4.11.2.10 Interpretation of the research sample's performance on primary factor N**

Factor N represents the social mask (Cattell 1989: 208). The majority of research participants scored to the lower end of the N pole, suggesting unpretentiousness. The research participants might therefore be the "transparent self" (Cattell 1989: 208), making little effort to hide their reactions. Compared to the normal distribution curve the research sample's distribution curve shows a tendency among asthmatics to be forthright and socially clumsy. They might be lacking self-insight and they might be unskilled in analysing the motives of others. The variance for factor N in the research sample's distribution curve is smaller compared to the normal distribution curve, which points to high reliability for factor N.

Although there is no research on the genetic basis for factor N, it can be inferred that its heritability is probably low, since it varies substantially across cultural groups (Cattell 1989: 209). According to Cattell any trait that shows strong variations of this sort is

considered to result more from socialization. A sample breakdown in terms of gender identified no significant gender differences, and the majority of research participants scored towards the lower end of the N pole, except for one male and one female research participant that scored at average level. The first inference therefore is that child rearing practices might play a role in asthmatic research participants' social clumsiness, as well as the way that asthmatic children are socialized within their peer group.

#### ***4.11.2.11 Interpretation of the research sample's performance on primary factor O***

Factor O measures feelings that people have about themselves in regard to their self-worth (Cattell 1989: 222). Cattell furthermore emphasized, "The essence of this factor is not actual guilt feelings, which are only its subjective manifestations, but an underlying emotional self-attitude. "I concluded that the basic core measured by the high factor pole is an absence of basic, healthy narcissism (more popularly called self-esteem)" (Cattell 1989: 222 - 223). The majority of research participants showed guilt-proneness, i.e., they appeared to be worrying, anxious, depressed, overcome by moods, a strong sense of obligation, yet sensitive to people's approval or disapproval, hypochondriac, phobic symptoms, loneliness (social?) and sometimes brooding behaviour. Compared to the normal distribution curve the research sample's distribution curve shows a high tendency for the group to have guilt feelings. The variance for factor O in the research sample's distribution curve is larger than in the normal distribution curve, which points to a better chance that individual persons in this group may be more or less prone to guilt than what the mean value of 9.0 reflects. Thus, the first inference is that asthmatic individuals in this research sample reveal guilt proneness that originates from an absence of self-worth (or healthy self-esteem).

A sample breakdown in terms of gender revealed that all research participants but one female performed at the extreme high end of this factor pole. "The genetic contribution to factor O is moderate (.34). Thus, persons have a constitutional tendency to evaluate themselves positively or negatively in addition to reacting to their life experiences" (Cattell 1989: 223). The second inference therefore is that there might be a psychobiological basis to personality development among asthmatic individuals. The third inference is that the research participants' lack of self-worth not only resembles a reaction to their life experiences, but that it might be a constitutional tendency. The fourth inference is that

there might be a psychobiological basis to asthmatic individuals' subjective feelings of anxiety and depression.

#### ***4.11.2.12 Interpretation of the research sample's performance on primary factor Q4***

Factor Q4 measures the unpleasant sensations that accompany autonomic arousal, colloquially referred to as 'nervous tension', or simply 'tension' (Cattell 1989: 294). The majority of research participants scored to the extreme high end of this factor pole, suggesting that they are tense, frustrated, driven, and experiencing high levels of anxiety.

A gender breakdown of the research sample demonstrated that all research participants, but one female who scored at average level, reportedly experience high levels of nervous tension and anxiety. Cattell (1989: 295) reported a moderate heritability quotient for factor Q4 of .34. "Hence, despite its substantial environmental component, there is a definite genetic tendency towards being either tense or relaxed" (Cattell 1989: 295). Thus, in keeping with Cattell's observations the first inference is that asthmatic individuals might be experiencing protracted stress. This inference is in keeping with research evidence indicating that the neo-cortex regulates social behaviour, and because of its relatively few connections with the limbic system, it can only modify emotional activity to a limited extent and can thus not switch off or limit the time period of negative emotional arousal (Meyer, Van Papendorp, Meij & Viljoen 2004: 7.30). The second inference is that there might be a psychobiological basis to asthmatic individuals' anxious and tense personalities. Because high Q4+ scores are associated with alcohol abuse and mood disorders, the third inference is that asthmatic individuals might be more prone to abuse alcohol, which condition often co-exists with an identified mood disorder. This third inference is also in keeping with the self-reporting schedules of these research participants, indicating experimentation with alcohol, including frequent social use of alcohol among seven (7) of the research participants.

#### **4.11.3 Interpretation of the combination of factors**

The preceding paragraphs described the so-called primary factors. However, in order to make important practical discriminations possible, the various combinations of these primary factors are now looked into. These combinations are presented here in order to

identify whether factor interrelationships cause certain primary traits not to be expressed in the expected pattern. “It is these unusual patterns that can raise questions about how the person expresses these temperament traits that are usually not found together” (Cattell 1989: 9).

**4.11.3.1 Factor interrelationships with factor A: *Affectothymia versus Sizothymia*  
(*The warm-cool social orientation*)**

Of the cohort, three (3) research participants demonstrated a combination of A-/I+ traits, i.e., 27.27%, suggesting that they are likely to be kind and sympathetic, though reserved. Furthermore, three (3) research participants, i.e., 27.27%, demonstrated a combination of A+/C- traits, while six (6) research participants demonstrated a combination of A+/F+ traits, i.e., 54.55% of the cohort. Both combinations suggest that the research participants diagnosed with asthma might reveal restricted reflective skill; therefore they might be impulsive and rush into premature decisions and arrangements that are not conducive to best long-term interests (Cattell 1989:96).

**4.11.3.2 Factor interrelationships with Factor B: *The ability to discern relationships*  
(*Intelligence*)**

Of the cohort, four (4) research participants demonstrated a combination of A+/B- traits, i.e., 36.36%, suggesting that they might be experiencing difficulty in discerning complex relationships.

Of the cohort, three (3) research participants demonstrated a combination of A-/B- traits, i.e., 27.27%, suggesting that they might be reserved and that they channel all reserves into their work, resulting in high task performance, but characterised by exclusion of social interaction. They also experience difficulty in discerning everyday relationships.

**4.11.3.3 Factor interrelationships with Factor C: *Adaptation to the environment***

Of the cohort, four (4) research participants demonstrated a combination of C-/F+ traits, i.e., 36.36%, suggesting that they might be sufficiently fluent in their thinking to generating a wide choice of alternatives towards problem solving, yet they rarely proceed

to problem solving, since their tendency towards being impulsive prompt them to act on the first appealing idea that occurs to them. They might not be motivated to bear with routine kinds of tasks.

Of the cohort, four (4) research participants demonstrated a combination of C-/O+ traits, i.e., 36.36%, suggesting that they might also show feelings of guilt, a negative self-concept, and dysphoria associated with negative self-evaluations.

Of the cohort, four (4) research participants demonstrated a combination of C-/Q4+ traits, i.e., 36.36%, suggesting that they might suffer from nervous tension.

Of the cohort, four (4) research participants demonstrated a combination of C-/O+ /Q4+ traits, i.e., 36.36%, suggesting that they often experience other anxiety symptoms besides those associated primarily with low ego strength.

#### ***4.11.3.4 Factor interrelationships with Factor F: Exuberant versus sombre (serious) orientations***

Of the cohort, seven (7) research participants demonstrated a combination of F+/A+ traits, i.e., 63.64%, suggesting that their surgency (due to F+) may be somewhat tempered by genuinely warm social interest (A+). Because of this combination, they seem to be surgent, but also outgoing, warm-hearted, easy going, and participating. They might be stimulus seeking - suggesting agitated depression.

Of the cohort, two (2) research participants demonstrated a combination of F+/C- traits, i.e., 18.18%, or four (4) research participants demonstrated a combination of F+/G- traits, i.e., 36.36%, or six (6) out of eleven (11) research participants demonstrated a combination of F+/Q3- traits, i.e., 54.55% suggesting that they might be rule breaking.

Of the cohort, six (6) out of eleven (11) research participants demonstrated a combination of F+/N- traits, i.e., 54.55%, suggesting that they might be surgent, but forthright, unpretentious, genuine but socially clumsy.

**4.11.3.5 *Factor interrelationships with Factor G: The content and action of moral values***

Of the cohort, four (4) research participants demonstrated a combination of G-/Q3- traits, i.e., 36.36%, suggesting that they invest little in maintaining a socially correct self-image. In addition to other G- qualities, they might also show undisciplined self-conflict; therefore they might be lax and follow their own urges. They might be careless of social rules, in keeping with low Q3- qualities.

Of the cohort, four (4) research participants demonstrated a combination of G-/Q3-/O+/F+ traits, suggesting acting out behaviour. Considering the three major behavioural controls inherent to the 16 PF, i.e., factors C, G, and Q3, the probability of acting out behaviour is suggested by an absence of one or more of these inner controls. Therefore, in contradiction to the preceding combination, only two (2) research participants demonstrated a combination of C-/Q3-/O+/F+ traits, suggesting that acting out behaviour cannot be ascribed to rule-breaking and an absence of morality, but rather to agitated depression (F+/O+ traits).

**4.11.3.6 *Factor interrelationships with Factor H: Courage versus timidity in human temperament***

Of the cohort, four (4) research participants demonstrated a combination of H+/A+ traits, i.e., 36.36%, suggesting that they are sociable, easygoing, and participating.

Of the cohort, five (5) research participants demonstrated a combination of H+/F+ traits, i.e., 45.45%, suggesting that, in addition to being bold and adventurous, they are likely to be exuberant and happy-go-lucky.

Of the cohort, three (3) research participants demonstrated a combination of H-/O+ traits, i.e., 27.27%, suggesting that they might be apprehensive, self-reproaching, insecure, worrying and troubled.

Of the cohort, three (3) out of eleven (11) research participants demonstrated a combination of H-/Q4+ traits, i.e., 27.27%, suggesting that they might tense, frustrated, driven and overwrought.

**4.11.3.7 *Factor interrelationships with Factor I: Feeling versus Thinking – contrasting modes of evaluating experience***

Of the cohort, three (3) out of eleven (11) research participants demonstrated a combination of I+/A- traits, i.e., 27.27%, suggesting that they might show empathetic understanding, which allows them to know through emotional justification just what others are experiencing.

Of the cohort, three (3) out of eleven (11) research participants demonstrated a combination of I+/F+ traits, i.e., 27.27%, suggesting that they might incline towards dramatization and self-centeredness.

**4.11.3.8 *Factor interrelationships with Factor L: Alienation versus Identification in social orientations***

Of the cohort, three (3) out of eleven (11) research participants demonstrated a combination of L+/O+ traits, i.e., 27.27%, suggests failure to restore self-worth and confidence. They might as a consequence of this failure show a pattern of learned helplessness, pervasive suspiciousness and hypersensitivity. This might also be indicative of a low self-esteem.

Of the cohort, three (3) out of eleven (11) research participants demonstrated a combination of L+/Q4+ traits, i.e., 27.27%, suggesting that they experience physical tension.

**4.11.3.9 *Factor interrelationships with Factor M: Intuition (instinct) versus sensing as contrasting perceptual modes***

Of the cohort, five (5) research participants demonstrated a combination of I+/M+/B (B sten 1 – 6) traits, i.e., 45.45%, suggesting that they have a rich inner live, but often lack

objectivity. The five (5) research participants that demonstrated a combination of M+/I+ traits, i.e., 45.45% suggest that this same group has a rich emotional life and openness to unconventional ideas.

Of the cohort, four (5) research participants demonstrated a combination of M+/A+(sten 6 – 10)/F+(sten 6 – 10) traits, i.e., 45.45%, suggesting that they are extraverted doers, who are not content unless they could eventually turn the fruits of their imagination outwards. The research participants diagnosed with asthma are especially insightful towards people and can use their perceptions to be persuasive and charming. They seem to be alert to their social environment, and are less accident prone than introverted M+ individuals.

Of the cohort, four (4) research participants demonstrated a combination of M+/Q3-traits, i.e., 36.36%, suggesting that they might lack concern for maintaining a socially approved self-concept, because they are either withdrawn inwardly, or because they are too preoccupied to notice their impact on others.

#### ***4.11.3.10 Factor interrelationships with Factor N: Self-presentation in social situations***

Of the cohort, four (3) research participants demonstrated a combination of N-/I+ traits, i.e., 27.27%, suggesting that they are using their feeling, rather than thinking, to make evaluations. The research participants diagnosed with asthma might be inclined towards having sentimental and romantic expectations, making them particular vulnerable to exploitation.

Of the cohort, four (11) research participants demonstrated a combination of N-/M+ traits, i.e., 54.55%, suggesting that they might experience difficulty in dealing with social reality and in responding appropriately to interpersonal cues – therefore they might make some extreme kinds of social mistakes, yet they might be unaware of the reactions these mistakes evoke. Because of their proclivity for being absentminded and inattentive to what goes on around them, they might potentially often feel embarrassed in social situations, e.g., for having forgotten a name while making introductions.

Of the cohort, four (4) research participants demonstrated a combination of N-/±C (sten 5 – 10) and ±G (sten 5 – 10) traits, i.e., 36.36%, suggesting that it is highly likely that what these research participants diagnosed with asthma communicate could be taken at face value, because they are not likely to deceive or manipulate. Within the workplace they can be expected to be trustworthy and to form trusting relationships.

Of the cohort, four (3) research participants demonstrated a combination of N-/B- traits, i.e., 27.27%, suggesting that they might be gullible, that the research participants diagnosed with asthma might make many errors in judgment, and that the research participants diagnosed with asthma might have difficulty in doing almost anything correctly.

#### ***4.11.3.11 Factor interrelationships with Factor O: Guilt proneness versus self-confidence and resilience***

Of the cohort, four (5) research participants demonstrated a combination of O+/H- or O+/E- traits, i.e., 45.45%, suggesting that they are likely to get involved in relationships with dominant persons, where they are willing to accept blame, and believe that they deserve punishment.

Of the cohort, four (3) research participants demonstrated a combination of O+/L+ traits, i.e., 27.27%, suggesting that they are apt to view others in the same negative light in which they view themselves, and that they might be cynical about humankind generally. They might fail to find “meaning in life”, and might expect little that is good and altruistic in selves and in others.

Of the cohort, four (4) research participants demonstrated a combination of O+/C-/Q4+ traits, i.e., 36.36%, suggesting negative self-appreciation, emotional instability, coupled with high anxiety.

Of the cohort, four (6) research participants demonstrated a combination of O+/G-traits, i.e., 54.55%, suggesting a low self-esteem combined with low moral conformity. This combination signals that their guilt originates from not endorsing conventional moral standards, i.e., rule breaking.

Of the cohort, four (4) research participants demonstrated a combination of O+/G-/Q1+/Q3- traits, i.e., 36.36%, suggesting that they might be experiencing identity problems, coupled with low self-esteem and morally non-conforming behaviour, e.g., rebelliousness. This rebelliousness usually signifies an attempt to gain a better sense of selfhood through personal autonomy.

Of the cohort, four (3) research participants demonstrated a combination of O+/Q3+ traits, i.e., 27.27%, suggesting a low self-esteem combined with high self-sentiment. They are likely to have a low self-esteem with high conventional morality, yet the unreasonable self-imposed standards do not come from the superego but from the desired self, i.e., their wished-for self-image. They are likely not to feel guilt, but to feel inadequacy and shame, because they fall short of their personal and social ideals. These ideals are usually unrealistic or humanly impossible to achieve.

#### ***4.11.3.12 Factor interrelationships with Factor Q1: Orientations towards change***

Of the cohort, four (3) research participants demonstrated a combination of Q1-/G+ traits, i.e., 27.27%, suggesting that they are likely to be loyal employees. They could be relied upon to be long and faithful friends.

#### ***4.11.3.13 Factor interrelationships with Factor Q2: Self-sufficiency (reliance on self) versus group dependency (reliance on others)***

Of the cohort, four (5) research participants demonstrated a combination of Q2+/B- traits, i.e., 45.45%, suggesting an unwillingness to accept guidance, a closed mind, poor problem solving and a tendency to repeat the same mistakes. Consequently it seems as if they do not learn from experience, which is due to their rigid cognitive systems that are incapable of generating new and better alternatives for solving problems, dooming them to repeat the same mistakes.

Of the cohort, four (8) research participants demonstrated a combination of Q2+/O+ traits, i.e., 72.73%, suggesting that they have withdrawn out of a sense of own subjective

unworthiness and because they believe that they would be rejected if they would truly reveal themselves to others, however social reality testing is usually intact.

**4.11.3.14 *Factor interrelationships with Factor Q3: Investment in maintaining a socially approved self-image***

Of the cohort, four (5) research participants demonstrated a combination of Q3-/M+/L+/Q4+ traits, i.e., 45.45%, suggesting clinical depression, accompanied by feelings of hopelessness and self-depreciation.

Of the cohort, four (3) research participants demonstrated a combination of Q3+/G± (sten 6 to 10) traits, i.e., 27.27%, suggesting that they might set extremely high standards. At best these standards could be very demanding, and at worst these standards could be impossible to humanly realize. However, they usually achieve congruence between their high standards and their behaviour (performance), therefore they are likely to experience a sense of mastery and efficacy. This exercising of one's will and directing of one's fate contribute to their sense of personal superiority, as well as knowledge that their standards are higher than most people's. These self-sentiments assist in containing existential anxiety. However, they might find it extremely strenuous to collaborate towards a group project if some of the co-workers are negligent, lax, lazy, or unreliable, or when equipment are out of order or useless.

**4.11.3.15 *Factor interrelationships with Factor Q4: Tense versus relaxed temperaments***

Of the cohort, four (4) research participants demonstrated a combination of Q4+/E+ or Q4+/L+ traits, i.e., 36.36%, depicts extra punitive behaviour, suggesting that they might falsely blame others for their short temper, impatience, and distractibility. Moreover, if they happen to be in a position of authority, they might be inclined to make quick, irrational decisions or explode into anger and, as a result, might be strongly disliked by their subordinates.

## **4.12 DISCUSSION OF FINDINGS**

Based upon the preceding interpretations of data, the findings are now grouped and discussed under two main headings, namely findings on the research sample's distribution curves, and findings on the 16 PF primary factors.

### **4.12.1 Findings on the research sample's distribution curves**

A much flatter distribution curve compared to the normal distribution curve is visible at factors A, L and O, whereas a moderately flatter curve is visible at factors B, C, M and Q4 and a slightly flatter curve at factor I. This is not as expected according to the normal distribution curve. This indicates the distribution of research sample values further away from the mean value and nearer to the opposite poles of characteristics, which indicate a tendency to develop extreme personality characteristics. Strong indication of extreme poles of factor-characteristics inherent to some of these asthmatic children is thus mostly affectothymic yet reserved, and they show guilt proneness, apprehensiveness and suspiciousness. Moderate indication of extreme poles of factor-characteristics inherent to some of these asthmatic children are concrete thinking, emotional vulnerability, imaginative and tenseness.

A more condensed distribution curve compared to the normal distribution curve is visible at factors F and Q3. This indicates the strong tendency of all the individuals of the research sample to act according to the mean value of the distribution curve for that factor. The values of the mean for surgency (impulsiveness) and for lower self-esteem are thus strongly indicated in the research sample.

The turning point at the mean value of the distribution curve for the research sample, to the right or the left compared to the mean value or turning point of the normal distribution curve, indicates a deviation from what is expected, e.g. at factors A, F, O, and Q4 (to the right); B and N (to the left); C, G (slightly left); I, L, M, Q3 (slightly right). Slightly left and right deviations may be insignificant, but a definite right or left indicates a more definite tendency to a certain factor characteristic as was found with outgoingness, surgency, guilt proneness and tenseness, concrete thinking, and forthrightness.

#### **4.12.2 Findings on the 16PF primary factors**

The results demonstrated that the fraction of research participants (45.45%) who showed an inclination towards subjective exaggerated reporting on negative symptoms or a tendency to fake good (MD – scores) was insignificant (p-value: 0.73). Three research participants (MD-score: 7) and 2 other research participants (MD-score: 8), scored however moderately high. These research participants present with poor self-insight and/or chance are that they tried to give answers that indicate positive functioning or avoid answers that would indicate disturbance.

The research sample's performance on the primary factors and combinations of these factors will be discussed according to their significance to  $p < 0.05$  levels. There were 3 primary factor groups e.g., F+ (p-value: 0.03271), O+ (p-value: 0.00586) and Q4+ (p-value: 0.00586) that proved significant on the 5%-level according to their p-values and which thus indicated a strong tendency among the research sample towards those characteristics. Nine or more research participants (81.82%), scored significantly high on these primary factors. There were four primary factor groups e.g., A+ (p-value: 0.274), B- (p-value: 0.274), M+ (p-value: 0.274) and N- (p-value: 0.274), that indicated a moderate tendency among the research sample towards the characteristics of those primary factors, but they were however non-significant on the 5%-level according to their p-values. The findings of the characteristics of the primary factors that proved significant will be discussed, while the findings of other primary factors will be discussed if in combination with or believed to contribute to the characteristics of the significant primary factors. The research evidence presented and the possible suggestions made and discussed in the following paragraphs serve to validate inferences made in the preceding interpretations of the findings and as such to get insights into the psychobiology of the development of personality in the asthmatic research sample.

##### **4.12.2.1 Factor F**

Hirshfeld-Becker, Biederman and Calltharp et al (2003: 989) defined surgency as high approach, sensation-seeking activity. This pole on factor F is further associated with sub traits or characteristics such as impulsivity, excitement-seeking (stimulus seeking),

happiness, agitated depression (Krug 1980) and pronounced group dependency (Cattell 1989: 95).

A few inferences, which will be implied in the following discussions, were made for factor F under heading 4.11.2.5, e.g.:

1. The psychobiology of personality might play a significant role in the way that asthmatic individuals apply themselves socially;
2. Gender does not play a significant role in the way that depression (agitated depression) among asthmatics is expressed;
3. Asthmatic individuals might be lacking cortical stimulation, resulting in excitement seeking behaviour;
4. Asthmatic individuals show proneness to develop mood disorders that might be expressed as agitated depression or as bipolar mood disorder.

Cattell (1989: 91) stated that an inherent predisposition (strong genetic component of 0.65) cause vulnerability for succumbing to environmental influences, which, in favourable circumstances, probably led to Karson and O'Dell's (1976) proposed statement/believe that F+ individuals are inadequately socialized. Hirshfeld-Becker, Biederman and Calltharp et al (2003: 989) believed that surgency is an element of behaviour disinhibition (BD). Research findings demonstrated that impulsive extroverted individuals (probably: A+/F+) had more high amplitude alpha activity (lower arousal) in the frontal brain sites (Fink et al in Zuckerman 2005: 106).

Some researchers identify the brain's frontal lobes as the locus of inhibition (Cattell 1989: 91), while Naudé et al (2004: 444) links abnormalities and functional impairments of both the frontal lobes and basal ganglia to the disruption of inhibitory control in various developmental disorders, such as Attention Deficit/Hyperactivity Disorder (ADHD), Obsessive Compulsive Disorder (OCD) and Tourette syndrome. According to Kaplan and Sadock (1998: 90) ADHD is associated with either frontal lobe or right hemisphere hypometabolism and that the frontal lobes are essential to the maintenance of attention. Wachtel and Boyette (1998: 10) mention that anxiety symptoms can however closely resemble ADHD. Five (p-value: 0.72559) of the 11 participants reported receiving a diagnosis of ADHD and using Ritalin during their primary school years. This is a slight

tendency, and not significant on  $p < 0.05$ . Examples that further support frontal lobe involvement are the increase in surgent behaviour following frontal lobotomies and decreases in inhibition while drinking, as this part of the brain is affected by alcohol ingestion” (Cattell 1989: 91).

Naudé et al (2004: 443) proposed that the limbic circuit with its projection zones in the medial prefrontal cortex (anterior cingulate gyrus and medial orbitofrontal cortex) as being one of five parallel, basal ganglia thalamocortical circuits. These circuits seem to carry different types of information, which are processed and supported in the frontal lobes and which are represented as a variety of behaviours. They further proposed that the functions of these circuits underlie inhibitory control. Such control deficits in developmental disorders reflect a disruption in the development of the basal ganglia thalamocortical circuits, which is in keeping with Panksepp’s description of EES (Naudé et al 2004: 444). Asthmatic children having inhibitory control deficits might thus be incautious of social cues about their behaviour and less able to learn from their mistakes. Agitated depression is often expressed as an inclination to make mistakes without bearing the consequences of social disapproval. Kaplan and Sadock (1998: 351) report that male-female differences in aggression tend to be small, because woman, when provoked get about as angry or aggressive as men, which is in accordance with this research findings of no gender difference in agitated depression.

Hirshfeld-Becker et al (2003: 989) observed high co-morbidity between BD and bipolar disorder with increased risk for behaviour-disinhibited adolescents with a family history of emotional dysregulation to develop bipolar disorder. The close association between high F+ scores and bipolar disorder was already established by Krug (1980) and confirmed by Cattell (1989: 97). Could it be that asthmatic individuals are lacking a certain neurotransmitter (excitatory neurotransmitter), which they tend to substitute by excitement-seeking behaviour, was asked under the previous heading.

Both serotonin for calming of activity (hyperactivity) and dopamine for improved attention (attention deficit) are effective in ADHD type disorders (Kalat 2001: 71). The dopamine activity according to Kalat reduces the ‘background noise’-effect in the brain. Low serotonin turnover at the pre- and post synaptic terminals is characteristic in individuals with impulsive behaviour, such as found in aggressive individuals, those who are convicted

of violent acts, as well as individuals who commit or attempt suicide (Kalat 2001: 353) and in depressive individuals (Kalat 2001: 430). Antidepressant drugs that prevent the reuptake of serotonin or that block the metabolism of serotonin to an inactive form, and thus increase serotonin availability and activity, alleviate depression (Kalat 2001: 430). A low serotonin turnover results from the failure in serotonin release and synthesis by pre-synaptic neurons. The concentration of the serotonin metabolite 5-hydroxyindoleacetic acid (5-HIAA) can be measured in a blood-, cerebrospinal fluid- or urine samples to test for serotonin turnover. A low metabolite concentration correlates with low serotonin turnover (Kalat 2001: 353).

#### **4.12.2.2 Factor O**

Cattell emphasized that factor O is not about the actual guilt feelings, but rather about the underlying emotional self-attitude or feelings regarding self-worth (Cattell 1989: 222). This absence of basic, healthy narcissism or more popularly called self-esteem, according to Cattell (1989: 222 - 223) is what is absent in the O+ personality.

A few inferences, which will be implied in the following discussions, were made for factor O under heading 4.11.2.11, e.g.:

1. That asthmatic individuals in this research sample reveal guilt proneness that originates from lack of self-worth (healthy self-esteem);
2. There might be a psigobiological basis to personality development among asthmatic individuals;
3. therefore the research participants' lack of self-worth not only resembles a reaction to their life experiences, but that it might be a constitutional tendency;
4. The fourth inference is that there might be a psigobiological basis to asthmatic individuals' subjective feelings of anxiety and depression.

The research sample's significant trait surgency and their possible inability to quickly learn from mistakes (A+: moderate tendency) and some inclination to break rules, make mistakes (F+/C- or F+/G-or F+/Q3-), and social clumsiness (F+/N-), will elicit social disapproval, which may lead to negative self- evaluation and guilt proneness. Thus the possible high amplitude alpha activity with lower arousal in the frontal brain sites (Finket

al in Zuckerman 2005: 106) and low serotonin turnover may result in behaviour deficits (Kalat 2001: 353) and negative self-evaluation (O+). In Kaplan and Sadock (1998: 236) it is stressed that if toddlers, between 3-5 years don't develop a sense of initiative and ambition and rather feel inadequate about their behaviour or competence, they develop a sense of guilt about self-initiative activity and a restricted imagination. They may as adults be morally too strict and insist that others adhere to their strict moral codes. This may negatively influence their relationships with others and ability to take acceptable risks. Kaplan and Sadock (1998: 236) further explain that successful resolution of this initiative phase result in a sense of responsibility, dependability and self-discipline. These imply both a constitutional tendency and an impact from life experiences in the development or the absence of 'healthy narcissism'.

This lack of narcissism and inclination to guilt feelings in the research sample will thus hamper the research sample's ability to assertiveness, which renders them vulnerable to dependency in a relationship with a dominant person. This will influence their ability to decision-making, social competence and self-sufficiency, which lead to negative self-appreciation or low self-esteem. Six of the 11 individuals in the research sample showed weak self-sentiment on factor Q3, which indicates a slight tendency (p-value: 0.5000) for low self-worth/self-esteem.

Zins, Elias and Greenberg (2003: 56) mentioned the growing need of children, to be empowered with emotional skills, which include self-assertiveness. Fodor (1992: 14) distinguished between various categories of assertiveness, such as how to say no or to refuse a request, disagreeing with others, handling both the receiving and giving of negative and positive feedback, asking for help and coping with anger. Social competence and the ability to assert oneself go hand in hand and are essential basic life skills, which advance effective social interaction. Individuals that are not comfortable with selves may exhibit a tendency to mask their true self and furthermore deny their true feelings. Patients, who deny their true self, may not accept, adapt to and cope with their asthma condition. Identity problems coupled with low self-esteem (O+/G-/Q1+/Q3-) may however also lead to morally non-conforming behaviour, e.g., rebelliousness to gain a better sense of selfhood through personal autonomy. Guilt feelings and self-denying behaviour create thus tension and will increase anxiety levels.

The strong guilt proneness and apprehensiveness of this group on factor O imply low resilience ability and the subsequent vulnerability to develop emotional difficulties (O+/C-/Q4+) such as worrying, anxiousness, depressed mood and moodiness. The diagnosis of depression before the age of 20 increases the risk for bipolar disorder (Hirshfeld-Becker et al 2003: 992).

#### **4.12.2.3 Factor Q4**

The majority of research participants scored to the extreme high end of this factor, suggesting that they are tense, frustrated, driven, and experiencing high levels of anxiety. This is also in keeping with 8 (p-value: 0.11328) of the participants reporting to be experiencing chronic stress in the self-reporting schedule. Although not significant, this is meaningful. Cattell (1989: 295) stressed the definite genetic tendency towards being either tense or relaxed.

A few inferences, which will be implied in the following discussions, were made for factor Q4 under heading 4.11.2.12, e.g.:

1. that asthmatic individuals might be experiencing protracted stress;
2. that there might be a psychobiological basis to asthmatic individuals' anxious and tense personalities;
3. that asthmatic individuals might be more prone to abuse alcohol, which condition often co-exists with an identified mood disorder.

The majority of research participants show extremely high ergic tension on factor Q4. The constant autonomic nervous system arousal and tension (stress) adversely influenced the function of the prefrontal cortex, through functional inhibition of the anterior cingulate gyrus, which leads to impaired error detection, the inability to regulate behaviour and to apply knowledge to relevant social situations (Naudé et al 2004:442-443). Du Preez's (2003) findings that chronic stress compromises reasoning, conceptualising, abstraction and recalling abilities seem to correspond with frontal lobishness and it contributes to the belief that frontal lobishness might originate from chronic stress. Protracted stress results from the neo-cortex's inability to extensively modify emotional activity, because of its relatively few connections with the limbic system, and it can thus not switch off or limit

the time period of negative emotional arousal (Meyer, Van Papendorp, Meij & Viljoen 2004: 7.30). The research sample's high score on factor O implicate personality aspects and behaviour that are anxiogenic and increase tension, e.g. low self-worth resulting in guilt proneness and sometimes rebelliousness to gain better sense of selfhood through personal autonomy.

Kaplan and Sadock (1998: 561) report higher risk for relapse in mood disorders with the experience of stressful life events. Because high Q4+ scores are associated with alcohol abuse and mood disorders Cattell (1989), the third inference is that asthmatic individuals might be more prone to abuse alcohol, which condition often co-exists with an identified mood disorder. Kalat (2001: 353) reports that low serotonin turnover, a factor in mood disorders, also contributes to impulsive and irresponsible behaviour, such as drug usage, sometimes leading to addiction e.g., cocaine, alcohol and other substances. Studies proved that sons of alcoholics, because of their genetic predisposition for low serotonin turnover, have a higher risk for addiction. This is probably because they hold their liquor better than others and therefore consume alcohol to the point of impaired judgement leading to intoxication and they further benefit more than the average person from stress relief, after alcohol consumption (Kalat 2001: 427). Boyd, McCabe and Teter (2006: 278) report that students who misused their asthma medication sometime during their life were more likely to misuse illicit drugs such as marijuana and alcohol and to smoke cigarettes. Above is in keeping with the self-reporting schedules of the research sample, indicating experimentation with alcohol, including frequent social use of alcohol among seven (7) of the research participants. If asthmatics tend to have a lower than expected serotonin turnover they may thus be predisposed to mood disorders and addiction to alcohol and other substances.

#### **4.13 CONCLUSIONS**

In conclusion the research information, interpretation and deductions will be used to compose a profile with common personality traits in the psychobiology of personality of the asthmatic adolescent/child. The 16PF factor characteristics of the asthmatic research sample and their strong and weak points affecting their health progression will offer new insights into the psychobiology of personality of asthmatic individuals. This information

can inform the planning of health treatment programs. In doing so, the sub-questions for the research question will now be addressed in order to test the research hypothesis.

#### **4.13.1 Creation of a profile with common personality traits for the psychobiology of personality of the asthmatic adolescent/child as composed from the research information, interpretation and deductions**

As this research project builds on a general stress-coping model it will be in order to start with the 16Pf factors addressing stress. The sub-questions building towards the research questions will continuously be addressed.

##### ***4.13.1.1 In what unique ways do personality traits contribute to tense or relaxed temperaments among asthmatic individuals?***

The measuring of tension according to the completion of the questionnaire is done on a continuum with two poles of extremities, low tension and high tension on factor Q4. According to the research:

- (Q4+) extremely high ergic tension, i.e. stress, moodiness, anxiety (statistically significant).

Other research sample scores for personality factors found to contribute to the high stress level were:

- (O+) Guilt proneness/low resilience (statistically significant);
- (C-) Low ego strength on factor C (clinically significant);
- (L+) High suspiciousness (clinically significant);
- (Q3-) Weak self sentiment/lack of control (slight tendency) with low ability to bind the free floating anxiety (Q4+);
- (A-) sometimes anxiety and depression (clinically significant);
- (N-) anxiety and depression due to immaturity (moderate tendency).

It is proposed, as is in keeping with the self-reporting schedules of the research sample, indicating a moderate tendency (p-value: 0.27441) to experiment with alcohol, that if asthmatics have a lower than functional serotonin turnover, they thus may be predisposed to get addicted to alcohol and other substances. This predisposition to addiction is frequently associated with the experience of tension, where the consumption of alcohol serves to relief stress (Kalat 2001: 427). Low serotonin turnover is also associated with ADHD, depression or a depressive disorder (Kalat 2001: 354). Both serotonin and dopamine activity are implicated in ADHD type disorders (Kalat 2001: 71). The experience of ADHD or symptoms thereof is slightly indicated in the sample group.

Du Preez's (2003) findings that chronic stress compromises reasoning, conceptualising, abstraction and recalling abilities seem to correspond with frontal lobishness and it contributes to the belief that frontal lobishness might originate from chronic stress.

#### ***4.13.1.2 Which personality traits are consistently found to buffer the distress response and promote resilience among asthmatic individuals?***

The resilience capacity as measured by O- and the ability to bind free-floating anxiety (Q4+), measured by Q3+ can buffer distress. According to the research:

- (O+) Guilt proneness/low resilience (statistically significant);
- (Q3-) indicated a lack of control (slight tendency) with low ability to bind free floating anxiety (Q4+).

Other factors or personality traits that would normally buffer the distress response and promote resilience were hardly found or not pronounced clearly. According to the research they were:

- (C-) Low ego strength on factor C (clinically significant);
- (L+) High suspiciousness (clinically significant).

The only characteristic displayed by a few research participants that might slightly buffer against subjective anxiety was factor G.

- (G-) slightly indifferent about moral values and social rules (slight tendency).

Fearful anxiety is characterised by generalised apprehensive tension and a tendency towards autonomic symptoms like tachycardia, sweating, gastrointestinal symptoms, and increased muscle tension. Anticipatory anxiety produces a need to escape the situation that intensifies the anxiety. Since anxiety is not addressed or buffered by protective personality factors in the research sample, it should be identified and addressed by health treatment planning. Emotional support and stress relief can reduce psychological and physical symptoms, alter neuroendocrine and immune functioning, delay disease progression, and reduce morbidity and mortality.

The other sub-questions building onto the research question are now answered.

#### ***4.13.1.3 In what unique ways do these psychobiological personality traits impact on***

##### *(a) Cognition and decision-making*

Factor B is the main factor measuring cognitive ability. According to the research:

- (B-) indicated a moderate tendency (p-value: 0.27441) to concrete thinking with low reflective ability, which poses difficulty for in learning and progression at school;

Other research sample scores of personality factors found to contribute to cognition were:

- (A+) easily bored and distracted, take longer to learn from experience, reactive inhibition (moderate tendency);
- (M+) important details are overlooked, affect objective decision- making (moderate tendency);
- (O+) apprehensiveness, low self-reliance, low resilience ability (statistically significant);
- (C-) emotional distress, giving up easily (clinically significant);
- (F+) surgency indicating impulsivity and possible lack of concentration (statistically significant).

It can be inferred that there is a moderate risk for cognitive vulnerability in the asthmatic research sample.

*(b) mood and anxiety*

The amount of tension a person experience will greatly affects mood and anxiousness. The scores of the main factors affecting mood and anxiety in the research sample were thus:

- (Q4+) extremely high statistically significant (p-value: 0.00586) ergic tension (stress, moodiness, anxiety).

Other research sample scores of personality factors found to contribute to the high stress level were:

- (C-) Low ego strength on factor C (clinically significant);
- (L+) High suspiciousness (clinically significant);
- (O+) Guilt proneness (statistically significant);
- (Q3-) Weak self sentiment/lack of control (slight tendency) with very low ability to bind the free floating anxiety (Q4+);
- (A-) sometimes anxiety and depression (clinically significant);
- (N-) anxiety and depression due to immaturity (moderate tendency).

It can be inferred that there is a moderate risk for mood and anxiety disorders in the asthmatic research sample.

*(c) self-esteem*

Factors Q3 and O+ are the main factors measuring self-esteem. According to the research:

- (Q3-) Slight tendency to weak self sentiment/lack of control (p-value: 0.50000) with very low ability to bind the free floating anxiety (Q4+);
- (O+) Statistically significant (p-value: 0.00586) guilt proneness and apprehensiveness, self-denying behaviour, all of which poses difficulty in resilience ability and contribute to weaken the self-esteem.

Other research sample scores of personality factors found to contribute to self-esteem were:

- (I+) Insecure and anxious about themselves (clinically significant);
- (C-) emotional difficulties, give up easily - feelings of ineffectiveness (clinically significant).

Does a person with the qualities described at a, b, and c have the insight and ability to cope with complicated medical treatment, life style changes, the uncertainty of disease progression, the trauma of asthma attacks and school absenteeism with the possibility of associated academic difficulties? If informed about these qualities, treatment-planning programs may serve to improve and prevent more pronounced future cognitive and emotional difficulties.

**4.13.1.4 *In what unique ways do personality traits play a role in asthmatic individuals' sense of alienation versus identification across different social settings?***

Factor L is the main factor measuring alienation (suspiciousness). According to the research:

- (L+) some individuals experienced some suspiciousness, which poses difficulty in the forming of trusting relationships or points to the absence thereof. This was meaningfully expressed by some participants, although a not significant contribution was found in the sample group (clinically significant).

Another research sample score of a personality factor found to contribute to identification or trust in social settings was:

- (Q3-) fidgety and demanding behaviour, very high standards towards themselves and others, almost impossible to humanly realize (slight tendency);
- (N-) Forthright and social clumsiness (moderate tendency).

**4.13.1.5** *In what unique ways do personality traits contribute to asthmatic individuals' sensed guilt proneness and subjective anxiety?*

Factor O is the main factor measuring guilt proneness. According to the research:

- (O+) statistically significant (p-value: 0.00586) guilt proneness and apprehensiveness, which poses vulnerability to develop difficulties such as worrying, subjective anxiety, depressed mood, and moodiness.

Research sample score of a personality factor found to contribute in contradiction to guilt proneness was:

- (G-) slightly indifferent about moral values and social rules (slight tendency).

**4.13.1.6** *In what unique ways do personality traits play a role in asthmatic individuals' sense of self-sufficiency (reliance of self) versus group-dependence (reliance on others, e.g., carers)?*

Factor Q2 is the main factor measuring self-sufficiency. According to the research:

- Factor Q2 (self-reliance). No extreme scores were found on this factor. Unexpected finding. It was expected that due to their illness, the research participants would tend to be more dependent on others (clinically significant).

Other research sample personality factors, both found in individual members that can contribute to self-sufficiency are:

- (Q1+) intolerance with conservative and established ways of doing (clinically significant);
- (Q1-) tolerance with conservative and established ways of doing (clinically significant).

**4.13.1.7 *In what unique ways do personality traits play a role in asthmatic individuals' adjustment to altered health status?***

Factor C is the main factor measuring emotional stability (favouring adjustment).

According to the research:

- (C-) although not a significant factor for the whole research sample, three research sample individuals showed emotional instability, difficulty in settling down, poor self-esteem and social adjustment. All these difficulties cause feelings of ineffectiveness (clinically significant).

Other research sample scores of personality factors found to contribute to the adjustment to altered health status were:

- (Q3-) Weak self sentiment/lack of control (slight tendency) with low ability to bind free floating anxiety (Q4+);
- (I+) Insecure and anxious about themselves (clinically significant).

Kaplan and Sadock (1998: 774) report that adjustment disorders should be treated with both pharmacotherapy and psychotherapy.

**4.13.1.8 *Which personality traits support health protective behaviour among asthmatic individuals?***

*Health protective behaviour can be supported by easy adjustment ability to changes in lifestyles and environmental conditions. Factor C is the main factor measuring emotional stability, which highly predicts adjustment. According to the research:*

- (C-) emotional distress and giving up easily, which cause feelings of ineffectiveness and not favouring adjustment (clinically significant).

The other research sample scores of personality factors that could contribute towards health support, but did only slightly or for some participants, were:

- (L+) low trusting (clinically significant);
- (O+) troubled adequacy on factor O (statistically significant);
- (I+) do not act on the practical, dwell on physical disabilities (clinically significant);
- (Q3-) low ability (slight tendency) to bind free floating anxiety (Q4+);
- (Q1-) Tolerance with conservative and established ways of doing and of traditional difficulties, which imply tolerance with own difficulties (clinically significant).

If taking all these factors into account, it can be stated that some individuals among the research sample will experience some difficulty (feelings of disempowerment and/or hopelessness) in promoting their own health by own initiatives or by reaching out for help from others.

**4.13.1.9 *In what unique ways do personality traits play a role in asthmatic individuals' orientation towards change, lifestyle modifications, compliance with treatment regimes, and self-care?***

Factor C is the main factor for measuring emotional stability, favouring adjustment. Factor G is the main factor for measuring super ego strength, favouring adhering to routines. According to the research:

- (C-) emotional distress and giving up easily, which cause feelings of ineffectiveness/not favouring adjustment (clinically significant);
- (G-) Weak superego (slightly indifferent about moral values and social rules), which indicates the opposite of responsibility, emotional discipline and concern about moral standards and rules (slight tendency, p-value: 0.50000).

Other research sample scores of personality factors, **also found not to contribute to the support of changes, modifications, compliance and self-care** were:

- (O+) Troubled adequacy on factor O (statistically significant);
- (Q3-) weak ability (slight tendency) to bind free floating anxiety (Q4+).

These factors were found to could have contributed towards the support of changes, modifications, compliance and self-care:

- (L+) Low trusting –non-supportive (clinically significant);
- (I+) Do not act on the practical, do dwell on physical disabilities –non-supportive (clinically significant);
- (Q1-) Tolerance with conservative and established ways of doing and of traditional difficulties, which imply tolerance with own difficulties –supportive (clinically significant).

#### **4.13.2 Testing of the research hypothesis**

##### ***Research hypothesis***

*Insights into the psychobiology of personality of asthmatic individuals can be applied in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma.*

The shared personality traits as demonstrated at hand of the 16 PF illustrates that the asthmatic research sample portrays a specific psychobiological personality profile. Some of the research sample's primary factors deviated significantly (F+, O+ and Q4+) from the normal distribution curves and are assumed to be significantly associated with asthma as a chronic condition. This knowledge can therefore be applied in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma, and the research hypothesis is therefore accepted.

*How can this profile inform treatment planning to the advantage of the asthmatic adolescent or child patient?*

The above profile with common personality traits as composed (concluded) from the research interpretation and deductions also indicates that the presenting psychobiological characteristics of the asthmatic research sample do not improve, protect and support current physical, cognitive and emotional well being and may even lead to more pronounced future physical, cognitive and emotional difficulties.

The correct emotional support and stress relief can reduce psychological and physical symptoms, alter neuroendocrine and immune functioning, delay disease progression, and reduce morbidity and mortality and improve cognitive function. If informed about the qualities based on the psychobiology of the asthma patient's personality, an improved health treatment program, which will offer more comprehensive informed treatment, may be to the advantage of the patient's overall functioning and quality of life. In the light of above researched information the research hypothesis is accepted.

#### **4.14 SYNOPSIS**

In this chapter the main objectives of the research, the research design, and the empirical investigation, as well as the analysis and interpretation of the research findings are discussed. Deductions that lead to conclusions were made, according to which the research hypothesis was accepted. The empirical investigation was governed by the following research question:

*Which insights into the psychobiology of personality could be applied as a tool in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma?*

The research sample findings generated fresh insights into the psychobiology of personality for the research sample. Some of the main insights were derived from the compiled personality profile for the research sample. Important characteristics for this group were tense temperament accompanied by guilt-feelings, low self-worth, and subjective anxiety, as well as surgency or uninhibited behaviour. The physiological, as well as the psychological insights derived from the literature research and from the study were integrated to reach some conclusions. The most important conclusions were based on the dependency of the psychobiological development of personality on genetic, as well as environmental or social influences. The necessity to manage anxiety and emotional and social skills development in addition to pharmacotherapy became clear.

These insights can be applied in future health treatment planning. If treatment and lifestyle modification planning is done together with a thorough understanding of the psychobiology of personality, it might improve emotional support and stress relief.

Emotional support and stress relief can reduce psychological and physical symptoms, alter neuroendocrine and immune functioning, delay disease progression, and reduce morbidity and mortality.

In chapter 5 the research findings are integrated with the literature review that was undertaken in chapters two and three in order to reach final conclusions and recommendations to conclude the study.

## **CHAPTER FIVE**

### **OVERVIEW OF THE RESEARCH FINDINGS, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 INTRODUCTION**

Chapter 4 presented the empirical part of this research project, as well as findings and interpretations thereof. Chapter 5 integrates this research information of chapter 4 with what was found in the literature review of chapter 2 and 3 in order to reach final conclusions and recommendations.

#### **5.2 SUMMARY OF FINDINGS**

Although many aspects involved or in interaction with the main constructs of the title were researched and noted in the literature review to develop a better insight into the constructs, only the most relevant aspects focusing on the main constructs of the title, will be summarised. Chapters two and three comprise the findings of the literature study and chapter four comprises the research findings.

#### **Chapter 2 THE LINK BETWEEN PSYCHOLOGICAL AND PHYSIOLOGICAL HEALTH STATES**

- Researchers provide evidence that asthma conditions are frequently poorly controlled (Peters, Ferguson, Deniz & Reisner 2006: 5), goals of asthma therapy are not being met in children and that levels of asthma control do not meet the goals of the GINA guidelines (Bisgaard & Szeffler 2005: 3).
- The inadequate control of asthma creates high risk for serious morbidity (Peters et al 2006: 2), social and economical burden.
- Adequate control of asthma is complicated by its unpredictable course, difficulty in diagnosis and treatment (Bisgaard & Szeffler 2005: 3-6), and environmental threats and stress (Peters, Ferguson, Deniz & Reisner 2006: 4).

- Asthma treatment aims to control symptoms and preventing long-term airway damage. Mild intermittent asthma in children is however difficult to treat leading to substantial threat for airway remodeling (Bibi et al 2006: 2).
- Stress is often associated with anxiety and depression resulting in increased exacerbation of asthma symptoms and the incorrect use of medication, which interfere with control in asthma (Peters et al 2006: 5).
- Bibi et al (2006: 6) noted that the non-compliance and non-adherence to treatment regimes associated with deterioration of the asthmatic condition in children is common.
- The role of rehabilitation (physical exercise training) in asthma management is unclear, but there is evidence that exercise training reduces dyspnoea, improves lung function and aerobic fitness and thus quality of life (McConnell 2005: 9).
- Although medication is beneficial and essential, it also serves as an additional stressor e.g. Gustafson and colleagues (2002: 8) noted increased psychosocial/personality difficulty.
- Side effects of steroids include an array of emotional problems, even possible emotional disorders, as well as cognitive complications and systemic symptoms (Khan and Nejtek 1999; Brown in Naudé & Pretorius 2003: 700).
- Side effects of  $\beta_2$ -agonists include tachyphylaxes to the bronchoprotective and bronchodilator activity, the worsening of the lung ventilation-perfusion imbalance, risk for tachycardia and other cardiac problems, changes in serum concentration levels and a possible delay in recognition of the severity of an asthma attack in time, leading to increased mortality (Lötvall 2005: 155; Sommers 2002: 28).

### **Chapter 3    NEUROBIOLOGICAL INFLUENCE IN PERSONALITY DEVELOPMENT**

#### Psychobiology

- According to Panksepp (1998: 24) brain circuits control the basic genetic emotional behaviour tendencies.
- Out of a mixture of innate and learned behaviour or tendencies, the brain develops patterns of action behaviour used in certain situations (Panksepp 1998: 24), which is believed to affect the development of and constitute the psychobiology of a personality.

## Personality

- All animals are enabled to use the opportunities in their environment by being born with a variety of capabilities to make the learning of cognitive and emotional behaviour and the formation of personality possible (Panksepp 1998: 24-27).
- A “secure base” is fundamental for optimal personality development in children (Panksepp 1998: 264).
- The child’s immature brain is functionally subjected to environmental stress e.g. the neurotoxic effect, which affects behaviour and personality development (Panksepp 1998: 118; Naudé et al 2004: 444).

## Anxiety

- Anxiety is an aspect in a variety of psychiatric disorders (Panksepp 1998: 212) that affects neuro-endocrinological functioning (Goleman 1995: 205), and often is accompanied by somatic symptoms, restlessness and in addition fears, nervousness and depressive disorders (Kaplan & Sadock 1998: 581-583).
- According to Panksepp (1998: 206) fear potential reflects anticipation for something that endangers survival. Anxiety or the anticipating conscious or unconscious fear for an asthma attack sometimes becomes a pressing mortal fear (chronic anxiety) for suffocation and death.
- People may fail to take the necessary precautions against anxiety, due to selective thinking, resulting in false reassurance (Kaplan & Sadock 1998: 583).

## Emotion

- James in Panksepp (1998: 42) postulated that affective feelings are the result of cognitive interpretations of energetic bodily responses. These feelings are influenced by spoor memories of previous experiences of responses in similar situations.
- Psychiatric disorders, such as mania, paranoid schizophrenia, anxiousness, obsessive compulsiveness and posttraumatic stress disorder result due to overloading of effective systems (Panksepp 1998: 25, 27). The overexposure to stressful life circumstances

may thus leave asthmatic children vulnerable to emotional dysfunction and even emotional disorders.

- Emotion “Quality of mood” is one of nine temperament categories of behaviour that mould temperament and thus personality (Zuckerman 2005: 5).

#### Behaviour

- Behaviour progresses, develops through learning of new patterns, which results in the formation and changing of brain circuits in behaviour programs of the brain (Panksepp 1998: 27).

#### Cognition

- Chronic stress cause cognitive vulnerabilities due to hippocampal atrophy also in frontal lobishness that has detrimental effects on behaviour, learning, memory and attention (Naudé et al 2004: 437-460). Chronic asthma induces chronic stress
- Kaplan and Sadock (1998: 583) claimed that anxiety tends to cause confusion and distortion of perception of time, space, people and meanings of events, which by lack of concentration interfere with learning, reducing recall and impair the ability to make associations.

#### Social competence

- Stress leads to impaired error detection and to the inability to regulate behaviour and to apply knowledge to relevant social situations (Naudé et al 2004: 442-443).
- Play with touch results in contact comfort and facilitates the learning of social skills to promote fitting into the structures of community and making friends (Panksepp 1998: 271-272, 280).
- The child who does not experience success in the outcomes of his/her behaviour and social skills are vulnerable to dysfunctional behaviour and to distrust in peoples motives (Dodge et al 2003).
- Insecure attachment leads to difficulty in social situations, vulnerability to opiate or other addiction and social isolation (Panksepp 1998: 249,263).

## Health

- Chronic psychological stress tends to affect immune function sufficiently to increase the risk for infectious diseases, diminish the efficacy of vaccines, and contribute to inflammation processes and immune system activity (Pruett 2003: 137).

## **Chapter 4 RESEARCH DESIGN, METHODOLOGY AND FINDINGS**

- The research design is based on quantitative research, which is deductive in nature.
- The research hypothesis, which flows from the research problem, directs the scientific inquiry (Breakwell 1995: 13), leading to hypothesis testing.
- The aim is to provide insights into the psychobiology of personality as a tool for improving psychological and physical health states of individuals living with chronic asthma.
- The following research hypothesis was tested and accepted:

*Insights into the psychobiology of personality of asthmatic individuals can be applied in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma.*

- The empirical investigation was governed by the following research question:

*Which insights into the psychobiology of personality could be applied as a tool in planning treatment programmes aimed at the improvement of psychological and physical health states of individuals living with chronic asthma?*

- The research sample portrayed a specific psychobiological personality profile.
- Statistically meaningful tense temperament with extremely high ergic tension e.g. moodiness and anxiety was identified.
- Various other personality characteristics as depicted by the primary factors contributed to high tenseness of which the most significant are guilt proneness/very low resilience

(statistically significant), low self worth and lowered ability to adapt to anxiety and depression due to immaturity (moderate tendency)

- Du Preez (2003) found that chronic stress compromises reasoning, conceptualising, abstraction and recalling abilities, which seem to correspond with frontal lobishness that might thus also originate from chronic stress.
- Low serotonin turnover is associated with depression, depressive disorders and a vulnerability to alcohol or other substance addiction (Kalat 2001: 354, 427).
- Individuals with a genetic vulnerability to addiction handle alcohol well, consume too much, get dependent and further experience greater relief from stress after alcohol consumption (Kalat 2001: 427).
- It is proposed that if asthmatics have a low serotonin turnover (F+ and alcohol experimentation among research sample), they may be predisposed to alcohol or substance addiction, as well as to depressive and thus emotional disorders.
- A slight tendency towards indifference about moral values and social rules would normally buffer the distress response for some participants.
- Anxiety, not addressed or buffered by protective personality factors, should be identified and addressed by health treatment planning.
- The inference is that there is a moderate risk for cognitive vulnerability e.g., decision-making due to moderate tendencies towards concrete thinking with low reflective ability, distractibility, longer period to learn from experience, overlooking of important details and emotional distress hampering perseverance and responsible behaviour (clinically significant). These factors pose a moderate threat for learning and progression in school.
- Self-esteem and self-worth lack significantly due to low resilience with guilt proneness, apprehensiveness and self-denying behaviour.
- Social competence of some individuals appear to be compromised due to suspiciousness, which obstruct social interaction towards trusting relationships (clinically significant), significantly low self-worth and self-denying behaviour and a slight tendency to fidgety and demanding behaviour.
- No definite trends were found in self-sufficiency versus group-dependence.
- Low resilience, poor self-efficiency, a lack of control in managing free floating anxiety, insufficient emotional discipline/emotional distress causing irresponsible behaviour and impair perseverance, all of which hamper or delay adjustment to altered

health status, changes, modifications, self-care, compliance, and thus adherence to treatment regimes.

- Some individuals among the research sample may feel disempowerment and/or hopeless, which hamper health protective behaviour, such as to promote their health by own initiatives or by reaching out to others for help.

### **5.3 DEDUCTIONS**

Deductions will be made by integrating the literature research findings with the research findings of the study. Most of the research findings on personality characteristics was expected, but not directly connected through research, with the psychobiology of the personality of asthmatics. The research sample's mean scores of the different 16PF-factors that project the personality traits on their specific profile, contributed to the researcher's insight into their psychobiology of personality. Using these research findings improves insight into the lives, cognition, emotionality, behaviour and physical health of asthmatic children. These insights are useful to inform health care workers, parents, educators and educational psychologists on more comprehensive treatment planning. The research hypothesis was therefore accepted.

#### **5.3.1 Adequate control in asthma**

Adequate control of asthma to slow down progression, prevent or reduce airway remodeling and improve quality of life proved difficult. Peters et al (2006: 2) report increased risk for serious morbidity and for social and economical burden due to inadequate control of asthma. Information gathered from the literature research and insights generated by the research project helped to identify factors, and gave insight into the challenges, involved in asthma control.

Bisgaard and Szeffler (2005: 3-6) mentioned the unpredictable course and difficulty in the diagnosis and treatment; Peters et al (2006: 4) referred to environmental threats, stress and its association with anxiety and depression resulting in increased exacerbation and symptoms and the incorrect use of medication; Bibi et al (2006: 6) noted the non-compliance and non-adherence to treatment regimes; Gustafson and colleagues (2002: 8)

acknowledge medicinal side effects as an additional stressor and noted increased psychosocial/personality difficulty.

Some of the individuals in the research sample lacked health protective behaviour due to emotional distress causing adjustment difficulties; low resilience and a lack of control to manage free floating anxiety were found; weak emotional discipline/emotional distress sometimes cause irresponsible behaviour and impair perseverance, which hamper adjustment to changes, modifications, self-care, compliance, and thus adherence to treatment regimes; some research sample individuals do not act on the practical, but rather dwell on physical disabilities. Taking all these factors into account, it can be stated that some individuals among the research sample will experience some difficulty (feelings of disempowerment and/or hopelessness) in promoting their own health by own initiatives or by reaching out for help and adhere to health treatment plans and pharmacotherapy.

### **5.3.2 Stress**

The biggest or most serious force affecting the research sample's health and personality seems to be their experience of a tense temperament, which is carried over to find expression in all the spheres of their life. It is believed that asthmatic children are sometimes overexposed to stress, because of their condition and the implications this disease has on their and their family's life. This stressful life circumstances leave them vulnerable to emotional, cognitive and social dysfunction and even emotional disorders (Panksepp 1998: 25, 27 & 212; Kaplan & Sadock 1998: 581-583). In the event of, especially chronic asthma, the patient lives in anticipation for recurring asthma attacks, suffocation and death. Panksepp (1998: 206) acknowledge this anticipation as fear, with its intensity ranging according to the anxiety level of the client.

The asthmatic research sample's score on tense temperament (p-value: 0.00586) reflects extremely high tension (stress, moodiness and anxiety). That this experience of stress is a conscious feeling of discomfort is confirmed by the 8 (p-value: 0.11328) participants reporting the experience of chronic stress in the self-reporting schedule. Personality traits that would normally buffer distress responses and promote resilience was hardly found or not pronounced enough which left the participants unable to control or adapt effectively to tension, which result in moodiness and anxiety. Anxiety is unpleasant and often

accompanied by headaches, perspiration, palpitations, tightness in the chest, mild stomach discomfort, and restlessness and in addition fear and nervousness (Kaplan & Sadock 1998: 581). The only characteristic, displayed by a few participants, which would slightly buffer against subjective anxiety, was factor G- (slight indifference about moral values and social rules- p-value: 0.50000).

This characteristic (G-) might lower or prevent them to be stressed or anxious, but serve a negative attitude towards life challenges. They may disregard or ignore important social moral values and rules, which may harm their social interaction and relationships. With their happy-go-lucky attitude they may also disregard others' rights and feelings and thus fail to develop appropriate social skills to manage social encounters. Such an attitude in the classroom may prove deleterious for academic development and for peer interaction. Favours development of these characteristics may thus also be harmful to the child's personality development. In contrast however, to focus on the gaining of resilience (O-), might prove beneficial to the child's total development. Thus to focus on improving (O-)-characteristics, such as self-worth, self-esteem and self-reliance will enhance the child's trust in him/herself and his/her ability to accept challenges and be effective in social encounters and in day-to-day activities. This may improve resilience, lessen stress and anxiety, decrease the risk for mood disorders and the improved ability to interact socially affective might ensure extended social support during times of stress and difficulty. Cognitive therapy, self-assertiveness, emotional intelligence and social skills development are some of the aspects to address during therapy in this regard.

### **5.3.3 Immune function**

Chronic psychological stress tends to suppress immune function sufficiently to increase the risk of infectious diseases, diminish the efficacy of vaccines, and contribute to inflammation processes and immune system activity (Pruett 2003: 137). Kang and Fox (2000: 1) found that acute stress significantly induce neuroendocrine and immune changes that affect pulmonary function in children with and without asthma. This increased immune system activity lead to the exhaustion of the body's energy stores, having deleterious health effects such as the neurotoxic effect where nerves of the brain die off, prematurely. This so-called neurotoxic effect might seriously impact on cognitive functioning as brain cells cannot be replaced (Panksepp 1998: 118). The deregulation of

the neuroendocrine system and immune function would worsen asthma symptoms with associated deterioration in the asthma condition.

#### **5.3.4 Stress and coping mechanisms**

The patient's personal characteristics determine the type of coping mechanisms they will use in the event of difficulties and changes leading to tension. Passive acceptance and passive problem solving seemed to be a major coping mechanism for the research sample. This way of coping probably originates from exposure to environmental conditions as discussed in more detail under heading 4.11.2.6 Parenting practices and disease related experiences are ascribed as causing factors. Learned personal scripts that develop from experience over time create helplessness, passive-aggression and feelings of powerlessness, of which is: 'Don't upset yourself about something'; 'It is not worth it, rather let go'. Some scripts may develop as a result of certain perceptions formed from treatment due to their illness. Their thoughts, fears and feelings, sometimes even of despair, are not always recognized and dealt with. Worried parents, family and doctors, sometimes, especially in the case of younger patients, don't talk to them, but rather about them. Personal scripts reflecting helplessness damage their self-esteem and self-assertiveness. Some may have given up on being assertive, because their perception is that their worthiness as a person (O+, significant p-value) is not perceived or respected or because of guilt feelings (O+, significant p-value). The effort that goes into the management of their illness causes them to feel like an object that burdens or if other's advice are not followed, it leads to tension ('I punish myself'), thus the creation of the script 'I am dependent on others to make decisions for me'.

#### **5.3.5 The frontal lobes and serotonin activity**

Some researchers identify the brain's frontal lobes as the locus for control of inhibition (Cattell 1989: 91), while Naudé et al (2004: 444) links abnormalities and functional impairments of both the frontal lobes and basal ganglia to the disruption of inhibitory control and Kaplan and Sadock (1998: 116) noted that the serotonin receptors in the basal ganglia may be responsible for agitation. This theoretically implies association of the frontal lobes, the basal ganglia and serotonin activity with agitated depression, impulsive

and agitated behaviour in BD, ADHD and alcohol consumption, agitated and bipolar depression.

High F+ (significant p-value in the research sample) is associated with bipolar disorder (Krug 1980; Cattell 1989: 97), and of which both is associated with behaviour disinhibition (BD) (Hirshfeld-Becker et al 2003: 989). BD is implicated in/associated with ADHD (Hirshfeld-Becker et al 2003: 992; Kaplan & Sadock 1998: 1193) and present with alcohol consumption (Cattell 1989: 91). Alcoholism is furthermore associated with depressive and anxiety disorders (Kaplan & Sadock 1998: 403-404). This F+ finding and its implications are supported by information in the self-reporting schedule that almost 45,45% of the research sample was diagnosed with ADHD and that 63.64% experimented with alcohol.

Serotonin activity is associated with depression, mood disorders, aggressive behaviour and a vulnerability to irresponsible behaviour leading to alcohol, cocaine or other substance addiction (Kalat 2001: 353-354, 425-427). Alcohol consumption in the research sample (significant tense temperament) might be motivated due to its stress relieving qualities (Kalat 2001: 427). This seemingly vulnerability to alcohol consumption, which may lead to experimentation with other drugs and the subsequent risk for addiction, is important to follow up and observe in asthmatic children. Boyd, McCabe and Teter (2006: 278) report that students who misused their asthma medication sometime during their life were more likely to misuse illicit drugs such as marijuana and alcohol and to smoke cigarettes.

It is possible that asthmatics with high F+ and thus elements of behaviour disinhibition (BD) and with or without depressive symptoms have a low serotonin turnover. The same etiology i.e. low serotonin turnover can be the reason why high F+ is associated with the development of bipolar depression. Asthmatic children having inhibitory control deficits might thus be incautious of social cues about their behaviour and less able to learn from their mistakes. Cognitive and behaviour therapy and social skills training is therapeutic options to help them to concentrate, to stop, think and then do.

### **5.3.6 Cognition, problem solving and social competence**

The research sample's scores for cognition and decision-making and social competence reflect slight tendencies of difficult functioning. The research sample's high stress levels

(Q4+, p-value: 0.00586) affect all their functioning, including cognitive and social coping skills.

Difficult cognitive functioning in the research sample was reflected by: meaningful, but not significant scores on B-, A+ and M+ indicating concrete thinking and low reflectivity, distractibility and tough to learn from experience, while details are overlooked; significant score on O+ and F+ indicating low self-reliance, low resilience, impulsivity and possible lack of concentration.

A+ individuals might take longer to learn from experience, even if punished, because they are less reactive to cortical stimulation than introverts and tend to form reactive inhibition to stimulus repetition. According to Zuckerman (2005) they might feel better at and react more efficiently to high intensity stimulation. This might lead to sensation seeking and risk taking, to intensify cortical stimulation (Zuckerman 2005: 102-103). The reduction of tasks into manageable units and to plan academic work that provides realistic challenges might keep their attention and boost their enthusiasm about learning.

The literature research concerning cognition confirmed and substantiated this with the following statements:

- Chronic stress cause cognitive vulnerabilities due to hippocampal atrophy and frontal lobishness that have detrimental effects on behaviour, learning, memory and attention (Naudé et al 2004: 437-460). Kaplan and Sadock (1998: 583) claimed that anxiety tends to cause confusion and distortion of perception of time, space, people and meanings of events, which can interfere with learning by lowering concentration, reducing recall and impair the ability to make associations.

The expression of cognitive difficulties in asthmatic children might be more pronounced due to school absenteeism. School absenteeism and ill health provide less opportunity to be challenged with new learning material, to practice new cognitive skills or to establish basic skills that serve as corner stones for further intellectual development and academic progress in school.

Difficult social functioning was reflected by: meaningful, non-significant scores on N-, indicating social clumsiness; significant scores on F+ and O+ indicating impulsive behaviour, low self-worth, self-reliance, guilt proneness and low resilience ability; insignificant but meaningful scores for *some participants* on L+ and Q3, indicating suspiciousness, which poses difficulty in the forming of trusting relationships and fidgety/demanding behaviour.

With low self-worth, self-reliance and guilt feelings it would be difficult for this research sample to reach out to their social world, be self assertive and competitive in sharing a space with others and claim available opportunities in their environment to progress effectively. Some of them rather disregard or ignore dissatisfactory conditions or events and thus react with passive acceptance and passive problem solving. Some of the participants may, because of A+ (moderate tendency) be genuinely warm and socially interest in others. Because of the F+/A+ combination, they seem to be surgent, but also outgoing, warm-hearted, easy going, and participating. Zuckerman (2005: 90) reported that extraverts are more optimistic, happy and sensitive to signals of reward. They would thus thrive in social situations or in relationships where they experience a 'pay off'.

The literature research confirmed and substantiated difficulty in social competency with the following statements:

- Lonely asthmatic children may feel socially rejected, because they had to withdraw from previously enjoyed activities, due to their illness. Rejection is associated with painful feelings and shame (Herbert & Thomas 1998). Shy passive children who are actively disliked by their peers can be very anxious socially and uncomfortable around peers (Welsh et al 2001). Stress leads to impaired error detection and to the inability to regulate behaviour and to apply knowledge to relevant social situations (Naudé et al 2004: 442-443). Vila and co-workers (2000: 2) reported a higher incidence of behavioural disturbances among asthmatic individuals, such as denial, overly compensating behaviours, depression, embarrassment, and a lack of confidence, which impact on social competence. Insecurely attach children, as might be lonely asthmatics, struggle with social situations and may be vulnerable to opiate or other addiction, which may lead to further social isolation (Panksepp 1998: 249,263)

### **5.3.7 Personality development**

Out of a mixture of innate and learned behaviour or tendencies, the brain develops patterns of action behaviour used in certain situations (Panksepp 1998: 24), which is believed to be part of the constitution of the psychobiology of a personality and thus affect the development of personality. A “secure base” is fundamental for optimal personality development in children (Panksepp 1998: 264). This research sample’s low self-worth indicates their insecure feelings about themselves, their social world and their interaction within it. The neurotoxic effect resulting from stress has a debilitating effect on behaviour and personality development (Panksepp 1998: 118; Naudé et al 2004: 444). Duff (2001: 350-357) observed a loss of identity, a loss of independence, and isolation from the peer group among adolescents suffering from chronic asthma, resulting in subjective depreciation of the self, as well as depression and anxiety. It is clear that the stress-dispersed life style of this asthmatic research sample is having wider implications for personal cognition, emotion and behaviour, which ultimately impair the effective moulding of their temperament and thus personality.

### **5.3.8 Synopsis**

The research sample’s tenseness, low resilience and thus implications for emotional well-being, cognitive and behaviour difficulties would complicate the acceptance of their illness and the associated life style modifications and changes in their environments and adherence to treatment programs and medication routines. Possible cognitive inabilities or difficulties would complicate insight into treatment regimes, not to mention the regular use of medication and other treatment and the motivation to behave in a health protective way to improve their quality of life.

A comprehensive health care treatment plan should include as many functional aspects of a patient as possible. If intervention takes place in one part of a system all the other parts get influenced and in a reciprocal way re-influence that certain one part again. If some aspect of the body is ill or needs attention, the treatment or therapy affects the total human being. This includes the mind, cognition, emotion and behaviour, which are in touch and part of the whole inner system and body and he/she needs to be observed for personality changes.

Children's parents and family form a big part of their life and thus their frame of reference. The school system and the educators contribute to children's general, but especially to their social and cognitive skills development. Friends are equally important for further social, cognitive, emotional, physical, and thus identity and personality development. These interconnected systems of influences in children's life continuously interacts with their personal characteristics or own personal inner life and bodily interactions towards future development and adaptations in their personality formation. This was confirmed by the research findings, which proved to give insight into the psychobiology of personality among the asthmatic research sample.

People may fail to take the necessary precautions to cope with anxiety and its debilitating effects on the development of the child, due to selective thinking, resulting in false reassurance (Kaplan & Sadock 1998:583). A health care treatment program can make provision for the treatment of anxiety in many different ways. Psycho-education that informs patients about their illness and ways to cope with the complications thereof, focusing on the development of anxiety coping strategies and social competency skills may ease their tension. Breathing exercises may improve their physical discomfort. Recommendations for a more comprehensive treatment program are discussed below.

#### **5.4 RECOMMENDATIONS**

I categorized the recommendations, including information and ideas into the main fields of the medical and paramedical professions, educational psychology, and guidance to teachers and parental guidance. It is however essential to read through and take all the information/recommendations into consideration to get all the pieces of the puzzle together. Work settings and functions in these different main fields do overlap and therefore all the information rendered can be relevant to the variety of health care workers, teachers and parents.

The side effects of medication have implications for physical, emotional and cognitive well-being and are considered an important aspect of influence on the psychobiology of personality and in quality of live of the asthmatic patient. Pharmacotherapy is however a given and the consideration of pharmacological products and dosages fall outside the field of this dissertation and will thus not be discussed in the recommendations. The focus is on

the psychological and physical functioning of individuals living with asthma, which implicate the psychobiology of personality.

In order to make the recommendations more comprehensive for treatment planning, it is necessary to understand as much as possible of the complete picture of the asthmatic adolescent/child patient. Following is thus a short explanation of recommended important aspects to consider for treatment planning.

#### **5.4.1 Important aspects to consider in treatment planning for the asthmatic adolescent/child patient**

The patient's quality of personal/intra-personal (emotional, cognitive, physical) functioning and in his/her personal life in the

- family environment ;
- academic/school environment;
- social environment.

##### **5.4.1.1 *Intra-personal functioning***

Intra-personal aspects of concern are the cognitive, emotional and physical functioning and well-being, which are in continuous and reciprocal interaction with each other. The experience of asthma might leave the patient vulnerable to all sorts of real or imagined fears that evoke and elevate stress. In a reciprocal relationship the perception of fear stem from both cognitive and emotional aspects, whereas the resulting tension and stress affect physical, emotional and cognitive well-being. This EXACERBATION CYCLE: i.e. arousal, tension, disease, emotional and cognitive well-being can breed further stress responses and thus become even more intense.

*A few threats for the asthmatic child patient may be:*

- The threat of an asthma attack (physical discomfort);
- Death during an asthma attack (death anxiety);
- Absenteeism from school and falling behind with school- and homework (loss of control);

- Isolation from peer group (social stigma);
- Group pressure to take part in activities that proves to be risky and may increase the severity of their asthma condition;
- Non-participation in sport and other activities that they previously enjoyed;
- Exposure to allergen;
- Side effects of medication;
- Over protectiveness of parents (role changes);
- Financial strain of medical treatment on their families;
- General life uncertainty.

#### **5.4.1.2     *Functioning in the family environment***

Asthma of a child may have aggravating implications for family functioning as discussed in chapter one and three. The family environment is where the child needs to feel secure, nurtured and protected. The presence of both parents is the ideal. The presence of other family members, who will together create support and a warm family environment is a bonus. Dysfunctional circumstances of family life may prove damaging to this ideal nurturing environment.

A common psychological response to accommodating changes in the family system is role overload which results from the physical, psychological, emotional, social, and financial strains that are associated with providing care to an ill family member (Pinquart & Sørensen 2005: 167). Overload resulting from these strains may affect parenting style and child-rearing practices, thereby ultimately affecting the personality development of the asthmatic child.

#### **5.4.1.3     *Functioning in the academic/school environment***

Approximately one quarter of a child's life is spent at school, in classes and involved in after school activities. Interaction with the peer group and educators at school presents essential moulding opportunities for social skills development. Problematic emotional, cognitive and social behaviour, which develops over time, can also be identified during these interactions.

The panic cycle begins when a person interpret an event or situation as threatening, which initiate feelings of apprehension or dread. The automatic fight/flight body response system switches on due to this arousal, causing bodily changes and symptoms such as increased breathing rate (Giarratano 2004: 109-110). Asthmatic children due to their condition are more absent from school, which may let them fall behind with schoolwork and homework. Side effects of medication may inhibit their ability to concentrate. This academic backlog and difficulty to concentrate, forgetfulness, group pressure to take part in activities counter-indicated to their condition, and the general sense of being different, may be threatening. This feeling of being trapped when they attend school and are faced with these conflicts may let them behave in ways they do not intend.

#### **5.4.1.4     *Functioning in the social environment***

According to Brown, Khan and Nejtek (1999) depression, mood swings, increased energy, insomnia, agitation, irritability, rapid speech and disorganized thought processes are possible symptoms of the prolonged administration of cortisone derivatives to asthmatic children. These research findings offered by Brown and co-workers (1999) raised questions about the possible inability of asthmatic children to function socially. Mood disturbances may affect the possibility to form and sustain friendships. Insomnia leads to tiredness during the day with less motivation to take part in peer group activities or to meet day-to-day social expectancies in all spheres of life. Irritability, agitation and increased energy at the wrong time may make positive interaction with the social world difficult. Depressiveness, the necessary withdrawal from some activities they used to enjoy and the consequent loss of friendships and even avoidance from others may lead to isolation and feelings of being different from anyone else. The perception that no one will understand them and their feelings may become a reality when they behave differently from what is socially expected, forgetting things and do not concentrate in class or other social situations.

## **5.4.2 Recommendations to medical and para-medical professionals and other health care workers**

These recommendations serve to inform health care practitioners, but may also be useful as sections for training material.

### **5.4.2.1 *Empowerment and how to reach out to the asthmatic child's needs***

Asthmatic children easily feel out of control under the pressure of the diseases challenges. They have to submit to various changes such as to withdraw from previously enjoyed activities, the realization that their condition places a financial and emotional strain on their families and the fear of asthma attacks even in the event of regular medicine use. They furthermore feel dependent on parents and medication and are surrendered to the course of the illness. These circumstances can be overpowering and can cause feelings of hopelessness.

*How do we as therapists, health care workers, teachers and parents help the child to cope with his/her diminishing quality of life?*

To acknowledge their illness, but also to normalize their situation by endorsing the perception that illness is a normal part of life. Everybody is ill at some time in their life, and many people are chronically ill, and not just from asthma. Introduce ways to help them to accept and manage their disease and facilitate the use of their own creativity to devise possible ways to adapt to difficulties.

Preventative management to prevent the upsurge of symptoms and exacerbations is essential. When asthma severity is underestimated it can lead to worsening of the condition and increased hospital visits. Patients should know how to use medication and other treatments to their maximal advantage. Research shows that almost 90% of asthma deaths could have been avoided by better management and care of the condition. Preventative management will be less problematic if the initiatives of health care workers at clinics, medical practitioners, educators and parents can be linked (GINA report, 2005: 82-83).

This brings us to practical education. Relevant topics for discussion related to their illness are: medication use, therapies and treatments, implications on their life and on the life of their families.

#### **5.4.2.2 *Psychoeducation***

Urek, Tudoric, Plavec et al (2005: 1) found that education of asthma patients enhances their chances to manage their condition and to achieve long-term asthma control, which improves quality of life. In their study to determine the effectiveness of educational methods, they found after a 12-week period of education a significant improved morning and evening peak expiratory flow rates (PEFR). Their study indicates that individual verbal instruction and integrated asthma classes were better methods to educate than just to inform with written information.

Urek et al (2005: 1) furthermore drew attention to the essential role of continual education to encourage efficient self-care and the use of a pharmacist's assistance. Self-care improves the chances to accomplish management targets; a pharmacist gives assistance in the selection and the proper use of medication, which lead to improved treatment and control of asthma. Benefits of this were seen in the number and severity of asthma exacerbations, school and work absenteeism, medical resources utilization, asthma morbidity and mortality, and the rate of complications (Urek et al 2005: 1-2).

It is however equally important to inform and assist all caretakers of patients i.e. parents, family, teachers and health care workers at school. Schoolteachers and physical instructors should be informed regarding asthma emergencies and the management thereof.

Good communication and the development of partnerships between the health care workers and their patients or their families are necessary to overcome obstacles (GINA report 2005: 82-83). According to Giarratano (2004: 72) education should be clear, concrete and simple with some reading material to read and share with other family members and friends at home. The client should understand and be able to relate his/her own experiences to the information. Case examples are more concrete and heighten personal reference. It is further advised to inquire about the personal relevance of the information at the end of sessions. It could be evaluated by questions such as: "What

information could you relate best with?” and “How may this information help you in the future?” (Giarratano 2004: 73). This enquiry frequently serves as motivation to overview the volunteered information. Relevant aspects can be identified and incorporated in a personalized frame of reference, steering the process to a self-developed plan of action to improve personal and family health.

According to Meichenbaum in Giarratano (2004: 70, 94) the purposes of psycho-education in the case of hyperarousal (high stress levels/anxiety) is to empower by conveying information, reduce confusion, give meaning, instill hope, to construct a new narrative and to assist the family. A secondary purpose may be to identify and evaluate possible attention, concentration and other cognitive competency and behavioral problems, which impact negatively on academic achievement and progression in school.

The advantages, if these challenges are met, seems to be lowered stress, the reduction of problems into manageable units, improved self efficacy and self esteem, reduced somatic symptoms, greater self awareness, and motivation of the patient to collaborate in an effective treatment program and to improve quality of life. It seems that the main purpose for patients are thus to have self-control over themselves and over their symptoms with the biggest challenge to experience feelings of integration, worthiness and safety.

- ***Aspects of importance for psycho-education***

The usefulness of medication and the possibilities of other treatment and therapies need to be conveyed. Knowledge about their medication can let patients feel in control. Being optimistic and believe in treatment to improve health, will install hope and some normalcy. They must try not to run out of medicine, especially in difficult to control asthma. The fear for an asthma attack can cause unbearable anxiety and may even bring on an attack with increased future anxiety about shortage of medication and anticipation fear for death.

The self-control of stressed/anxious individuals can be improved by arousal reduction strategies such as breathing control, hyperventilation exposure, grounding techniques, distraction exercises, isometrics, visualization exercises and anger management strategies (Giarratano 2004: 94). Individualized treatment can include counseling or individual therapy, group therapy and family therapy.

Empowerment through education about their condition can help the patient to feel more in control of the situation and of what happens to them. Learning about asthma means that the unknown, which can lead to death, becomes known and may lower anxiety. It is also important to inform patients about which tests, and how it works, can be used to evaluate and measure progress of the illness.

To address the feeling of them (the asthmatic) being an object of discussion, it will help to share, on their level of understanding, what is discussed about them and decided about their condition. Let more mature children take part in the negotiation of changes and precautions to the advantage of their health and development. This will help them not to feel left out and more in control

Guidelines for the implementation of an allergen avoidance plan may improve the patient's quality of health. The successful implementation of such a plan depends on the patient and his/her family. They should understand the principles and aim of the allergen avoidance strategies and buy into the idea of using and maintaining it. Allergy testing can identify information regarding allergenic substances in the patient's environment. Zuckerman (2005: 247) stated that environmental stressors affect physiology, neurotransmitters, hormones, and even neurons, sometimes in more than transient ways. .

Negotiate changes that will not negatively affect essential aspects of healthy development such as social interaction and peer group activities. Create opportunities for social interaction in safe environments. Arrange contact with other young asthmatic people e.g. at support groups.

Look for role models with chronic illnesses that are survivors and enjoy live to its fullest. Emphasize the importance of living a full live by reaching out to others, especially in the helper roll, to discover their own capacity to help and be part of a community of active people, instead of focusing on themselves as disabled.

Give information on how stress management programs can improve immunity and lung function. Smyth, Stone, Hurewitz and Kaell (1999) implemented a stress management programme that demonstrated improvements in lung function and overall disease activity

among asthmatic individuals, suggesting that anxiety and stress might play a significant psychobiological role in this condition.

Discuss participation in exercises and other activities. Do not let fear 'rule' by overprotect asthmatic children. With the regular use of medication and if the asthmatic condition is stabilized, most child patients can safely take part in exercises and many other activities, which are seen as potential risky activities. It is however necessary to get clearance from the medical practitioner and to keep proper supervision.

#### **5.4.2.3 *Small support groups***

Support group attendance can be supplementary to health care education or can even render an educational service through health care professionals. Well-controlled mutual support initiatives and the sharing of personal tips on managing asthma and how to cope with stress can enrich group education. According to Stern (1981: ix) the support, subtle pressures and encouragement in such a group promote social change, changes in personality, attitude and conduct. It may facilitate the identification of behaviour that exacerbates asthma symptoms and address changes in order to prevent recurrence of symptoms. Opportunities are created to share apprehensions and receive reassurance and possible resolution for some of the turmoil related to anxiety about family and school. To give meaning and to verbalize their worries may help them on their way to adapt to changes and to cope with their illness. Stern (1981: ix) reported that the small support group can be seen as an ideal setting where people are fostered to grow and change, which enable them to function better.

#### **5.4.3 Recommendations to educational Psychologists**

This information is suitable to give insight into some aspects concerning asthmatic children.

##### **5.4.3.1 *Therapeutic interventions***

The emphasis is generally on medical treatment, while emotional and cognitive therapies are overseen. Other therapies and interventions must be used with and not instead of

medicine. In the role of facilitator, which is sometimes required, it will be necessary to network with all the other parties involved with the patient's care. Try to make sure that medication is effective and with the least possible side effects and communicate your concerns to the relevant parties.

An asthmatic child may experience any forms of day-to-day stress as unnecessary strain. This day-to-day stress can easily trigger the child's susceptibility to anxiety, mood disorders and depression. One of the goals of therapy is to increase anxiety tolerance or to cope with the experience of anxiety by investigating the underlying causal conflict (Kaplan & Sadock 1998: 583). Depression is characterized by functional disabling behaviors such as a change in sleeping patterns and eating habits, which can worsen a child's concentration. It is common knowledge that anxious children find it difficult to focus their concentration. Low concentration and focusing ability adversely affects problem solution and reasoning ability, thus impacting the coping and learning behaviour and the actualization of the child's potential to lead a fulfilled life. It is thus essential to consider the impact of anxiety on their progress in school, and furthermore on their development of emotional, cognitive and social skills.

#### **5.4.3.2 *Child guidance***

- ***Relevant aspects for intervention and assessment***

Regarding report building it is essential to inform the patient of the reasons for assessment and about your role as facilitator. One must allow clients to keep reasonable control in their involuntary circumstances of their illness. According to Giarratano (2004: 41) traumatized patients, which includes I believe some stressed asthmatic patients, especially children might be overwhelmed and may even be reluctant to open up and disclose their concerns and fears. Knowledgeable third parties, such as parents, other caregivers and educators may present reliable information for an assessment.

Current stressor effects can be exacerbated by previously experienced trauma. Detailed information about current and past traumatic events and secondary stressors are thus important to complete a picture of the patient's perceived strain Giarratano (2004: 42-45). While the client is in hospital with a lot of attention, safety and support, his/her observed

picture is one of perceived control, with less symptoms and discomfort. At home and in his/her functional environment without the attention and specialist care he/she may feel the opposite as he/she did in hospital.

It is important to assess family functioning and family coping mechanisms. Family members worry and may get confuse about many aspects of the disease that they do not understand. Some aspects of concern are due to factors such as the special needs of a child with a chronic condition, environmental and behavioral adaptations, chronic medication and the implications thereof, as well as the increased financial burden and other family insecurities. The lack of proper coping strategies lead to poor task performance, poorly modulated emotions, negative self perception and the inability to enjoy rewarding interaction with others (Giarratano 2004: 47) - this is probably also applicable to the functioning of family members of the asthmatic patient. Lack of affect may indicate coping or on the other hand negation of the perceived overwhelmed difficulties (Giarratano 2004: 45).

Multiple approaches will present a more integrated database from which a more complete personal image of circumstances can be constructed. Using the Global Assessment of Functioning (GAF) scale, which rates psychosocial, occupational and psychological functioning, can do a measurement of a patient's level of functional impairment. The Global Assessment of Relational Functioning (GARF) can be used to judge the functioning of a family or ongoing relationship regarding emotional climate, adaptability to stress, communication skills and distribution of power. The Social and Occupational Functioning Assessment Scale (SOFAS) assess without influence of severity of symptomatology (Giarratano 2004: 46-47). The effective self-management of asthma depends on a certain level of awareness of the disease. Many adolescents struggle to manage their asthma condition with adverse affects on several aspects of their lives, which result in a reduction in quality of life. The Pediatric Asthma Quality of Life Questionnaire (PAQLQ) is a previously validated scale that measures asthma-specific quality of life in three domains: activity limitations, symptoms, and emotional functions (Rich, Lamola & Woods 2006: 748). Informal assessment material, interviews and observation in real life situations may generate reliable information and first hand experience of the patient and his/her family's lifestyle and behaviour.

A self-report 'life story' narrative from the patient may carry a history of important information concerning main life events, health, feelings, cognition, decision making abilities etc. Assessment should include a clinical interview and a measure of depression and anxiety. Information about the patient's functioning in their environment, their thoughts, their emotional state, their general well being, and their behaviour in and out of the house and/or at school, which include their social behaviour. According to Giarratano (2004: 61) a behavioral assessment systematically examines the patient's problems in the context they occur. It helps to define and understand what happens when problem behaviour or emotions takes place and thus may generate ways to improve, reduce or solve the problems. It is motivational to ask a patient to consider the possible outcomes or the impact on his life should he/she continue the problem behaviour, such as social withdrawal (Giarratano 2004: 67).

According to Giarratano (2004: 48) Exposure Therapy (ET) for traumatic memories should not be used in the event if the patient has active suicidal plans, presence of right frontal lobe brain injury, use opiate-based or benzodiazepine medication, shows external locus of control or non-compliance and presents with borderline personality disorder or a thought disorder/psychosis.

#### **5.4.3.3     *Stress support***

Giarratano (2004: 28-30) noted a few possible predictors of traumatization or risks for poor recovery, following a critical event, namely: the severity of the stressor, prior history of psychiatric illness, personality, tendency to engage in dissociative mechanisms, coping styles, cognitive processing, biological mechanisms and loss.

The intensity and the duration of the period of stress reactions in a stressful situation are unique for each individual and not always predictable. When dealing with their asthma condition patients may live in fear of asthma attacks and possible death and this cause's great stress in a patient's life. Patients' stress reactions can be mild and transitory or lingering. The chronicity of the disease and/or the inability to cope with the emotional strain of asthma attacks poses an increased risk for posttraumatic psychiatric symptoms. Either way asthmatic patients will have a better chance to return to a healthy relaxed state with proper support and therapy.

Giarratano (2004:4) reported that a person who experienced a critical incident cope when he/she demonstrates: sustained task performance, reduction of distress, interaction with others and effective communication about the incident and the ability to maintain the sense of personal worth. Giarratano (2004: 38) further states that if the patient meets acute stress disorder (ASD) -criteria a week after the event, that they will probably develop posttraumatic stress disorder (PTSD) if not treated properly. The level and type of stress symptoms can be identified through the use of questionnaires and interviews, and even questionnaires on depression and emotional status. The ICD-10 and DSM-IV offer criteria to diagnose different stress disorders.

#### **5.4.3.4 *Hyperarousal***

During hyperarousal the emotional regulation is lost and it is easy to get angry and irritable (Giarratano 2004: 102). Negative thoughts, especially during stressful times, can result in restlessness and nightmares during sleep.

If patients manage to lower their arousal, their ability to cope in stressful situations improves. There are various methods to directly decrease arousal. These methods include breathing training, grounding and distraction techniques, progressive muscular relaxation and cognitive restructuring (Giarratano 2004: 100-133), which can be learned and applied by the patient on a daily basis.

- ***Control techniques for hyperarousal***

Breathing exercises: taken from Ference, edited by Lough, Doershuk and Stern 1979: 199

Six clinical goals:

- To alter the distribution of ventilation to the lung to increase oxygen uptake and reduce carbon dioxide in the blood, flowing through the pulmonary vessels;
- To reduce energy used for breathing;
- To remove bronchial secretions;
- To reduce pain;
- To mobilize the chest wall;

- To expel fluid and air from the pleural space;
- Additionally it will help to prevent pulmonary complications.
  
- ***Breathing training***

Calm breathing enhances the patient's ability to decrease anxiety and to cope with stressful situations (Giarratano 2004: 100). Subtle shifts in breathing can decrease anxiety symptoms such as muscle tension, migraines and panic attacks (Schiraldi in Giarratano 2004: 102).

The direct aim of slowing the breathing rate is to decrease constriction of the blood vessels by increasing the carbon dioxide concentration and decreasing the oxygen concentration of the blood. The resulting decreased constriction of the blood vessels increases blood flow to normal and lowers arousal, heart rate, and blood pressure and thus reduces tension or stress. It is an effective method to switch of the fight/flight response of the body.

Different techniques are 'Breaths per minute exercise', 'The breath waltz', 'Buddha belly breathing', 'Visual breathing', 'The healing light', and the 'Hyperventilation exposure exercise'. The conditions and procedure for all these exercises are discussed in Giarratano (2004: 113-120).

- ***Grounding and distraction techniques***

Negative automatic thoughts accompany negative emotional states. The aim with grounding and distraction techniques are to reduce: irrational thoughts, preoccupation with somatic symptoms, intrusive re-experiencing of symptoms and anxiety (Giarratano 2004: 120). The conditions and procedure for all these exercises are discussed in Giarratano (2004: 120-125).

- ***Cognitive restructuring***

Cognitive therapy aims to empower a person to evaluate whether negative thoughts and beliefs are accurate and helpful. It seems that success with these techniques increases by

regular use, although a single technique may lose their effectiveness after a while (Giarratano 2004: 100).

- ***Progressive muscular relaxation (PMR)***

PMR involve the tensing and relaxing of different muscle groups and the use of PMR-scripts. With more practice the effectiveness of these exercises improves (Giarratano 2004: 125-133).

#### ***5.4.3.5 Loneliness***

Loneliness is to experience feelings of despair due to a lack of connectedness to the social world, after a person withdraws him/herself from interaction with other people. Reasons for this withdrawal behaviour can, in my viewpoint, be very diverse and bound to personal circumstances such as lack of support, too many disappointments, lost of control and the feeling of not having an impact on the world. Loneliness seems to stem from a process that starts with a person's tendency to withdraw from interaction with other people so that current relationships are not maintained and the possibility of new relationships diminishes. This loneliness that develops is an affective and emotionally painful state (Herbert & Thomas 1998). Lonely people feel that they are not acknowledged by society, which leaves their lives empty. Lonely people seem to be discouraged to let their voices be heard (low self-esteem and non-assertive behaviour). Such a person might have had poor social skills to start with and/or never had the opportunity to develop or improve their social skills by experience after their withdrawal from the social world.

#### ***5.4.3.6 Assertiveness and social skills***

Social competence and the ability to assert oneself go hand-in-hand and both are essential basic life skills, which advance effective social interaction. Social interaction is important throughout one's life in order to develop skills to ask for and get support from others as well as to support and look out for others in return. Effective social interaction makes life worthwhile. It generates energy that creates motivation to form and implement goals in one's life. If people act socially inappropriately, they will have to face the consequences, which may lead to disappointment and despair.

In my opinion unassertiveness of asthmatic children may stem from deficits in information processing skills, role modelling of such skills and social learning experiences. Much was said in the previous chapters about possible problematic cognitive functioning stemming from emotional difficulties and/or medication side effects. The results in this research confirmed possible deficits in cognitive function.

- ***Factors prohibiting assertive communication***

Individuals not being comfortable with selves may exhibit a tendency to mask their true self and to deny their feelings. They may frequently change personal strategies for communication and distort facts and experienced situations to fit their agenda for a wished self, which confuses other people. Patients, who do not accept, adapt to and cope with their asthma condition, may deny their true self. To be able to communicate one's feelings, it is important to have the necessary vocabulary to describe these feelings.

Socio-cultural male-female expected behaviour, may inhibit a person to acknowledge and express his feelings openly. Males, who are socialised to take on a strong masculine role, may fear to be seen as vulnerable, when expressing feelings such as helplessness. Females on the other hand may, according to certain cultures, not allow themselves to express anger or behave in an assertive manner.

**TABLE 5.1: Examples of assertive and unassertive communication and behaviour  
Adapted from Fodor (1992: 7-11)**

Assertive behaviour		Unassertive behaviour
Outward expression of friendly, affectionate and non-anxious feelings		Inhibited/passive/avoidant behaviour
Open and honest communication		A pattern of shyness
Risk taking		Self-denying life
Being up front		Interpersonal relationships suffer
Self expressiveness		Found with anxiety disorders
Handling disagreements		Aggressiveness
Speaking up		Relationship anxiety
Disagreeing with other's		Fear of public speaking
Ownership of ones experience		Depressed/sad/weepy/angry

Respectful of others		Impulsive-aggressive
Willingness to express experience		Out of control
		Helpless
		Subservient
		Unexpressed feelings
		Do not deal with issues
		Down themselves
		Passive-aggressive behaviour

The information in this table can be used to identify or to evaluate assertive behaviour.

- ***Scripts associated with unassertive responses (Fodor 1992: 16-17)***

- Fear the worst when being assertive.
- Taking care of other's feelings and needs are more important than ones own needs and feelings.
- Don't upset yourself about something. It is not worth it, rather let go.
- Why bother? (Avoid hassles, rather than face them).
- I can't help it. (I have no control over my condition, my feelings and my lifestyle).
- I can't control my anger.
- The world should be fair and just.
- People should do what I want them to do.

The identification of the underlying believes for assertiveness issues are essential for intervention or therapy.

- ***Possible perceptions of the patient to keep in mind***

Giarratano (2004: 78-79) explained what is called Trauma World Rules. I used some of those rules/perceptions together with some that seems to fit into the frame of reference of the asthma patient's experience. It clarifies some of the patient's problematic emotional perceptions that influence and guide their life decisions and behaviour.

- A live threatening attack may be generalized to 'late means dead' (Giarratano 2004: 78).

- To forget to use medication properly, to leave it somewhere or when medication loses effectiveness mean 'mistakes equal death' (Giarratano 2004: 79).
- It may seem that power and control over one's life and activities are lost to parents and health practitioners such as doctors and hospital personnel. Power is also lost to fear of attacks, the pain of loneliness, rejection when living differently, educators when I do not progress, thus 'I am powerless'.
- If other's advice are not followed, there are consequences to be dealt with, which lead to high stress levels (I punish myself), thus 'I am dependent of others to make decisions for me'.
- My condition of illness is upsetting and has debilitating consequences for everyone.
- Much effort goes into managing my illness, thus I am an object that burdens people.
- Worried parents, family and doctors do not talk to me, but rather behind my back and about me. 'My worthiness as a person is not respected'.
- My thoughts, fears and feelings, sometimes even of despair, are not recognized, thus 'I am not worthy'.
- Some asthma symptoms that are difficult to treat involve medicine trials and changes that may, to patients and their family, seem like experimentation. 'I am thus an object of experimentation and not worthy of the best treatment'.
- 'I can't let my guard down' (Giarratano 2004: 82). Patients have to regularly take medication, detect symptoms for a possible asthma attack, fear to take part in some group activities and vigorous sporting activities.

- ***Elements of assertiveness and social skills training***

Fodor (1992: 12) considered assertiveness behaviour in a situation to be a process that develops in stages, where difficulties can develop at any stage. He proposed a few stages and/or steps in the process of being assertive, namely:

- Clarify the feelings being elicited in the situation. The focus here is on awareness of feelings and on distinguishing between the different feelings such as anger, excitement, anxiety and general upset.
- Delineate the rights in the situation. Focus on who has got the right to do what.
- Address goals. What does everyone want to achieve in the situation.

- The skills aspect: The skill to open and honest communication.
- Clear expression of feelings and to keep these feelings under control.
- Can the person listen to the viewpoints of others?
- Is it possible to compromise when disagreement is clear?
- Can they be clear about realistic barriers that prevent goal achievement?
- Self incentive: is it possible to feel good and praise yourself about your strategy to address the problem, instead of ignoring it even if not all the assertive goals have been reached?

Social skills assistance should be planned in consultation with parents and teachers.

Programs that cater for individual and group work may prove more effective, especially if role-play opportunities for difficult situations and events are included. Internal dialogues are linked with assertiveness. Internal scripts can inhibit an assertive response and/or create anxiety and anger about the effect of such a response.

#### **5.4.4 Teacher/educational guidance**

##### *The necessity to plan and maintain an asthma management program in schools*

In the National Asthma Education and Prevention Program (NAEPP 2003: 1,2) it is reported that 3 out of 30 children in a classroom have asthma in the US and that it is a leading cause of school absenteeism. Rees and Kanabar (2001: 4-6) claim that the prevalence of asthma is gradually on the increase in most countries, while Gustafsson et al (2002: 2) state that the prevalence of childhood asthma has doubled during the recent decade. According to these researchers the frequency of asthma diagnoses has risen globally and it has become the most common chronic disease in childhood and adolescence.

##### **5.4.4.1 The benefits of asthma management in schools**

- Asthmatic children function appropriately to their potential;
- Better school attendance;
- Improved alertness;
- Fewer symptoms;

- Fewer restrictions on participation in physical activities;
- Fewer medical emergencies;
- Multidisciplinary cooperation provide a safe environment at school;
- Good health and safety are prerequisites to academic achievement.

#### **5.4.4.2     *School difficulties the asthmatic child is faced with***

- Absenteeism: being in the dark about class work and discussions and tasks missed out on;
- Poor concentration;
- High stress levels and anticipation anxiety;
- Cognition difficulties, such as poor concentration;
- Social expectations of independence;
- Feelings of being different, and the consequent perception of being rejected;
- Building up frustration about prohibited activities (exercises) contra - indicated to their condition;
- Having to offer explanations about certain asthma causing behaviour or behavioural changes or differences all the time;
- Food - hypersensitivity and asthma.

#### **5.4.4.3     *How to be alert and prepared***

To have an asthmatic child in the class brings extra challenges and responsibility.

- Challenges and difficulties the educator will have to deal with:
  - The asthmatic child's perceptions;
  - Stress levels of the child;
  - School absenteeism;
  - An asthma attack at school;
  - Emotional distress and unexpected/unusual behaviour of the child.

- How to cope with these challenges:
  - It is necessary to be informed about the detail of the child's condition and treatment;
  - Substances that worsen the symptoms must be listed and at hand;
  - A list with the medications he/she needs to use at school, which is used before physical exercise and in the event of an acute episode (asthma attack);
  - Awareness of an emergency plan for during and after the acute episode;
  - Any emergency telephone numbers for the family doctor, parents or guardians should be at hand.

High stress levels will not only impair academic achievement, but also may harm positive social interaction with friends and educators and may distort perceptions and influence behaviour. Emotional distress and unexpected/unusual behaviour (incompetent behaviour) of the child may develop in reaction to high tension, anxiety or emotional upset associated with asthma symptoms. Take note when the child gets upset easily and more than expected for the stimulus, shows personality changes or behavioural changes and report it to the parents and/or other health professionals involved. Create an atmosphere of warmth and acceptance in the classroom.

Through peer acceptance the adolescent cope with separation issues they may have, while struggling to gain autonomy to establish their identity. Peer group acceptance is an important issue for any adolescent, which should not be compromised (Fodor 1992: 205). It is however sometimes clear that many adolescents do not have those skills to interact with maximum affectivity in social situations. Miscommunication causes frustration and anxiety. Sometimes this miscommunication is part of a bigger self-esteem/self-worth problem. They may feel disempowered and would rather withdraw than reach out to other peer group members. According to Bruner (cited in Bosacki 2003: 141) children's ability to act competently are influenced by what they can accomplish. This believed ability is co-created by the feedback of their ability by significant others and integrated into their self-concept. In presenting communication and social skills developmental tasks and encourage self-assertive behaviour as part of the curriculum the educator could help the child to develop competent social skills e.g. how to look out for him/herself.

(Fodor 1992: 11) stated the following guidelines for assertive communication, namely

- be direct and honest about one's own emotional states;
- make eye contact;
- make 'I' statements;
- state own preferences and own feelings, instead of always asking others how they feel or rely on or use other's opinions;
- blamers normally do not take responsibility for their own actions and feelings.

One of the social skills programs that are mentioned in Fodor (1992: 207-216) was adapted according to the 'structured learning' approach of Goldstein, Sprafkin, Gershaw, and Klein. This program starts with awareness and deflection of feelings and move on towards learning to communicate more clearly by movement beyond anger and exposing the hurts. It concludes with attempts to talk about what is wrong.

Zins, Elias and Greenberg (2003: 56) mention the growing need of children, to be empowered with emotional skills. They mentioned the South African climate of violence, crime and the high prevalence of AIDS/HIV as extra-aggravating conditions that require special effort to empower children to cope with and to adapt to these issues. Having to deal with a chronic disease such as asthma places the child patient right in the same league of extra-aggravating conditions and evenly in need of these empowering emotional and social skills. The Collaboration for Academic, Social and Emotional Learning introduced and defined the field of social and emotional learning (SEL). The SEL program was devised to be used in schools (Zins et al 2003: 56). It focuses on education that links academic achievement with the necessary emotional and relationship skills to succeed in school, in family and in community life.

Accordingly the SEL program (Zins et al 2003: 56) presents learning that through the processes of acquiring knowledge, skills, attitudes and beliefs children are empowered to:

- recognise and manage emotions;
- care about others;
- make good decisions;

- behave ethically and responsibly;
- develop positive relationships, and
- avoid negative behaviours.

According to Fodor (1992: 3) socially competent adolescents show empathy towards and are skilled in helping others, are self-disclosing, communicate effectively and share interests with others. He further stressed adolescent's relationships with peers, siblings and parents as an essential part of pro-social behaviours that is important for adolescent functioning. Leading trainers consider self-expressive direct, open and honest communication that respects the other as assertive behaviour Fodor (1992: 9). Fodor (1992: 14) further distinguished between various categories of assertiveness, such as initiating interactions, dealing with dating issues, how to say no or to refuse a request, disagreeing with others, handling both the receiving and giving of negative and positive feedback, asking for help and coping with anger. Role-play and practising to get to know the boundaries of interaction in a certain situation comes through experience of similar events or during child's play.

Absenteeism from school has implications for the educator's workload, the parent's responsibility to support their child through difficult times, and for the child to catch up with lost work. Overburdened teachers seldom get to assist children who were absent from school to catch up with lost work. It may be necessary to contract with parents and children or to devise a plan of action to prevent that the child fall behind, loose hope and experience the risk of failing.

#### **5.4.5 Parental guidance**

Parents and client's concerns should be addressed on a continuous basis. Questions about the disease, the severity thereof and medical treatment as well as emotional and mental well-being should be answered, supported with factual information where possible. Information and knowledge place persons in a position to make informed decisions about treatment, live changes and personal activities and behaviour. It gives back some control in a situation with a chronic disease that can't be cured or wished away. The options and benefits of medication and treatment available need to be discussed in as much detail as compared to the parent's level of understanding.

#### **5.4.5.1**     *Questions that parents ask*

- Are there certain medications that work the best?
- How is the best treatment option determined?
- How can the proper dose of medication be determined?
- What are the side effects of medication?
- What happens when medication isn't effective?
- When is the disease under control and can medicine dosage then be decreased?
- What is the effect of medication on growth and development?
- Can medication interfere with learning and concentration?
- Can medication be stopped for 'resting periods'?
- Why would medication stop to be effective?
- Concern about the financial impact of this chronic condition and how to manage it.
- What is the effect and interaction of other medication with asthma medication, e.g. prescription medication for anxiety or depression?
- Which symptoms can be expected, even with medicinal controlled asthma?
- How long should my child use medication?

#### **5.4.5.2**     *Parental support/assistance*

Parents would like to believe that this disease is not serious and permanent. They need an opportunity to deal with their feelings and thoughts. They will have questions about their child's illness and information about the broader picture of asthma. They might question the existence of a chronic condition and the necessity of regular medicine use. Treatment failures tend to despair parents and motivate them to do doctor hopping, delaying the process of devising a comprehensive plan that works. Therefore it is important that the parents understand the complexity of the disease. They might need help to explore and fully understand the treatment options. What can be done when treatment fails?

There is not one partly or general treatment program that can accommodate all the individual challenges that this complex disease presents for each patient. The complexities include psychological, physiological, cognitive and psychosocial challenges as discussed.

Parents should know about the prominent issues concerning asthma and how to address it. They, because they know their children the best, are the number one reference regarding their children's well-being, with teachers sometimes in the second best position to observe and evaluate children's cognitive, emotional and social behaviour and interaction with their peer group. The practitioner and other health care professionals are capable and qualified and have expert knowledge and experience with similar asthma cases, but they see your child, infrequently, for a few minutes at a time. They still need extensive input and control over the implementation of a health care program, which include lifestyle changes, adjustment issues and the regular and correct use of medication. Health care workers sometimes don't have the time to linger on issues such as difficulties with peer interaction and making and keeping friends. Thus, in the child's best interest, the safest approach is to work in a partnership, which includes the parents, child, teachers, physicians, other health care practitioners or anyone else involved, to device the best informed individual health care treatment plan possible.

#### **5.4.5.3 *What is asthma and how serious can it be***

Asthma is a chronic lung disease. The inflamed airways of asthmatics are extra sensitive to substances causing allergies, e.g. dust mites, mould and pollen etc. When the airways react to allergens or triggers it gets swollen and contracted, which prevent enough air to move in and out of the lungs (NAEPP 2003: 1, 3). An accurate diagnosis is necessary for effective treatment.

#### **5.4.5.4 *Is medication therapy/treatment enough?***

Medication is the first line of treatment and is essential. There are however sometimes secondary symptoms such as depression and tension that need more medication. Any chronic illness is a disease that you live with for the rest of your life. This disease has symptoms that affect the functioning of the whole person, body and mind. It is therefore necessary to plan for the management of it. Planning may include making adaptations in the environment that supports the child and helping him/her to cope with the social, cognitive and emotional challenges presented by asthma. If it is not managed well it may have debilitating consequences for the development of the child. The tools that promote successful coping include environmental changes, physiological and psychological

intervention strategies and a proper medication regime, to control the disease symptoms. It is also necessary to observe your child for personality changes, and behavioural and academic difficulties that may develop so that the correct treatment option can be chosen in time to improve the condition and prevent further changes. The ideal should be to get proper counselling or guidance by professionals, for both child and parents, on the different aspects of the disease. It will also be beneficial to attend a support group in order to discuss mutual concerns and get tips on coping with the treatment, family and financial challenges of asthma.

#### **5.4.5.5      *Why is all this fuss necessary***

Asthma, because of the variety of implications for healthy functioning is a complicated illness. The disease course and progression are uncertain. Worsening of the symptoms or an asthma attack is a reality, even if it is well controlled.

There are various aspects originating from this situation of having a family member with asthma. Several changes in and around the home to protect your child from triggers/allergens can be a big challenge, especially if a loved pet has to leave the home or the child can no longer take part in previously enjoyed activities. The child may have to cope with guilt feelings about the burden his/her disease is placing on the family.

There needs to be left the ability to lead happy and fulfilled lives. It is thus difficult for any one professional to have the whole picture. Parents, because of their involvement in their child's life, are the most able to gather the various perspectives of all involved parties to present to health care professionals. They will use this information to get insight into the child's and the family's functioning and together with you develop a health care management plan tailored to the patient's individual needs.

#### **5.4.5.6      *Prevention and safety precautions***

- Challenges and difficulties the parent will have to deal with:
  - The asthmatic child's perceptions;
  - Stress levels of the child;

- School absenteeism;
  - An asthma attack at school or elsewhere;
  - Emotional distress and unexpected/unusual behaviour of the child.
- How to cope with these challenges:
    - It is necessary to be informed about the detail of the child's condition and treatment;
    - Listed substances that worsen the symptoms must be listed;
    - A list with the medications he/she needs to use at school, which is used before physical exercise and in the event of an acute episode (asthma attack);
    - An emergency plan for during and after the acute episode should be in place;
    - Any emergency telephone numbers for the family doctor, parents or guardians should be at hand.

#### **5.4.5.7     *The over-concern of parents***

In our nuclear economic culture, children are supervised when they are young, but as they grow older they are given the gradual freedom to make choices and to take care of themselves at a level that seems possible for them to handle. Parental behaviour and nurturing adapt to this process. Concerned parents of asthmatic children may however, constrict their children's independency. Parent's fear of possible health hazards in their children's live, such as allergens, playing sports and taking part in other vigorous activities, staying out too late when it is cold or not being clothed warm enough force them to be overprotective.

Parental checking behaviour can be a teenager's nightmare or provide excellent opportunities to create manipulation strategies. The general belief is that harsh early experiences such as rejection and parental indifference can probably modify emotional traits permanently. Extreme measures of care are needed to keep a balance and to respect a child's need for nurturance and/or independence.

## 5.5 SHORTCOMINGS INHERENT TO THE DESIGN

- *Sample size*

A bigger sample group would have brought more confounding factors into the research group, which would require more effortful selection, better screening procedures or analyzing methods and probably more contact with the participants. These efforts would pay off well in terms of better generalizability.

- *Sample choice*

Purposeful sampling was the sampling method of choice, less complicated and contributed to a more valid outcome for a certain group of children. Because of the small sample the aspect of mixed gender was not addressed in the analysis and discussion of the results.

- *Confounding variables*

A confounding variable, which was not ruled out, is the fact that the participants were learners in grade 12. With their heavy workload and the nearing end exam, it is possible that they might have been experiencing more than the usual day-to-day strain. It is however also possible that asthmatic children, due to additional strain caused by their illness were experiencing a tension overload. This confounding factor may have been ruled out by using a control group without asthma to measure the correlation between the experimental and control groups for anxiety/tension.

- *Reliability and validity of the research instruments*

The using of a standardized questionnaire (16PF) reliability and validity was guarded during the assessment phase. The interpretation of the scores was handled with due caution to ensure against personal subjective influence. Reliability is preserved by the accurate and truthful documentation of the procedures followed during the study.

- *Limitations of the methodology and possible contributions*

The existing body of knowledge covering the relation between psychobiological factors and personality development among individuals diagnosed with chronic asthma is relatively restricted. The majority of these sources dealing with asthma only reflect on the negative affect flowing from asthma as a chronic illness, without considering the neurochemistry involved in personality development. The size of the sample poses another limitation. Due to the small sample (purposeful sampling) size, little possibility to generalize the findings to the bigger community exists and then not without reservation. Age restrictions (18 years) and homogeneity of the population (learners from one single school) of one culture group (white and Afrikaans speaking) restrict generalization even more. However, this project is explorative in nature, which might prompt further research into this phenomenon. The tendencies in personality characteristics found in asthmatic children, deducted from the research findings, do however prove to be realistic if compared to literature findings and have application value for asthmatic children more or less the same age.

- *Availability of relevant literature*

Statistics on the prevalence of childhood and/or adolescent asthma in SA or in schools in SA was vague or unavailable. Information about asthma management programs in SA-schools is not generally available. The researcher relied on research information, asthma management programs and relevant statistics in other countries.

## **5.6 RECOMMENDATIONS FOR FURTHER STUDY AND RESEARCH**

While conducting the research various topics of concern for healthy psychological (personality) and physical (health) development came to my mind. These topics might be worthwhile to research.

Topics:

- What is the role of the production and the role of pro-inflammatory cytokines and their messengers in the central nervous system and the implications it has for personality development (independence and self-sufficiency) and the persons health perception?

- Does serotonin concentration differ in asthmatic children in comparison with healthy peers?
- Does serotonin play a role in the development of frontal lobishness?
- What is the influence of anxiety on serotonin metabolism and availability?
- What is the effect of asthma on identity formation?
- Do asthmatic adolescents experience an identity crisis and how does it influence their future expectancy?
- Does the process of identity formation take longer for the asthmatic adolescent versus the general healthy population?
- What are the effects of academic demands on the anxiety levels of schoolchildren, especially adolescents?

## **5.7 CONCLUSION**

The above-mentioned research confirms the wide variety of non-specific symptoms that obviously are a source of misery for the patient. It will not be stretching the truth to imply that stress induced changes, especially over a long period, in the nerve and immune system adversely affect stressed peoples personality development and significantly decrease the patient's quality of life.

There is thus little debate that reducing the psychological burden of medical conditions and related stressors is a worthwhile venture for improving at least some aspects of chronically ill individuals' psychological and physical health states. If treatment and lifestyle modification planning is done at hand of a thorough understanding of the psychobiology of personality, it might have positive psychological and physiological effects, for example reduce emotional, cognitive, behavioural and physical symptoms, alter neuroendocrine and immune functioning, delay disease progression, and reduce morbidity and mortality. The focus is thus on a general stress-coping model in order to create general well being by developing comprehensive healthy personal functioning that create and sustains healthy personality trait development for asthmatics. It is envisioned that the recommendations based on these insights might significantly contribute to planning of treatment and lifestyle modifications for improving psychological and physical health states of individuals living with chronic asthma.

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## APPENDIX A

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Tel 012 420-5559

Fakulteit Opvoedkunde  
Groenkloof Kampus  
Departement Opvoedkundige Sielkunde  
Jan 2007

Geagte Oudleerder

Soos telefonies bespreek is ons tans besig met 'n navorsingsprojek oor leerders wat asmaties is. Vir hierdie projek benodig ons inligting van leerders wat onlangs 18 jaar was en 'n sekere persoonlikheidsvraelys, naamlik die 16 PF vraelys voltooi het. U was gedurende 2005 'n leerder aan die Hoërskool \_\_\_\_\_ in Kemptonpark. Gedurende 2005 is beroepsvoorligting aan die hand van ondermeer die 16PF vraelys gedoen.

Ons wil graag met u toestemming die inligting van u 16 PF – vraelys en u self rapportering vraelys insluit by ons navorsingsprojek. Alle inligting van die vraelys word streng vertroulik en anoniem hanteer, sodat geen persoonlike inligting wat u kan identifiseer in die projek gebruik of bekendgemaak sal word nie.

Die inligting wat ons so insamel, sal deel vorm van 'n statistieke poel van inligting wat glad nie aan identiteit gekoppel word nie, maar wel aan die feit of u asma vermeld het, al dan nie, tydens die afneem van die 16PF Vraelys destyds.

Daar word geglo dat asmalyers unieke persoonlikheidseienskappe besit. Die eienskappe ontwikkel ondermeer vanuit genetiese potensiaal in interaksie met unieke lewenservaring wat die asma kondisie insluit. Die projek fokus op die identifikasie van daardie unieke eienskappe en die invloed daarvan op die asmalyer se lewenskwaliteit. Die funksionele waarde van die navorsingsprojek berus daarop dat dit ander navorsing kan aanmoedig en ondersteun. Verder sal dit 'n bydrae lewer tot beter begrip en kennis van die asmaleier se lewenservarings en lewensuitdaging wat hanteer word. Die begrip

en insigte sal aangewend word in die beplanning van gesondheidsorg programme wat indirek die lewenskwaliteit van asmalyers kan verhoog.

Na aanleiding van die grootte van die navorsingsprojek, geïsoleerd gesien, sal die resultate slegs op beperkte skaal veralgemeenbaar wees, naamlik na 'n sub- populasie in die Afrikaanse kultuurgroep. Met bydrae tot en die ondersteuning van soortgelyke studies kan insigte vanuit die projek egter groter toepassingsmoontlikhede openbaar.

Indien u bereid sou wees om aan hierdie projek deel te neem, word u versoek om die onderstaande te voltooi en terug te faks na tel. \_\_\_\_\_

Vir enige vêrdere navrae of indien u terugvoer sou verlang oor die projek kan u gerus met die volgende persone in verbinding tree:

Prof. H. Naudé                      012 420 4146 (W)

Me. E.W. Erasmus                012 804 4984 (H)  
   082 828 6380 (Sel / W)

U samewerking word hoog op prys gestel.

Die uwe

\_\_\_\_\_

Prof. H. Naudé  
(Studieleier)

\_\_\_\_\_

Me. E.W. Erasmus  
(Navorsers)

Skrap wat nie van toepassing is nie.

Hiermee verleen ek, \_\_\_\_\_

my ingeligte toestemming dat inligting soos bo vir die navorsingsprojek uiteengesit op 'n anonieme wyse gebruik mag word.

Die uwe

\_\_\_\_\_

Oudleerder

\_\_\_\_\_

Datum