ILLNESS COGNITIONS AND HEALTH BEHAVIOURS IN ADULT ASTHMATICS

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ABSTRACT

A study in the area of health psychology, focusing on illness cognitions and health behaviours and employing a cognitive approach, was conducted. The aim of the study was to test two theoretical models of the determinants and consequences of perceived seriousness of illness using adult asthmatics and, supplementary to this, to generate some information of practical value in self-managing this illness. It was hypothesized that perceived prevalence, perceived treatability, and asthma history (duration, average intensity over entire history, average intensity over the last six months, and frequency of attacks) would correlate with perceived seriousness (self-rated seriousness and number and frequency of symptoms), and that these relationships would be moderated by repressive defence style. It was further hypothesized that seriousness would influence asthma health behaviour (competencies and adherence), and that response and personal efficacies would moderate these relationships. These hypotheses were tested using data from two mail surveys of members of New Zealand regional Asthma Societies, conducted six months apart (N=412 and 389 respectively).

The results revealed limited support for the model examining determinants. Only average intensity over entire history, average intensity over the last six months, and frequency of attacks were positively related to self-rated seriousness, whilst average intensity over entire history was positively related to number and frequency of symptoms. There was no evidence that repressive defence style moderated any of the seriousness relationships. However, repressive defence style related to number and frequency of symptoms, but not to self-rated seriousness. The findings provide some support for the notion that rational information processing dominates the seriousness relationships in persons with chronic asthma. The desensitizing influence of asthmatics' experiences with, and knowledge of, asthma was offered as an explanation

for the null relationships between duration and seriousness, prevalence and seriousness, and treatability and seriousness.

The findings also revealed limited support for the consequences model. Only one seriousness-health behaviour relationship emerged, such that number of symptoms positively related to health competencies. This finding is consistent with a number of studies reporting that the experience of symptoms motivates health behaviour. The competing influences of seriousness as a motivator of health behaviour versus the tendency for seriousness to be negatively related to adherence to complex regimens was offered as a possible explanation for the null relationship between seriousness and adherence. Self-efficacy was not a moderator of the seriousness-health behaviour relationships. It was concluded that methodological inadequacies may have contributed to this result. Despite the general lack of support for the models, the study led to some interesting discussion on a range of largely theoretical issues. For example, it was concluded that an assertion made early in the study that seriousness is a salient illness cognition may not be justified.

Additionally, the study findings have three potential applications in the area of asthma self-management. First, the percentage of asthmatics using each of the health competencies provides information of use to asthma educators and clinicians in targeting asthmatics weak in particular areas of self-management. Second, variations identified in the adherence practices and use of health competencies by age, gender, educational level, and number of symptoms should also be useful to asthma professionals, for the same reason. Third, of all the study variables, response efficacy was identified as being most important in determining asthma health behaviour. It is suggested that developers of asthma self-management programmes should incorporate this variable in programmes aimed at promoting health behaviours.

DEDICATION

This thesis is dedicated to my father

James Gordon Laird

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CHAPTER I

INTRODUCTION

The present study has dual objectives. The primary objective is to develop and test two distinct psychological models: (i) to examine some theoretically important determinants of perceived seriousness of illness in adult asthmatics and, (ii) to examine the role of perceived seriousness of illness in determining health behaviour in adult asthmatics. The secondary objective is to generate some information which has applied value in the area of adult asthma self-management. The duality of these objectives arises since asthma is a suitable illness to test the models, and the theory testing will generate information useful in asthma self-management.

The introduction is divided into three main sections. The first section briefly introduces cognitive approaches in health psychology, argues for the centrality of perceived seriousness as an illness cognition, and develops the study models. The second section describes adult asthma, provides a rationale for selecting this illness to test the study models, and reviews prior research on asthma relevant to the current study. The third section sets up the study by drawing together the first two sections, and offers hypotheses.

1.1 Cognitive approaches in health psychology

Like all branches of psychology, health psychology can draw upon various schools of thinking to direct its research. Among these is the cognitive school of psychology, and Seeman (1989) regards the cognitive subsystem as perhaps the most important one in determining health outcomes. This view is supported by Rodin and Salovey (1989), who comment that health psychology has benefited greatly from the theoretical developments of cognitive psychology. One of health psychology's most substantial

contributions has been the development of cognitive models of health behaviour (Taylor, 1990). That thoughts and beliefs influence health behaviour was perhaps first recognized in formulations such as the Health Belief Model (HBM) (Rosenstock, 1966). Since its conception, the HBM has generated a huge number of empirical studies attempting to explain health behaviour (see Harrison, Mullen, & Green, 1992 for a meta-analysis; Janz & Becker, 1984 for a review), and it continues to guide a substantial number of contemporary studies (e.g., Aiken, West, Woodward, & Reno, 1994; Bond, Aiken, & Somerville, 1992; Champion, 1994; Ronis, 1992). Its relative success in predicting health behaviour has undoubtedly provided impetus for subsequent theorizing concerning the role of cognitive factors in illness. Health psychology has also drawn upon the field of cognition to develop common sense representations of illness (e.g., Bishop & Converse, 1986; Leventhal, Meyer, & Nerenz, 1980; Turk, Rudy, & Salovey, 1986) and, pertinent to the current study, cognitions have been examined in the context of coping with chronic illness (e.g., Taylor, 1990).

Croyle and Ditto (1990, p. 31-32) define illness cognition to be "any mental activity (e.g., appraisal, interpretation, recall) undertaken by an individual who believes himself or herself to be ill, regarding the state of his or her health and its possible remedies." This definition is accepted for the purpose of the current investigation, which is primarily concerned with perceptions an individual holds of his or her illness. The current study focuses on a particular illness perception, perceived seriousness. This perception is studied in the context of persons suffering from a chronic illness. In the next section, perceived seriousness is defined and its salience as an illness perception is argued.

1.1.1 Perceived seriousness

Early definitions of the seriousness of an illness tended to focus on its objective

features. Hinkle, Redmont, Plummer, and Wolff (1960, p. 1331) defined seriousness as "the likelihood that (an) episode of illness, or it(s) sequelae, if untreated, will lead to (the) death of a subject." Hinkle et al. (1960) devised a scale of seriousness, which measured the epidemiological probability of death arising from having a particular illness. In contrast, the current study is concerned with the perception of seriousness, which Wyler, Masuda, and Holmes (1968) refer to as a gestalt of illness. These researchers did not offer a formal definition of perceived seriousness, but regarded it as including such factors as "prognosis, duration, threat to life, degree of disability, and degree of discomfort" (p. 363).

Some researchers have described perceived seriousness in terms of the consequences of an illness (Janz & Becker, 1984; Turk et al., 1986). According to Turk et al. (1986, p. 469) seriousness "represents an individual's knowledge about the degree to which a disease is contagious, difficult to cure, long-lasting and requires medical attention." Janz and Becker (1984, p. 2), in their review of the HBM, describe the judgement of seriousness as including "evaluations of both medical (and) clinical consequences (e.g., death, disability, and pain) and possible social consequences (e.g., effects of the (illness) on work, family life, and social relations)." This describes a cognitive mechanism by which a person generates a judgement of seriousness; through an evaluation of the consequences of an illness. In part, the present study is similarly oriented, since it will examine some cognitive constructs theoretically important in determining seriousness. In general, Janz and Becker's description taps the construct of interest in the current investigation, and contributes to the accepted definition for this study. Perceived seriousness is defined to be an individual's perception of the seriousness of their illness, based on his or her aggregate evaluation of its biopsychosocial consequences.

The judgement of seriousness is one illness perception which is meaningful to nearly

all laypersons. Even the common cold will prompt a judgement of seriousness and treatment for this illness is sometimes dismissed on the grounds that "it is not really all that serious". In fact, it seems inevitable that any illness, acute or chronic, will attract a judgement of seriousness from the person who has it, as well as from his or her relatives and friends. As Jemmott, Ditto, and Croyle (1986, p. 899) comment "the judgement of seriousness is interesting because it captures, in a simple way, a critical part of what is on the layperson's mind when considering a health disorder." According to Jenkins (1966) the dimension of seriousness, among others, is common to all illnesses. These views suggest that seriousness is an important illness perception to persons who are ill.

Several lines of research provide evidence that perceived seriousness is a salient illness perception (Rippere, 1976; Rosenberg, Hayes, & Peterson, 1987; Rosenstock, 1966; Turk et al., 1986; Wyler et al., 1968; Wyler, Masuda, & Holmes, 1970). In devising the Seriousness of Illness Rating Scale, Wyler et al. (1968) was able to rank 126 illnesses according to their seriousness. Seriousness ratings of these illnesses were obtained from persons with and without medical expertise. In another study, Rippere (1976) asked medical students to provide interval scale rankings of the seriousness of 15 illnesses, and compared them to the Wyler et al. (1968) rankings for the same illnesses. The selection of perceived seriousness to rank illnesses in these studies provides indirect evidence for the centrality of this judgement. Rosenberg et al. (1987) have subsequently expanded and restandardized the Wyler et al. (1968) scale to reflect more recent medical knowledge.

The importance of the judgement of seriousness has also been recognized in a number of major formulations of health behaviour. Weinstein (1993) reviewed four cognitive models of health behaviour; HBM (Hochbaum, 1958; Leventhal, Hochbaum, & Rosenstock, 1960), theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein &

Ajzen, 1975), protection motivation theory (Maddux & Rogers, 1983; Rogers, 1983), and subjective expected utility theory (Edwards, 1954; Sutton, 1982). He claimed that they are used more frequently in health behaviour research than other models. According to Weinstein these formulations have a number of common features. One of these is the assumption an individual's anticipation of illhealth and the desire to avoid or reduce its impact motivates health behaviour. Consequently, 'perceived severity/perceived seriousness' is included in the HBM and protection motivation theories, 'negative utility' in subjective expected utility theory, and 'negative evaluation' in the theory of reasoned action. These constructs are essentially interchangeable (Weinstein, 1993). Overall, the inclusion of perceived seriousness (or synonymous constructs) in these formulations provides further evidence for the centrality of this judgement. This conclusion is supported by empirical studies using these formulations. For example, one review of HBM research concluded that perceived seriousness consistently predicts health behaviour in persons diagnosed as having an illness and/or experiencing symptoms (Janz & Becker, 1984). In passing, it can be noted that few other illness perceptions meet with the same success in explaining health behaviour (see Taylor, 1990).

Perhaps the most conclusive evidence for the importance of perceived seriousness was provided by Turk et al. (1986). These researchers investigated the dimensional structure that organises an individual's common sense illness schema. To do this, a questionnaire was administered to nurses, college students, and diabetics, who were asked to rate the qualities of two diseases. One of the diseases was personally relevant (flu or diabetes) and the other was familiar but had never been experienced (cancer). Exploratory factor analysis revealed that the structure of an illness has four dimensions, and one of these was perceived seriousness. Confirmatory factor analysis established the stability of all four dimensions using a second sample drawn from the same populations. This study provides empirical evidence for the generality of the

perception of seriousness across different illnesses and groups of subjects. According to Turk et al. perceived seriousness is psychologically meaningful.

The determinants of perceived seriousness are not well understood, although some laboratory based research has been conducted by Croyle, Jemmott, and colleagues. This is surprising considering the importance of this judgement to the major formulations of health behaviour described earlier, and the vast number of empirical studies that have employed these models. In fact, the majority of studies involving seriousness have treated it as an independent variable rather than a dependent variable (Jemmott et al., 1986). In the current research, both the determinants and consequences of seriousness are examined for a chronic illness.

1.1.2 Determinants of seriousness

Based on a programme of largely experimental research conducted by Croyle, Jemmott, and colleagues, some theoretically important determinants of perceived seriousness can be identified. These researchers conducted a series of experiments to investigate the determinants of cognitive appraisals that occur following a risk factor test (Croyle & Jemmott, 1991). The principal appraisal investigated was perceived seriousness. To do this, they developed the TAA enzyme research paradigm, which involves subjects being told they are being tested for a fictitious enzyme (thioamine acetylase (TAA)) deficiency, and that this is a risk factor for pancreatic disorders. They are also told that a test is available to detect the presence or absence of TAA in saliva. This (bogus) test involves the administration of common glucose test strips, which turn from yellow to green in response to sugar in saliva. For more detail on the paradigm, see Croyle and Ditto (1990).

This programme of research identified five factors thought to determine the judgement of seriousness; perceived prevalence, treatment information, personal experience,

diagnostic certainty, and personal relevance (diagnostic status). In general, Croyle, Jemmott, and colleagues' work involved the manipulation of one or more of these factors and the measurement of perceived seriousness. Jemmott et al. (1986) manipulated perceived prevalence by informing subjects that either 1 out of 5 (low prevalence condition) or 4 out of 5 (high prevalence condition) had the TAA deficiency. In another study (Ditto, Jemmott, & Darley, 1988), treatment information was manipulated by either informing subjects that the TAA deficiency can be treated simply and painlessly (treatment informed condition) or withholding this information (treatment uninformed condition). Personal experience was not a manipulated variable. In Jemmott, Croyle, and Ditto's (1988) study subjects were provided with a list of 12 symptoms or diseases and asked if they had experienced any of them. This formed a dichotomous variable, such that a subject either had a history of a particular illness or they did not.

These constructs (perceived prevalence, treatment information, and personal experience) can be modified for use in the current study, which naturalistically investigates a chronic illness. As will become clear, this involves reoperationalizing them as continuous variables. The remaining two constructs, diagnostic certainty and personal relevance, do not lend themselves to naturalistic study. Diagnostic certainty is not suitable for inclusion in the current study because it is unlikely to have sufficient variability. Positive diagnosis will be recognised by nearly all sufferers of a chronic illness. Personal relevance is also unsuitable for inclusion. Here, a disorder has high personal relevance to the person who has it and low personal relevance to the person who does not. Since it is proposed to investigate persons who have a disorder this variable must be excluded from the study. Prior research on the three constructs included in the current study (perceived prevalence, treatment information, and personal experience) is now reviewed.

(i) Perceived prevalence

Research from a variety of domains points to a relationship between perceived prevalence and evaluative judgements. In the area of social cognition, MacArthur (1981) and Taylor, Fiske, Etcoff and Ruderman (1978) report that persons whose social grouping is rare are evaluated more or less positively than those whose social grouping is common. Also, consumer behaviour is sometimes influenced by perceived prevalence, such that attractive objects (e.g., precious gems and metals) are valued highly because they are rare (Brock, 1968; Fromkin & Synder, 1980).

Research in the area of health provides evidence that perceived prevalence influences decisions about seeking treatment (Ditto & Jemmott, 1987; Friedson, 1970; Mechanic & Volkart, 1960; Zola, 1966). For example, Zola observed instances of populations where illnesses were both medically significant and widespread, yet they remained largely untreated. One explanation for this observation is that these illnesses were not regarded as serious or even pathologic, due to their high prevalence. This explanation suggests that seriousness may act as a mediator in the relationship between prevalence and treatment seeking behaviour.

Two studies (Jemmott, Croyle, & Ditto, 1984; Jemmott et al., 1988) provide correlational evidence for a relationship between perceived prevalence and perceived seriousness. Jemmott et al. (1984) asked college students to estimate the prevalence of a familiar symptom or disease and rate its seriousness. They found a negative association between these variables. In essence, this finding was replicated by Jemmott et al. (1988). They report that individuals who believed that a symptom or disease was rare tended to view that condition as more life threatening than did individuals who believed it was common.

Jemmott et al. (1986) were the first to provide direct experimental evidence for a

relationship between prevalence and seriousness, using the TAA research paradigm. In their study, personal relevance and perceived prevalence were manipulated and perceived seriousness was measured. The manipulation of personal relevance involved leading half the subjects to believe they had TAA deficiency, while the other half were led to believe they did not have it. This manipulation was crossed with a second manipulation concerning the perceived prevalence of TAA deficiency. Subjects were led to believe that five subjects were participating in the experiment, even though there were only two or three. They were asked to self-administer the enzyme test. For the high prevalence condition, subjects were told that four out of the five subjects had TAA deficiency, whereas subjects in the low prevalence condition were told that only one of them had the deficiency. Subjects were asked to rate the seriousness of a number of familiar and unfamiliar disorders, including the fictitious TAA deficiency. Jemmott et al. (1986) found that subjects in the low prevalence condition rated the seriousness of the deficiency more highly than subjects in the high prevalence condition. They also found that subjects who thought they had the deficiency appraised it as less serious than subjects who believed they did not have the deficiency.

Other studies provide further evidence for a relationship between prevalence and seriousness (Ditto & Jemmott, 1989; McCaul, Thiesse-Duffy, & Wilson, 1992). In Ditto and Jemmott's (1989) study some subjects were told that the TAA enzyme condition was a negative characteristic (made them more susceptible to pancreatic disease) while others were told it was a positive characteristic (made them less susceptible to pancreatic disease). Information concerning the prevalence of the characteristic was also manipulated. Ditto and Jemmott found that when subjects were told the condition was a positive characteristic they appraised it as more beneficial when they thought it was rare compared to when they thought it was common. Conversely, when the enzyme deficiency was defined as a negative characteristic they appraised it as more harmful when they thought it was rare than when it was thought

to be common. These findings led Ditto and Jemmott to argue that the effect of prevalence information on evaluative judgements is explained by a simple heuristic, which provides a connection between the prevalence of a characteristic and its evaluative extremity. Thus, characteristics which are undesirable, such as health disorders, are evaluated with increased negativity when they are rare. Conversely, rarity increases the positive evaluation of desirable or valued characteristics. Ditto and Jemmott suggest that this may be quite a general heuristic, which may be used by people to evaluate a wide variety of personal characteristics (see e.g., Ditto & Griffin, 1993). Ditto and Jemmott went on to examine the possible link between prevalence and health behaviour. Subjects were given an enzyme test and asked to indicate their interest in receiving informational services (a free pamphlet, a booklet costing $0.50c, and/or a free physical exam) concerning the TAA enzyme deficiency. Ditto and Jemmott found that subjects who thought the TAA deficiency was a negative characteristic wanted more information when the health condition was judged to be rare compared to when it was judged to be common. This finding is consistent with Zola's (1966) research reported earlier.

McCaul et al. (1992) extended the work of Croyle, Jemmott, and colleagues in a study on periodontal disease. They randomly assigned college students to conditions in which they learned that they had periodontal disease, were at risk for having it, or did not have it. Then they examined the coping responses of the students both immediately after the diagnosis and two days later. McCaul et al. found that the students who had been told they had periodontal disease perceived it to be more prevalent than students in the other conditions, and students who had been identified as being at risk perceived the illness to be more common than students who were told they did not have it. They also found that illness and at risk diagnosed subjects believed that the illness was less serious, despite the fact that they reported more bleeding of the gums during the two day interval between tests. All these responses were the same when the subjects were

retested two days later. Overall, this laboratory study provides some evidence for the generality of the prevalence/seriousness relationship, since it investigated a real-world illness.

(ii) Treatment information

According to Croyle and Jemmott (1991) the minimized seriousness that occurs following positive "diagnosis" (e.g., Jemmott et al., 1986) has two possible explanations. It may be due to rational aspects of information processing or defensive processes such as denial. These two explanations provide competing sets of predictions concerning the effects of treatment information on seriousness. On the one hand, if rational aspects of information processing provide the best explanation, it would be reasonable to posit that a treatable illness will be perceived as less serious compared to an untreatable one, provided the treatments themselves are not aversive (Croyle & Jemmott, 1991). On the other hand, if defensive processes such as denial produce minimized seriousness, then the seriousness of a health threat may well be recognised. Should this be true, providing information that an illness is treatable should result in an increase in perceived seriousness (Croyle & Jemmott, 1991). Ditto et al. (1988) examined these competing explanations using the TAA research paradigm. They divided their subjects into two groups. The first group was told they had the TAA deficiency and the second group was told they did not. Prior to the administration of the risk factor test a second manipulation was introduced, whereby subjects in the treatment informed condition were told the treatment for TAA deficiency is relatively simple and painless, while those in the treatment uninformed condition remained naive. The results provided support for the motivated denial explanation of minimized seriousness. Subjects who believed they had the deficiency and were not provided with the treatment information tended to downplay the significance of the test. The highest average seriousness rating of pancreatic disease occurred for subjects who thought they had the deficiency and were provided with the treatment information.

Ditto et al. (1988) provided further evidence for the motivated denial explanation of minimized seriousness. Subjects were asked to recall the colour of their test strips following the test, and rate it on a 10-point colour scale, which ranged from light green to dark green. Recollect that the 'test strips' used in the TAA paradigm are actually common glucose test strips, which turn from yellow to green in response to sugar. They found that subjects who thought they had the deficiency but were not provided with the treatment information thought the test strips were less green than subjects in the other conditions. Consequently, these subjects might have deduced that they have a more benign form of pancreatic disorder, or that the test result was negative (Ditto et al., 1988). Overall, providing recently "diagnosed" subjects with information that the TAA deficiency is treatable results in higher judgements of its seriousness.

(iii) Personal experience

An individual's personal experience with an illness may also influence their judgement of its seriousness. Research on personal relevance provides background support for this possibility. Studies conducted by Chaiken (1980) and Petty and Cacioppo (1979) report that personally relevant information is processed differently from information which is not personally relevant. Jones and Davis (1965) report that the perception of another individual's behaviour is influenced by the relevance of that behaviour to the perceiver. Also, as reported earlier, a highly personally relevant disorder is judged to be less serious than one that has low personal relevance (Jemmott et al., 1986). Recall that a disorder is personally relevant to the person who has received a positive "diagnosis" and not personally relevant to the person who has not. Jemmott et al's (1986) study, in particular, points to a possible relationship between personal experience with an illness and seriousness.

More direct evidence on the possible relationship between personal experience and

seriousness was provided by Jemmott et al. (1988). They investigated the role of experiential factors in seriousness judgement, by comparing the perceptions of laypersons and physicians. Both these groups were asked to provide judgements on the prevalence and seriousness of several health disorders. They were additionally asked to indicate if they had experienced any of the illnesses. This study found that individuals who had experienced an illness estimated its prevalence to be higher than individuals who had not experienced it. There was general support for this finding across several different symptoms and diseases, and expertise did not alter this relationship. The study also reports that laypersons who have experienced a disorder rate it as less serious than persons who have never experienced it. This relationship did not emerge for physicians, which suggests that expert knowledge somehow "disconnects" it. Two naturalistic investigations provide further evidence that personal experience and seriousness are related. Jamison, Lewis, and Burish (1986) report that adolescent cancer patients perceive cancer as significantly less severe compared to a control group of healthy adolescents. Marteau and Johnson (1986) asked parents of children with diabetes, asthma, epilepsy, and no chronic illness to rate the seriousness of eleven childhood illnesses. They found that for each illness (diabetes, asthma, and epilepsy) the lowest seriousness judgement was made by parents whose child suffered from that illness.

Jemmott et al. (1988) offer two explanations for the finding that personal experience of a disorder results in lowered seriousness ratings. First, persons with such experience will have greater knowledge of their illness, and this may result in minimized seriousness. Jemmott et al. (1988) provide some support for this explanation. They report that physicians rated the various disorders as less serious than laypersons, and Keown, Slovic, and Lichtenstein (1984) report a similar finding with respect to drug side effects. An alternative explanation for Jemmott et al's (1988) finding is that denial produces minimized seriousness. Subjects who reported

experience with an illness may have downplayed its seriousness in order to maintain their sense of self.

(iv) Denial

The literature is replete with studies suggesting that denial and other forms of defensiveness are common initial reactions to illness. The term denial has been variously defined, which, among other considerations, reflects the fact that different schools of psychology understand the concept differently (Forchuk & Westwell, 1987). However, there is some agreement that denial involves an attempt to disown the existence of unpleasant reality (Campbell, 1981). Havik and Maeland (1986) describe denial as including a variety of reactions all of which have one common feature: to alleviate unpleasant affects by nullifying threatening information related to an illness or its consequences.

According to Levine and Zigler (1975) denial is a universal phenomenon that has been observed in all types of illness. It has been described as a common initial reaction among cancer patients (Peck, 1972; Shands, Finesinger, Cobb, & Abrams, 1951; Watson, Greer, Blake, & Shrapnell, 1984) and is commonly exhibited by patients with acute cardiac disease (Croog, 1983; Croog, Shapiro, & Levine, 1971; Hackett & Rosenbaum, 1980; Levine et al., 1987; Soloff & Bartel, 1979). Watson et al. (1984) investigated denial as a reaction to a diagnosis of breast cancer. They found that patients who denied the seriousness of the cancer diagnosis had less mood disturbance and accepted the implications of the diagnosis better. They concluded that denial is effective in reducing the short term stress associated with the diagnosis.

A number of researchers (e.g., Croog et al., 1971; Croyle & Sande, 1988; Deaton, 1986; Ditto et al., 1988; Janis, 1958; Lazarus, 1983; Lipowski, 1970) report that denial is sometimes manifested through the patient's minimization of seriousness of

health threat. Using the TAA research paradigm, Croyle and Sande (1988) experimentally investigated denial and confirmatory search of memory as consequences of medical diagnosis. They hypothesized that, when faced with a positive diagnosis, an individual will either deny or downgrade the diagnosis or selectively search memory for evidence to confirm it. Recall that Jemmott et al. (1988) found that experience with an illness results in minimized seriousness. This may be explained by denial or by the fact that individuals who experience an illness are more likely to have knowledge about it. Selectively searching available memory may provide the individual with information that the illness is not really all that serious. Croyle and Sande found paradoxical evidence that positive diagnosis can initiate both denial and confirmatory search of relevant memory, and that these processes occur independently. When faced with a positive test result, subjects judged the deficiency as less serious and rated the test results as less accurate compared to subjects who had a negative test result. Croyle and Sande concluded that minimization of seriousness provides experimental evidence of denial. They argue further that the tendency for positive test subjects to downgrade the test's accuracy provides evidence of a second form of denial, scepticism concerning the validity of diagnosis. They also point to the possibility that denial of affect may have occurred. The results also indicate that this group of subjects selectively uncover evidence from memory to confirm the test. It would seem likely that these processes, denial and search of illness relevant memory, continue well beyond the point that an individual confirms his or her diagnosis. It is probable that they are still continuing in an individual with a chronic illness, especially if he or she is not fully adjusted to that illness.

These findings raise the question as to exactly what role denial plays in influencing seriousness following diagnosis. In the present study, it is argued that denial can be offered as a possible moderator in the relationships between seriousness and the determinants: perceived prevalence, treatment information, and personal experience.

Consider, for example, the relationship between treatment information and seriousness (Ditto et al., 1988). It is likely that persons with high denial will perceive information concerning the treatment of an illness more intensely than persons with low denial. The strength of the relationship between treatment information and seriousness should therefore vary as denial varies, and a moderating influence is indicated in this relationship. Comparable arguments can be offered for the relationship between perceived prevalence and seriousness, and between personal experience and seriousness. Henceforth, the relationships between the determinants and seriousness, and the possible moderating role of denial in these relationships is referred to as the determinants model.

An analogous set of relationships can be proposed for persons suffering from a chronic illness. This proposal is reasonable to the extent that the findings of Croyle, Jemmott, and colleagues generalize to the study of chronic illness. There are two considerations which may influence the generality of their findings. First, Croyle, Jemmott, and colleagues conducted laboratory studies to experimentally investigate psychological reactions to "diagnosis", whereas the study of a chronic illness necessarily involves using correlational methods in a field setting. Second, Croyle, Jemmott, and colleagues investigated recently "diagnosed" subjects, whereas the study of a chronic illness involves subjects who are partly or fully adjusted to their illness. This difference, in particular, may influence the nature of the relationships in the determinants model.

Setting these two considerations aside, it would seem likely that the relationships in the determinants model will hold for a specific category of chronic illness. These are illnesses which are relatively serious and symptomatic in nature. In particular, the presence of symptoms would seem critical in promoting minimized seriousness. Aversive symptoms are likely to continuously fuel denial and foster minimization. This

is likely to be true for chronic illnesses such as asthma, which is a relatively serious illness (Rosenberg et al., 1987) with distressing symptoms. Thus, for a particular group of chronic illnesses, denial is likely to moderate the seriousness relationships. In so far as denial is operating in this way, the direction of the seriousness relationships will be the same as those found in Croyle, Jemmott, and colleagues' work. For example, a positive relationship between treatment information and perceived seriousness is expected.

Other literature suggests that denial may play a different role in chronic illness. Levine et al. (1987) longitudinally investigated the influence of denial on the course of recovery of patients with cardiac disease. Their findings suggest that denial was adaptive during the acute phases of the illness, but maladaptive following discharge from hospital. These researchers found that patients classified as high deniers had poorer adherence levels compared to low deniers following discharge. In a meta-analysis of 26 studies, Mullen and Suls (1982) compared the effects of denial and non-denial on adaptation to stress. They concluded that denial results in better adaptation over the short term, whereas non-denial results in better adaptation over the long term. Suls and Fletcher (1985) extended this meta-analytic review and came to a similar conclusion. Overall, these studies suggest that denial is an adaptive mechanism to deal with the stress of diagnosis and the acute stage of an illness, but is less adaptive, maybe even maladaptive, during the chronic stages of an illness.

Croyle (1990) has shed some experimental light on the role of denial in chronic illness. He investigated the relationship between blood pressure test results and perceived seriousness of blood pressure. In his first experiment, Croyle measured the blood pressure of a group of subjects and randomly assigned them to one of two experimental conditions; normal blood pressure and high blood pressure. They were then asked to complete a questionnaire and rate the seriousness of their blood pressure.

In his second experiment, involving a second group of subjects, the first experiment was repeated and subjects were additionally asked to indicate whether or not they thought hypertension was acute, cyclical, or chronic in nature. Previous research reveals that these alternatives are all commonly held beliefs (Meyer, Leventhal, & Gutmann, 1985). Findings from both experiments provided evidence of minimization of seriousness. However, in subjects who thought hypertension was a chronic disorder there was no evidence of minimization of seriousness. In accepting Croyle and Sande's (1988) conclusion that minimization provides direct evidence of denial, it would seem that denial was either absent or does not influence seriousness in the subjects who viewed hypertension to be a chronic illness. Overall, this set of studies (Croyle, 1990; Levine et al., 1987; Mullen & Suls, 1982; Suls & Fletcher, 1985) suggest that denial is unlikely to moderate the relationships between the determinants and seriousness for a chronic illness. Should this be true, the direction of the seriousness relationships is more likely to be determined by rational information processing. As such, for example, a negative relationship between treatment information and perceived seriousness is expected.

1.1.3 Summary

In the first instance, perceived seriousness was defined and arguments for its salience as an illness perception were presented. Next, a series of laboratory studies conducted by Croyle, Jemmott, and colleagues were reviewed, and three theoretically important determinants of perceived seriousness were identified. These were perceived prevalence (e.g., Jemmott et al., 1986), treatment information (Ditto et al., 1988), and personal experience (Jemmott et al., 1988). Other studies (e.g., Croyle & Sande, 1988) were reviewed, which provided support for an assertion in the current study that denial is a possible moderator in the seriousness relationships. Together, this set of relationships was labelled the determinants model. Next, the model's utility when studying a chronic illness was considered. Some arguments suggested that there should

be support for the relationships in the model, for a particular category of chronic illness. These are illnesses that are relatively serious and symptomatic in nature. Other arguments suggested that denial is unlikely to moderate the seriousness relationships, and that the nature of the model relationships may be quite different. On theoretical grounds, neither of these two competing positions is considered more likely than the other.

1.1.4 Consequences of seriousness

The second part of the study concerns a model of the consequences of seriousness. This model is generated from a separate set of theoretical and empirical considerations to those used in devising the determinants model.

According to Taylor (1990) a convergence of research findings suggests that vulnerability, seriousness, and self-efficacy are central determinants of health behaviour (see also Weinstein, 1993). Taylor comments that many researchers now attempt to conceptualize and measure all these components in predicting health behaviour. In essence, researchers use this strategy to maximize the explained variance in health behaviour. Taylor's (1990) conclusion is pertinent to the current study, since both seriousness and self-efficacy will be included as influences on health behaviour in the consequences model. Before commencing to develop this model, a definition of health behaviour suitable for use in the current study is offered.

(i) Definition of health behaviour

A number of alternative definitions of health behaviour and related concepts have been offered over the years (e.g., Kasl, Cobb, & Arbor, 1966a; 1966b; Kirscht, 1983; Mechanic, 1986). In a classic paper by Kasl et al. (1966a) health behaviour is defined to be "any activity undertaken by a person believing himself to be healthy, for the purpose of preventing disease or detecting it at an asymptomatic stage (p. 246)." This

definition has little relevance to the discussion as the present study is interested in persons who are ill. These researchers define illness behaviour to be "any activity, undertaken by a person who feels ill, to define the state of his health and to discover a suitable remedy (p. 246)." Finally, they define sick role behaviour to be "any activity undertaken by those who consider themselves to be ill, for the purpose of getting well (p. 246)." This last definition captures some elements relevant to the current study. First, as with Kasl et al. (1966a), the present study is interested in the activities that people engage in during illness. Second, the link between these activities and the "purpose of getting well" is also of interest in the current research. A definition by Kirscht (1983, p. 278) describes preventive behaviour to be "any behaviour that people engage in spontaneously or can be induced to perform with the intention of alleviating the impact of potential risks and hazards in the environment." This definition is, in itself, unsatisfactory for the current purpose; it focuses on behaviours that prevent illhealth in healthy persons. However it contributes to the final definition which is accepted for the purpose of the current research. Health behaviour is best defined for this research to be any behaviour that an ill person engages in spontaneously or can be induced to perform with the purpose of either slowing pathological processes or maintaining or improving health status. Implicit in this definition is the possibility that the ill person may undertake no action at all or engage in behaviours that lead to a decline in health status.

This definition permits an examination of the influence of illness perceptions on health behaviour. For example, it is anticipated that the greater the judged seriousness of a chronic illness the more likely an individual is to engage in behaviours that either slow pathological processes or maintain or improve health.

(ii) Seriousness and health behaviour

A number of studies have argued that the determinants of health behaviour are

multifaceted and complex (Best & Cameron, 1986; Cummings, Becker, & Maile, 1980; Leventhal & Cameron, 1987; Mechanic, 1983). Consistent with the biopsychosocial model (Engel, 1977), Best and Cameron (1986) point to a complex interplay between biological, psychological, and sociocultural factors in their determination. Of the psychological factors involved, it will be argued that perceived seriousness is one important factor determining health behaviour. Overall, most support for this contention is provided by Health Belief Model (HBM) research.

The assumptions of the HBM formulation (Rosenstock, 1966) are now reviewed, since it is one cornerstone of the consequences model. The origins of this model go back to the social psychological theory of Kurt Lewin (Lewin, 1935), and the HBM is consistent with other theories of decision making under uncertainty, such as those of Tolman and Rotter (Becker et al., 1977). The HBM has a phenomenological orientation, and assumes that an individual's subjective experience is central in determining his or her behaviour (Mikhail, 1981). This assumption has considerable empirical support, and is also consistent with the general finding that associations between objective features of the environment, including objective medical opinion, and behaviour are generally weak or absent. The other major assumption of the HBM is that behaviour is rational (e.g., Leventhal & Cameron, 1987). The model assumes that an individual will make logical and rational decisions concerning their health based on the perceptions they hold. The relative success of the HBM in predicting health behaviour provides some evidence for this assumption. However, it should be noted that few HBM studies have directly examined this assumption by ascertaining direction of causal effects. It will become clear that the consequences model shares these same assumptions.

The HBM was originally devised to explain preventive health behaviour, and included four main predictor variables; vulnerability, seriousness, benefits, and barriers

(Rosenstock, 1966). Consequently, one of the major components of the HBM is the perceived seriousness of a disorder. It should be noted that the terms "seriousness" and "severity" are often used interchangeably in HBM research.

Janz and Becker (1984) reviewed research using the HBM, which revealed that perceived seriousness is the weakest of the four components in predicting preventive health behaviour. In fact, perceived seriousness was unrelated to preventive health behaviour in two thirds of studies reviewed. Janz and Becker suggest that respondents in these studies may have had trouble in conceptualizing seriousness because (i) they are asymptomatic, (ii) they may be unfamiliar or inexperienced with some illnesses, and (iii) some of the illnesses investigated were chronic in nature. Other research does not support these explanations. Turk et al. (1986) report that persons can conceptualize the seriousness of a chronic illness such as cancer, when they have not experienced it. Regardless, seriousness and preventive health behaviour are not strongly related (Janz & Becker, 1984).

Becker, Drachman, and Kirscht (1972) were among the first to recognize that the HBM could be applied to persons who have either acute or chronic illness. Janz and Becker (1984) also reviewed the use of the HBM to predict health behaviour in persons who have an illness. Sick role behaviour was defined as "actions taken after diagnosis of a medical problem in order to restore good health or to prevent further disease progress" (p. 3). Their review included studies on hypertension, diabetes mellitus, and end stage renal disease, as well as research on mother's adherence to regimens for their children, visiting a physician while experiencing symptoms, and clinic utilization. A total of 13 studies were reviewed, and in 11 of these perceived seriousness was related to sick role behaviour. This led Janz and Becker to conclude that perceived seriousness assumes much greater importance in the prediction of sick role behaviour compared to preventive health behaviour.

Since the Janz and Becker review, a number of studies have been conducted using the HBM to predict health behaviour for a chronic illness. For example, Brownlee-Duffeck et al. (1987) investigated diabetes mellitus and found general support for the relationship between perceived seriousness and adherence. Bond et al. (1992) studied adolescents with this illness and found threat (perceived resusceptibility combined with seriousness) interacted with benefits-costs to predict adherence and interacted with cues to action to predict metabolic control.

Overall, it seems that perceived seriousness is not a reliable predictor of preventive health behaviour, but consistently predicts sick role behaviour. According to Janz and Becker (1984) this may be explained by perceived seriousness having more meaning to persons who have been diagnosed as ill and/or are experiencing symptoms. It is likely that such persons will be much more motivated to evaluate the consequences of an illness, and it was previously argued that this generates a judgement of seriousness. Other studies provide support for Janz and Becker's explanation (Becker & Maiman, 1975; Kasl, 1974; Kirscht & Rosenstock, 1979; Mikhail, 1981). In their review of the determinants of adherence, Becker and Maiman (1975, p. 15) comment that "The presence of physical symptoms probably exerts an elevating or "realistic" effect on perceived seriousness, motivating the patient to follow the physician's instructions as long as the organic indications of illness persist (or to avoid their reoccurrence)". Also consistent with this explanation is the finding that the fewer overt symptoms a person has, the lower their adherence (Chryssanthopoulos, Laufer, & Torphy, 1983), and that patients frequently discontinue taking medication when they feel better (e.g., Becker & Maiman, 1975).

As mentioned earlier, the HBM assumes health behaviour is rationally determined by health beliefs. Under this model, the relationship between health perceptions and health behaviour is not merely correlational, but causal (Chen & Land, 1986).

However, it is possible that health beliefs develop in response to an individual engaging in health behaviour. Still further, it is possible that a reciprocal causal relationship exists between health perceptions and health behaviour. Chen & Land (1986) investigated these types of questions using LISREL analysis of the relationships between health perceptions and preventive dental behaviour. Contrary to HBM predictions, they found that dental visits had a positive causal path to perceived seriousness, although the effect was small. However, in defence of the HBM prediction, it is quite possible that dental disease, unlike chronic and sometimes life threatening illnesses such as asthma, is not sufficiently serious to motivate the individual to engage in health behaviour (see Chen & Land, 1986). Finally, the possibility of a negative association between perceived seriousness and health behaviour cannot be discounted. Bond et al. (1992) report that for patients with a severe chronic illness there is some evidence that threat is negatively associated with adherence to complex regimens.

Overall, it is reasonable to posit that perceived seriousness is an important determinant of health behaviour during chronic illness. A person who perceives the seriousness of their chronic illness to be high will be more likely to engage in health behaviour than a person who perceives it to be low. However, it seems likely that this relationship may be moderated by other factors. Some research suggests that self-efficacy is a strong contender in this role.

(iii) Self-efficacy and health behaviour

It is clear that other salient psychological constructs, besides seriousness, will be involved in determining health behaviour. As mentioned earlier, a consensus of research has found that self-efficacy is important (Taylor, 1990). This section reviews Bandura's (1977) theory of self-efficacy, provides evidence that it is a central determinant of health behaviour, and completes the development of the consequences

model.

Bandura's (1977) self-efficacy theory was developed within the general framework of social learning theory. Essentially, the theory describes a mechanism through which an individual exerts influence over his or her behaviour (O'Leary, 1985). According to Bandura (1980) an individual's self-referent thought acts as a mediator between what that person knows and does. Bandura's (1977) theory focused on two aspects of an individual's thinking, which he termed expectations of outcome and self-efficacy. Expectation of outcome was defined to be "a person's estimate that a given behaviour will lead to certain outcomes" (Bandura, 1977, p. 193), and expectation of self-efficacy to be "the conviction that one can successfully execute the behaviour required to produce the outcomes" (Bandura, 1977, p. 193). Consequently, Bandura's constructs reflect an individual's perceptions concerning the connection between behaviour and outcome, and their capability to perform that behaviour (Strecher, DeVellis, Becker, & Rosenstock, 1986). They do not represent objective or 'true' capabilities, which is consistent with the general phenomenological orientation of the current study. Second, self-efficacy is not a personality construct, rather it concerns perceptions about abilities to execute specific behaviours in particular situations. Bandura's expectancies only acquire meaning when a researcher specifies the task and context involved (Strecher et al., 1986). For example, in the case of adult asthma, the self-efficacy expectations for taking a particular medication compared to avoiding a specific precipitant may well be different, as well as being dependent on situational factors such as seasonal changes in asthma. This very specific example exemplifies the need to specify both behaviour and context in assessing self-efficacy.

The relative contributions of outcome and self-efficacy expectations in predicting health practices depend on the illness under investigation (Strecher et al., 1986). Outcome expectations are likely to dominate the prediction of health practices which

are easy to change but which have unsure consequences (e.g., adherence practices in hypertensives). In contrast, self-efficacy expectations are likely to dominate the prediction of health practices which are difficult to undertake but which lead to certain outcomes (e.g., smoking cessation). Clearly, for illnesses with health practices that are difficult to change and have uncertain consequences, both outcome and self-efficacy expectations will be important. One example of this is asthma where the individual is required to follow a complex regimen, including avoiding personal precipitants, to control an unpredictable illness. For illnesses such as asthma, both expectations are likely to contribute to the determination of health behaviour.

Self-efficacy is increasingly being recognised as an important determinant of health behaviour (see O'Leary, 1985; Strecher et al., 1986 for reviews). Such recognition seems to be theoretically justified. Concepts similar to or synonymous with self-efficacy have been included in a number of theoretical formulations of health behaviour. The HBM (see Janz & Becker, 1984) includes the notion of perceived benefits as a predictor of preventive health behaviour and management of existing illnesses. This notion is similar to Bandura's outcome expectation construct (Clark et al., 1988). Janz and Becker emphasized the importance of perceived benefits in predicting preventive health behaviour, and Mullen, Hersey, and Iverson (1987) suggest that the HBM should be modified to include self-efficacy as an additional feature. Self-efficacy has also been included in other formulations such as Rogers (1983) protection motivation theory, and Beck and Frankel (1981) regarded efficacy as an important predictor of perceived threat control. Consequently, it is clear that Bandura's self-efficacy expectancies are theoretically important in determining health behaviour.

In the fifteen or so years since its conception, Bandura's (1977) theory has generated a substantial number of empirical studies in the area of health. Strecher et al. (1986)

reviewed studies relating self-efficacy to smoking cessation, weight control, contraception, alcohol abuse and exercise behaviour. These researchers conclude that self-efficacy is a dependable predictor of health behaviour. In the experimental studies reviewed, the manipulation of self-efficacy was found to initiate and maintain health behaviour change, and in the survey studies reviewed, it was strongly correlated with health behaviour change and maintenance. Similar conclusions were reached by O'Leary (1985) in her review of self-efficacy. She reports that self-efficacy predicts relapse in substance abuse patients, pain tolerance both in experimental and clinical settings, success in overcoming eating disorders, recovery from myocardial infarction, and adherence to medical regimens. Overall, self-efficacy is an important determinant of both preventive health behaviour and sick role behaviour.

A number of studies have included measures of both seriousness and self-efficacy to investigate the determinants of health behaviour (Taylor, 1990). Beck and Lund (1981) investigated the roles of self-efficacy strength and fear arousal in improving adherence to a regimen designed to control periodontal disease. Persuasive health communications were used to manipulate perceptions concerning the seriousness of the disease and susceptibility to it. The researchers explained a preventive regimen and encouraged its use, and also measured the perceived efficacy to perform this regimen. Beck and Lund found that high perceptions of seriousness increased adherence, but that self-efficacy to perform the regimen was the best predictor of adherence. In another study, Maddux and Rogers (1983), gave an essay on cigarette smoking to subjects, which included manipulations of the perceived probability of lung and heart diseases occurring, the severity of those diseases, the effectiveness of ceasing to smoke in avoiding the diseases, and how easy it was to quit. They found that self-efficacy was the dominant predictor of intention to quit in subjects convinced that this would reduce the probability of illness.

Self-efficacy has also been found to interact with other psychosocial variables to determine health behaviour. Two studies report that self-efficacy interacts with locus of control (Chambliss & Murray, 1979a, 1979b), and another study reports interactions with anxiety (Strecher, Becker, Kirscht, Eraker, & Graham-Tomasi, 1985). Consistent with the assumptions of the HBM, Bandura's theory assumes that people are both active and rational (Bartlett, 1983). It has mainly been employed in research involving adults (Schlosser & Havermans, 1992).

In order to include self-efficacy in the consequences model, there is a need to modify Bandura's original definitions. Consistent with these definitions, Beck and Frankel (1981) introduced the concepts of response and personal efficacies as possible influences on health behaviour following threat communication. They defined response efficacy to be "the perceived contingency between the performance of a recommended response and the reduction in the depicted threat (Beck & Frankel, 1981, p. 212)." Personal efficacy is defined to be "the person's perceived ability to perform the recommended action successfully (Beck & Frankel, 1981, p.212)." The definition of response efficacy can be redefined to be the perceived contingency between the performance of health behaviour and the management of a chronic illness. Similarly, personal efficacy can be redefined to be the person's perceived capability to carry out health behaviour. These definitions are suitable for investigating a chronic illness, and are accepted for the purpose of the current study.

Clearly, main effect relationships between self-efficacy and health behaviour are expected when studying a chronic illness. However, of greater interest in the consequences model is the possibility that interactions between seriousness and self-efficacy determine health behaviour. Indeed, the accepted definitions of personal and response efficacies suggest that they can be offered as possible moderators of the relationship between seriousness and health behaviour. Protection motivation theory

(Prentice-Dunn & Rogers, 1986; Rogers, 1983) has formally proposed such a role for self-efficacy. Prentice-Dunn and Rogers (1986, p.156) state that "if response efficacy and/or self-efficacy are high, then increases in severity and/or vulnerability will produce a positive main effect on the motivation to act. On the other hand, if response efficacy and/or self-efficacy are low, then increases in severity and/or vulnerability will either have no effect or a boomerang effect, actually reducing intentions to comply with the health recommendation." As such, response and personal efficacies can be included in the consequences model as possible moderators of the seriousness/health behaviour relationship. Specifically, it is posited that a given level of perceived seriousness is more likely to motivate health behaviour when response efficacy (or personal efficacy) is high compared to when it is low.

1.1.5 Summary

In the first instance, health behaviour was defined for the purpose of the current study. The consequences model proposes that seriousness judgement determines health behaviour in persons with chronic illness. A consensus of findings from HBM research provides support for this contention in persons who are ill (see Janz & Becker, 1984 for a review). In addition, the model proposes that self-efficacy moderates the seriousness-health behaviour relationship. Research on protection motivation theory (e.g., Prentice-Dunn & Rogers, 1986) provided support for this contention.

1.2 Adult asthma

1.2.1 Description

First, adult asthma is described. This includes offering a definition of the illness, and providing information on its symptomatology and health behaviours.

(i) Definitions

Adulthood has been variously defined in asthma research. However, a number of

asthma studies have defined it to be persons who are 18 years of age or over (e.g., Wilson, Scamagas et al., 1993). This definition is accepted for the purpose of the current study.

Providing a suitable definition of asthma is more problematic. In 1918 Rackemann asked "What is the fundamental disturbance of anatomy or physiology which expresses itself in attacks of asthma?" (p. 552). To date, there has been no satisfactory answer to this question. Gross (1980) comments that asthma's etiology is obscure, its clinical picture is diverse, its pathophysiology involves apparently multiple mechanisms, and its boundaries with other illnesses are hazy. Consequently, it is not surprising that a variety of definitions of asthma have been offered over the years.

However, a number of studies have described the major features of asthma. According to Creer, Reynolds, and Kotses (1991) there are four main features.

Hyperreactivity of the airways: Bronchostriction in asthmatics can be triggered by a wide variety of stimuli, which have no effect on normal individuals. The specific stimuli that trigger asthma vary from asthmatic to asthmatic, and from attack to attack in the same individual. Some asthmatics suffer from seasonal asthma, which is sometimes referred to as extrinsic asthma. The triggers in this type of asthma are outside the body (e.g., pollens, cold air). Other asthmatics are said to have intrinsic asthma and experience the illness all year round. For these individuals, asthma can be triggered by a wide range of stimuli, including nonspecific irritants and infections. These triggers are often difficult to identify. However, the majority of asthmatics have mixed asthma, which has both intrinsic and extrinsic triggers.

Intermittency of attacks: Frequency of attacks varies from asthmatic to asthmatic and, for any particular asthmatic, it may also vary from time to time. An asthmatic can

suffer several attacks a day, and then have no asthma for months, even years. In the case of extrinsic asthma, frequency of attacks can vary with change of season, due to altering levels of environmental triggers.

Variability of attacks: Each discrete attack varies in severity. In addition, the severity of the overall condition may alter with time.

Reversibility of asthma: In the majority of asthmatics reversibility of airways obstruction is complete, although in others it is not. Reversibility can occur either spontaneously or as a result of treatment. This feature distinguishes asthma from other respiratory illness such as emphysema, which do not remit.

Using these four characteristics, Creer et al. (1991, p. 497) offered a definition: "Asthma is a disorder characterized by increased hyperreactivity of the airways to various stimuli, including (i) allergens, (ii) nonspecific irritants, such as exercise and cold air, and (iii) infections. Several responses may occur, including (i) constriction of the smooth muscle in the bronchial wall, (ii) swelling of the bronchial walls, (iii) increased mucus secretion, (iv) infiltration of the inflammatory cells, or (v) a combination of these responses. The occurrence of these responses is commonly referred to as an asthma attack; these attacks, episodes, or flare-ups occur intermittently, vary in severity, and may reverse either spontaneously or as a result of treatment." This is the accepted formal definition of asthma, for the purpose of the current study.

(ii) Symptomatology

According to the Oxford Textbook of Medicine the principal clinical symptoms of asthma are breathlessness, wheezing, and chest tightening (Benson, 1984). Benson comments that the illness is frequently accompanied by coughing, which can be the

major symptom. In addition, asthmatics often experience fatigue, as a consequence of increased respiratory effort. Nocturnal wheeze in the early hours of the morning is also a common feature of the illness (Benson, 1984). Harrison's Principles of Internal Medicine lists dyspnea, coughing, and wheezing as the main clinical symptoms, commenting that the latter is often regarded as the trademark of the illness (McFadden, 1987).

Clinical descriptions of asthma (e.g., Benson, 1984; McFadden, 1987) seldom include description of the subjective symptomatology of the illness (Kinsman, Luparello, O'Banion, & Spector, 1973). The Asthma Symptom Checklist (ASC) (see Brooks et al., 1989; Kinsman et al., 1973; Kinsman, Dahlem, Spector, & Staudenmayer, 1977) provides a comprehensive list of these symptoms. The Brooks et al. (1989) version of this instrument lists the symptoms for adults asthmatics in the general population. This instrument identifies five categories of symptoms: (i) *panic fear* (e.g., afraid of being left alone, nervous, worried), (ii) *airway obstruction* (e.g., wheezing, chest tightening, coughing), (iii) *hyperventilation* (e.g., headache, dizzy, chest pain), (iv) *fatigue* (e.g., weak, exhausted, no energy), and (v) *irritability* (e.g., cranky, edgy, short tempered). Essentially, this listing extends clinical listings (e.g., Benson, 1984) by adding two categories of affective symptoms, panic fear and irritability.

(iii) Health behaviour

Asthma is a complex and unpredictable illness (e.g., Hilton, 1986; Rachelefsky, 1987), and the health behaviours required to prevent or control it are multifaceted. Klingelhofer and Gerswhin (1988) comment they are as multifarious as the illness itself.

A review of asthma literature reveals numerous commentaries on various aspects of asthma health behaviour (e.g., Bailey et al., 1987; Bailey et al., 1990; Benson, 1984;

Clark, Gotsch, & Rosenstock, 1993; Creer & Kotses, 1990; Hindi-Alexander, 1985; Hindi-Alexander & Throm, 1987; Klingelhofer & Gershwin, 1988; Lehrer, Sargunaraj, & Hochron, 1992; Matts, 1984; McFadden, 1987; Tehan, Sloane, Walsh-Robart, & Chamberlain, 1989; Wilson-Pessano & Mellins, 1987), but few attempts to systematically identify and classify them. However, Wilson and colleagues have made a substantial contribution to this area, by providing comprehensive lists and classifications of asthma health behaviour for children (McNabb, Wilson-Pessano, & Jacobs, 1986), for parents of infants and young children (Wilson, Mitchell, Rolnick, & Fish, 1993), and for adults (Wilson, 1993; Wilson et al., 1990; Wilson, Scamagas et al., 1993; Wilson-Pessano et al., 1987).

The list of adult behaviours reported by Wilson and colleagues are now described. They labelled these behaviours "health competencies", and this terminology is also used in the current study. Wilson-Pessano et al. (1987) identified 73 of these competencies using the critical incident technique (Flanagan, 1954), and Wilson et al. (1990) organised them into five major categories.

Preventive medication competencies involve a set of actions for following a prescribed medication regimen. Specific competencies include accepting the need to initiate and maintain a correct pattern of medication-taking, taking the medications as prescribed, using strategies to maintain adherence and minimize side effects, and adjusting the regimen in accordance with the prescription or after seeking additional medical advice.

Precipitant avoidance competencies involve a set of actions for avoiding or minimizing exposure to identifiable allergic, irritant, exertional, and/or emotional precipitants of asthma symptoms. Specific behaviours include working with the physician to clearly identify personal precipitants, avoiding airborne allergens/irritants in the home, workplace, or elsewhere, avoiding exertion, emotions, foods/beverages/medications

that have been identified as precipitating symptoms, not smoking or stopping smoking, and overcoming significant emotional, lifestyle, or situational barriers to effective avoidance of precipitants.

Symptom intervention competencies involve a set of actions for insuring appropriate care of symptoms and acute exacerbations. Specific competencies include recognizing early warning signs of asthma attacks, taking appropriate action to remove precipitants, using prescribed medication appropriately, and making correct decisions concerning the urgency and extent of self-care and medical treatment needed.

Communication competencies involve a set of actions to advance personal knowledge and capabilities in the self-management of asthma and to ensure an optimal relationship with the health care system. Specific competencies include reading and asking questions about asthma, establishing an on-going patient-doctor(s) relationship for clinical care, keeping the doctor(s) informed of changes in symptoms, and communicating effectively with doctor(s) who provide emergency treatment.

Health promotion competencies involve a set of actions for maintaining or improving general physical and mental health, thereby enhancing abilities to deal with asthma itself. Specific competencies include getting regular exercise, maintaining proper weight and nutrition, maintaining adequate hydration, getting adequate rest, as well as actions aimed at resolving major personal problems or stressful life situations that adversely affect asthma or asthma self-management (Wilson et al., 1990). They claim that this listing is comprehensive, and the rigorous methodology that they used to collect the competencies (Flanagan, 1954) and previous research (e.g., Lehrer et al., 1992) supports this claim.

1.2.2 Rationale for selecting asthma

Asthma was chosen as a suitable illness to test the study models for the following reasons. This choice is also justified from the viewpoint that further research on the health behaviours of adult asthmatics is needed.

(i) Reasons for selection

In the first instance, asthma is suitable for investigating the models because it is a chronic illness. For example, chronic asthmatics will have perceptions of the prevalence, treatability, and seriousness of their asthma. They will also be able to report on their history with the illness, and their experience of its symptoms. Further, asthmatics have been found to vary along dimensions of denial (e.g., Steiner, Higgs, Fritz, Laszlo, & Harvey, 1987). As an important adjunct, the selection of a chronic illness permits multiple measurements of variables over time. As such, it becomes possible to examine some important time-based issues such as test-retest reliability, stability of variable levels and variability, and replication of relationships. Finally, the selection of a chronic illness provides latitude in choosing a suitable time frame for data collection.

Asthma is also suitable because it has an associated set of health behaviours. This is important since a central feature of the consequences model is the relationship between seriousness and health behaviour. Also, asthma has an appropriate level of 'objective' seriousness. The 'objective' seriousness of this illness is not so low that sufferers will have insufficient motivation to engage in health behaviour (Becker & Maiman, 1975). Conversely, it is not so high that the robustness of the relationship between seriousness and health behaviour becomes uncertain (Becker & Maiman, 1975). The 'Seriousness of Illness Rating Scale - Revised' gives asthma a seriousness ranking of 85 from a total of 137 diseases (Rosenberg et al., 1987). As such, asthma falls into the midrange of 'objective' seriousness. Asthma is also a suitable illness from the viewpoint that it

is a symptomatic illness. According to Becker and Maiman (1975, p. 15) the experience of symptoms "exerts an elevating or 'realistic' effect on perceived seriousness", and the probability of obtaining a positive correlation between seriousness and health behaviour increases.

A range of other criteria point to the suitability of asthma for investigating the models. First, asthma is unlikely to manifest itself in a way that will disrupt data collection or lead to poor quality data being returned. This is true since asthma is an episodic illness and asthmatics function normally when not experiencing symptoms (McFadden, 1987). Second, asthma is not an illness which involves physiological and/or psychological addiction. The threat to health is complex for these illnesses, since the addictive substance(s) is reinforcing to the sufferer. Third, asthmatic subjects are readily accessible in New Zealand. Access to subjects is available through the Asthma Foundation of New Zealand, which coordinates thirty relatively autonomous Asthma Societies throughout the country (Kesten & Rebuck, 1991).

There is one criterion which asthma does not satisfy. It would be desirable that the selected disorder have a precise medical definition. As discussed earlier, the definition of asthma has long been a contentious issue. In research practice, this is best dealt with by requesting participation from physician-diagnosed asthmatics (e.g., Wilson, Scamagas et al., 1993).

In conclusion, asthma is a suitable illness to test the study models. It satisfies all the stated criteria, with the exception of precise medical definition.

(ii) Contribution to asthma health behaviour research

The selection of adult asthma is also justified from the viewpoint that there is a clear need for further research on adult asthma health behaviour. This need arises from

three general findings on asthma. First, there is substantial evidence that the personal and economic costs of asthma are very high (e.g., Bailey et al., 1987; Bailey et al., 1990; Brooks et al., 1989; Clark, 1989; Clark et al., 1993; Klingelhofer & Gershwin, 1988). Second, these costs can be attributed, at least in part, to the poor self-management practices of asthmatics (Bailey, et al., 1987; Bailey et al., 1990; Brooks et al., 1989; Creer et al., 1991; Hilton, 1986; Rea et al., 1986; Sibbald, White, Pharoah, Freeling, & Anderson, 1988; Voyles & Menendez, 1983). Third, there is evidence that teaching asthmatics the correct use of health behaviours offers them the most hope in self-managing their illness (Lehrer et al., 1992). The current study is expected to contribute to the understanding of these health behaviours. It is expected to provide descriptive information on them, and information on their cognitive determination. Such information should contribute to knowledge in the area of asthma self-management.

1.2.3 Asthma research

This section examines asthma research relevant to the current study. Few asthma studies have been conducted that bear directly on the determinants model. However, there has been some previous asthma research pertinent to the consequences model. To a large degree, these studies have investigated the determination of asthma health behaviour. They can be organised under four headings: demographic characteristics, denial, symptoms, and cognitions.

(i) Demographic characteristics

Although demographic characteristics generally do not distinguish non-adherers from adherers (Leventhal & Cameron, 1987), some studies have reported that specific demographic characteristics contribute to the determination of asthma health behaviour. First, Bauman and Powell-Davies (1989) report that socially disadvantaged asthmatics are less likely to use health behaviours. This suggests that socio-economic

status and/or ethnicity may be determinants of asthma health behaviour. There is some evidence of this in New Zealand, where the self-management practices of Maori asthmatics are poorer than those of Europeans (Pomare et al., 1992).

In an HBM study, Jones, Jones, and Katz (1987) report statistically significant associations between demographic characteristics and two aspects of asthma adherence, making and keeping appointments. They reported that older asthmatics were more likely to make and keep appointments than younger asthmatics, as were married asthmatics compared to single asthmatics. Women were more likely to make appointments than men. Interestingly, educational level did not determine these adherence measures. In another study, Bailey, Richards, Brooks, Soong, and Brannen (1992) found that older asthmatics adhere better to oral medications and have a tendency toward better adherence with inhaled bronchodilators than younger asthmatics.

Although not a demographic characteristic, a number of studies report that social support improves the self-management practices of asthmatics (Bailey et al., 1987; Sibbald et al., 1988; Snadden & Brown, 1992; Tehan et al., 1989). In contrast, social influences such as unfavourable attitudes and prejudices toward asthmatics may adversely influence these practices. Lack of knowledge about asthma and its management on the part of family, friends, or employers may have a similar effect (see Bailey et al., 1987).

(ii) Denial

A number of reviews concur that there is no personality pattern exclusive to persons with asthma (Creer, 1978; Purcell & Weiss, 1970; Renne & Creer, 1985). However, certain psychological variables are sometimes accentuated in asthmatics, as a consequence of the illness. These include anger and aggression, fears and phobias,

depression, and denial of illness (Creer & Kotses, 1990). One study (Creer et al., 1989) found that from a total of 65 adolescents and adults with asthma 52% said that they sometimes denied their illness.

A number of studies report that asthmatics have high levels of denial (e.g., Agle, Baum, Chester, & Wendt, 1973; Yellowlees & Ruffin, 1989). Yellowlees and Ruffin comment that this is generally helpful to asthmatics, assisting them to deal with constant losses in health and self-esteem, maintain a normal social presentation, and deal with external influences such as stigmatization. Thus, a higher than usual level of denial may be normal and adaptive in persons with asthma.

Other research suggests that asthmatics using excessively high levels of denial may be at risk (Dirks, Schraa, Brown, & Kinsman, 1980). They report that some asthmatics employ a defensive style termed 'inappropriate excessive independence', which is related to heightened use of denial and poorer adherence practices. Dirks, Horton, Kinsman, Fross, & Jones (1978) found that this style is related to higher hospitalization rates. Another study found that denial, poor adherence, and psychological problems were more common in asthmatics who died (Sears & Beaglehole, 1987). Similarly, Yellowlees and Ruffin (1989) report that the presence of excessive levels of denial and a history of psychiatric illness increase the likelihood of death from asthma. Thus, asthmatics using very high levels of denial may be at risk, and this can probably be linked to their poorer adherence practices.

Other lines of research support a relationship between the excessive use of denial and poor health outcomes in asthmatics. One study (Steiner et al. 1987) investigated the role of repressive defense style (RDS) in the perception of asthma. They offered a definition of persons who have an RDS, known as repressors: "Repressors are characterized by the reporting of low anxiety on rating scales and high defensiveness

with paradoxically high autonomic (skin response, heart rate) and behavioural indices of anxiety. They can therefore be distinguished from truly 'low anxious' subjects who do not report high defensiveness and do not demonstrate other signs of anxiety" (p. 35). Essentially, repressors are persons who have stable and high levels of denial, and can be distinguished from persons with truly low anxiety. Steiner et al.'s (1987) investigation was prompted by the findings of Rubinfeld and Pain (1976), who reported that 15% of asthmatics are unable to sense marked changes in obstruction to their airways. Steiner et al. investigated the hypothesis that this inability is correlated with insensitivity to emotional arousal, which is related to RDS. This hypothesis was confirmed, with asthmatic repressors showing less ability to accurately perceive asthma. Steiner et al. argue that RDS may play a role in the pathogenesis and psychomaintenance of asthma. Other studies report that asthmatics with high trait anxiety have more frequent and longer stays in hospital (Kinsman, Dirks, & Jones, 1982), and that low levels of attack related anxiety is also associated with increased frequency of hospitalization (Dirks, Kinsman, Horton, Fross, & Jones, 1978). Thus, it would seem likely that asthmatic repressors are more likely to be hospitalized. Steiner et al.'s findings provide one possible explanation for this. As a consequence of misperceiving their illness, asthmatic repressors may be less likely to take appropriate action.

(iii) Symptoms

A number of general studies report a relationship between the experience of symptoms and the use of health behaviour (Becker & Maiman, 1975; Blackwell, 1979; Ford et al., 1989; Hampson, Glasgow, & Zeiss, 1994; Jonsen, 1979; Keller, Ward, & Bauman, 1989; Klonoff, Annechild, & Landrine, 1994). According to Becker and Maiman (1975) the presence of symptoms motivates a patient to adhere, and continues to do so provided the organic indications persist. This is supported by the large number of studies reporting that patients sometimes discontinue with prescribed

treatments when they feel better (e.g., Becker & Maiman, 1975). Another study (Ford et al., 1989) reports that the experience of symptoms is an important variable contributing to the psychological distress associated with a chronic illness. They argue that this distress provides the motivation to engage in health behaviour. Consistent with this explanation, other studies (Blackwell, 1979; Jonsen, 1979) have viewed symptoms as cues that elicit health behaviour. Hindi-Alexander and Throm (1987) have demonstrated a relationship between symptom experience and health behaviour in asthmatics. In addition, they report that asthmatics with "occasional" symptoms are twice as likely to be low adherers compared to those with "constant" symptoms (p. 8). Consequently, frequency of asthma symptoms and adherence are related.

As mentioned earlier, Brooks et al. (1989) identified five factors of asthma symptoms; panic fear, airways obstruction, hyperventilation, fatigue, and irritability. To date, the panic fear factor has attracted most research attention. One study (Jones, Kinsman, Dirks, & Dahlem, 1979) reports that high panic fear promotes greater use of bronchodilator medication, and is related to lower emergency hospital admissions. Hyland, Kenyon, Taylor, and Morice (1993) comment that asthmatics high in panic fear have a vigilant, symptom-sensitive focus consistent with persons who are at the approach pole of the approach-avoidance continuum (see Roth & Cohen, 1986). Although these asthmatics suffer greater distress from their illness, they have better adherence and long term control over the illness. This is consistent with research reported earlier, on the relationship between RDS and adherence in asthmatics. It is likely that panic fear and RDS are negatively related.

(iv) Cognitions

Limited research has been conducted on the cognitive determinants of asthma health behaviour. A few studies have examined the roles of seriousness and self-efficacy in explaining these behaviours, and Maes and Schlosser (1987; 1988a; 1988b) have

conducted some studies that are relevant to the present study. In addition, there has been some largely theoretical work on the possible moderating or mediating role of illness cognitions in the relationship between knowledge of asthma and performance of health behaviour.

Research using the HBM provides evidence that seriousness explains asthma health behaviour. One study (Smith, Ley, Seale, & Shaw, 1987) investigated relationships between measures of parents' health beliefs and adherence in children with asthma. They found that seriousness positively correlated with concurrent adherence, but did not predict future adherence. In another study, Jones et al. (1987) investigated the use of the HBM in improving adherence for adult asthmatics visiting an emergency department of a hospital. They studied a specific aspect of adherence, making and keeping appointments, and found a positive association between seriousness and these outcomes.

Other studies suggest that self-efficacy is an important determinant of health behaviour in asthmatics. Clark et al. (1988) investigated health beliefs and feelings of self-efficacy in children with asthma. They found that, among other factors, self-efficacy predicted self-management, whereas perceived seriousness of attacks and beliefs concerning the benefits of self-management did not. In passing, these researchers suggest that their findings should be interpreted with caution, in the light of the developmental status of children and possible measurement inadequacies of the study. In another study, Kaplan, Atkins, and Reinsch (1984) trained chronic obstructive pulmonary disease patients to walk using a variety of methods. One of the methods was to confront patients' irrational perceptions of the consequences of walking and encourage optimistic self-talk. At a 3-month follow-up, Kaplan et al. found that changes in self-efficacy to walk were associated with walking adherence ($r = .32$), whereas health locus of control was unrelated.

Three studies by Maes and Schlosser shed light on the role of cognitions in determining health outcomes, including health behaviour. Maes and Schlosser (1987) investigated the influence of various cognitions and coping mechanisms on well-being, hospital admissions, medication consumption, and absence from work due to asthma in asthmatic patients. Subjects were asked to complete questionnaires, which included measures of external control, psychological stigma, optimism, coping mechanisms, state and trait anxiety, as well as measures of the outcome variables. They found that cognitions and coping determined a considerable amount of variance in all the dependent variables, apart from medication consumption. However, Maes and Schlosser (1987) queried the finding for medication consumption, suggesting that their measure of it was not sufficiently sensitive. They also suggested that the study should be revised to include a measure of asthma adherence. In another study, Maes and Schlosser (1988a) constructed a cognitive-educational intervention programme aimed at altering coping behaviour in asthmatic patients. The programme primarily drew upon principles of Ellis' (1962) rational emotive behaviour modification. Measures of cognitive attitudes (optimism, locus of control, shame/stigma), coping behaviour in attack situations (minimizing the seriousness of the attack, rational action, and reacting emotionally), coping in daily life (maintaining a restrictive lifestyle, focusing on asthma and hiding asthma), emotional distress (anxiety, anger, and depression), and the use of medication were taken for both experimental and control subjects, before and after the intervention. The subjects who received the intervention became less preoccupied with their asthma and reported significantly lower emotional distress in their daily lives. Also, they reported using less maintenance medication. This study demonstrates that using Ellis' rational emotive therapy as a basis for a cognitive group intervention programme can improve the functional status of asthmatics, and reduce their dependence on medication. For more detail on these two studies, see Maes and Schlosser (1988b).

Separate from the research just described, some researchers have theorized about a possible mediating or moderating role for cognitions in the relationship between knowledge and performance of health behaviour in asthmatics. There is considerable evidence that knowledge of asthma is not a sufficient condition, in itself, to promote health behaviour. For example, some studies report no association between asthma knowledge and asthma morbidity (Hilton, Sibbald, Anderson, & Freeling, 1982; 1986), and other studies (Creer & Kotses, 1990; Klingelhofer & Gerswhin, 1988) have concluded that although asthma self-management programmes nearly always transmit knowledge to asthmatics, they do not necessarily result in improved control over the illness or better adherence.

Bridging the gap between knowledge and performance is perhaps the most substantial theoretical question facing developers of asthma self-management programmes. A number of studies (e.g., Creer, 1987; Creer & Kotses, 1990) point to the importance of cognitive and motivational factors in the knowledge/performance relationship. In essence, they argue that if an asthmatic knows what to do and the cognitive and motivational variables prompt him or her to do so, the individual will perform the health behaviour. For example, it has been suggested that improving the self-efficacy expectations of asthmatics should strengthen the knowledge/performance relationship (Creer, 1987; Creer & Kotses, 1990). Few empirical studies have investigated the role of cognitive and motivational factors in this relationship (Creer & Kotses, 1990).

(v) Summary

A review of the literature reveals that certain demographic characteristics are associated with asthma health behaviour. These are age, gender, socio-economic status, ethnicity, and marital status. There is also evidence that social factors, such as social support and prejudicial attitudes, can influence these behaviours.

Many asthmatics experience high levels of denial, which can be viewed as an adaptive feature of their functioning (Yellowlees & Ruffin, 1989). However, asthmatics who use excessive amounts of denial (or who are repressors) are more likely to be hospitalized, probably because they deny (or repress) the illness and the need to take appropriate action.

A number of studies provide support for a positive relationship between extent of symptoms and use of health behaviour in asthmatics. This includes support for a relationship between frequency of symptoms and health behaviour. Some research reveals that there is a link between the experience of panic fear symptoms and adherence.

Few studies have examined the influence of cognitions in determining asthma health behaviour. However, there is some evidence that both seriousness and self-efficacy are important. Some studies show that cognitions influence asthma medication consumption (e.g., Maes & Schlosser, 1988a). Other lines of research have theorized about the possible moderating or mediating role of cognitive and motivational factors in the knowledge/performance relationship in asthmatics.

1.3 The present study

The present study has one central objective: to test the determinants and consequences models. An additional aim was to generate information of applied value in the area of asthma self-management. Adult asthma was selected as a suitable illness to test the models. The determinants model proposes that perceived prevalence, treatment information, and personal experience are associated with perceived seriousness, and that denial moderates these relationships. The consequences model proposes that perceived seriousness is associated with health behaviour, and that self-efficacy

moderates this relationship.

In order to complete the formulation of the current study it is necessary to reconceptualize some of the constructs used by Croyle, Jemmott, and colleagues in order to develop the determinants model. This is necessary because their work experimentally investigated psychological reactions following "diagnosis", whereas the current study investigates a chronic illness using correlational methods. In essence, Croyle, Jemmott, and colleagues manipulated variables such as perceived prevalence and treatment information, and this cannot be done in the current study.

In contrast to Jemmott et al.'s (1986) study, where perceived prevalence was a manipulated variable, participants in the current study will be asked to provide estimates of the prevalence of asthma in New Zealand. Similarly, Ditto et al.'s (1988) treatment information construct was also a manipulated variable. In the present study, participants will be asked to provide estimates of the extent to which they perceive asthma to be treatable. This was labelled perceived treatability. Finally, Jemmott et al.'s (1988) personal experience construct was considered to be equivalent to asthma history in the current context. This was indexed by obtaining ratings on three variables: duration of asthma, average intensity of asthma, and frequency of attacks. Together, these variables characterize an individual's asthma history in a direct way.

To finalize the determinants model it is necessary to consider how to assess denial. Repressive defense style (RDS) is one of the most common ways in which denial has been conceptualized. Numerous studies have been conducted on RDS (e.g., Asendorpf & Scherer, 1983; Holroyd, 1972; Weinberger, Schwartz, & Davidson, 1979; Weinstein, Averill, Opton, & Lazarus, 1968), and asthmatics have been found to vary along this dimension (Steiner et al., 1987). For the purpose of the current study, RDS will be adopted as the measure of denial in the determinants model.

Aside from reconceptualizing Croyle, Jemmott, and colleagues' constructs to make them suitable for use in the current study, one further conceptual issue concerning the measurement of perceived seriousness in the current study needs consideration. Clearly, single item self-report measures, such as those used in Croyle, Jemmott, and colleagues' work and in HBM research, provide one possible way of assessing seriousness. However, given the centrality of seriousness as a construct in the current study, it was felt necessary to consider alternative assessments of it. In the context of asthma, the assessment of seriousness can be extended by including a measure of asthma symptoms. The Asthma Symptom Checklist (ASC) (Brooks et al., 1989) provides measures of both frequency and number of symptoms, and both of these will index asthma seriousness. Specifically, it can be assumed that when asthmatics experience a greater frequency of symptoms, or a larger number of symptoms, their asthma is more serious. For this reason, the ASC was included in the present study to provide a more comprehensive assessment of seriousness, and to avoid reliance on single item measures of this central construct. This completes the formulation of the current study, and the hypotheses can be offered.

There are two separate sets of hypotheses in the current study. The determinants of seriousness model has four hypotheses:

a) It is hypothesized that there is a relationship between perceived prevalence and perceived seriousness.

b) It is hypothesized that there is a relationship between perceived treatability and perceived seriousness.

c) It is hypothesized that there is a relationship between asthma history and

perceived seriousness.

d) It is hypothesized that RDS moderates each seriousness relationship. i.e. The relationship between a determinant and perceived seriousness will be stronger for asthmatics higher in RDS compared to asthmatics lower in it.

The consequences of seriousness model has three hypotheses:

a) It is hypothesized that there is a positive relationship between perceived seriousness and asthma health behaviour.

b) It is hypothesized that personal efficacy moderates the relationship between perceived seriousness and asthma health behaviour. i.e. The relationship between perceived seriousness and asthma health behaviour will be stronger for asthmatics higher in personal efficacy compared to asthmatics lower in personal efficacy.

c) It is hypothesized that response efficacy moderates the relationship between perceived seriousness and asthma health behaviour. i.e. The relationship between perceived seriousness and asthma health behaviour will be stronger for asthmatics higher in response efficacy compared to asthmatics lower in response efficacy.

In addition to the formal hypotheses, some supplementary research questions were addressed in the current study. These include the questions: (i) Do seriousness and health behaviours vary according to demographic characteristics? (ii) Does self-efficacy influence health behaviours directly? (iii) Do the levels of the study variables change over time? (iv) Do the study relationships replicate over time? Questions (iii)

and (iv) can be addressed since the current study involves two phases (see Section 2.1).

CHAPTER II

METHOD

2.1 Design

A postal survey design was used, which involved two administrations of essentially the same questionnaire (see Appendices D & F), separated by six months. The first questionnaire was administered in mid-September 1991, during Spring; and the second was administered in mid-March 1992, during Autumn.

The design permits an investigation of a number of important time-based issues. Test-retest reliabilities for a number of the study variables were unavailable, and these can be calculated directly from the data. In particular, they can be computed for a number of key single item measures, constructed specifically for the study. Stability of variable levels and variability can be examined, which provide information on how asthma perceptions and the use of health behaviours differ across the two measurement points. The design also allows for an investigation of replication of relationships.

2.2 Sample

Eligibility to participate in the current study was determined by three inclusion criteria. First, a participant must be diagnosed as having asthma. This criterion was considered to be the most effective way to target asthmatics when using a postal survey design. Second, a respondent must be 18 years of age or over. Finally, a respondent must not be experiencing substantial symptoms other than those that relate to asthma. Other research (Wilson, Scamagas et al., 1993) has used a very comparable set of criteria to define eligibility to participate in adult asthma research.

Participants were drawn from the memberships of the Auckland and Canterbury

Asthma Societies. The Auckland Society has approximately 3000 members (K. Hyde-Smith, personal communication, June 20, 1991), and the Canterbury Society approximately 1000 members (S. Yates, personal communication, May 20, 1991). Consistent with this, approximately three quarters of the sample was drawn from the Auckland Society, and approximately one quarter from the Canterbury Society.

No systematic sampling procedure was used in the study. Participation was sought by circulating the study information in a newsletter posting of both Societies. All members of the two Societies therefore received a request to participate. A total of 430 (approximately 11%) agreed to participate in the study. Members declined to offer participation for two reasons. First, some were ineligible under the inclusion criteria and, second, of those who were eligible, some were unwilling to take part. Members who were ineligible to participate included those who were (i) parents of asthmatic children, (ii) asthmatic but under the age of 18, (iii) persons suffering from chronic obstructive pulmonary disease, or (iv) persons interested in asthma, but not asthmatic. It is not possible to calculate the true response rate for the study.

A total of 9 out of the 430 consenting participants were omitted from the sample. These persons were either offering participation on behalf of their child(ren) or their postal address was not legible. Of the 421 participants who subsequently received the first questionnaire 412 (97.9%) returned it completed. Only those participants who returned a completed first questionnaire received the second questionnaire. A total of 389 of the 412 (94.4%) participants returned this second questionnaire.

The sampling procedure used clearly does not generate a representative sample of New Zealand adult asthmatics. For example, Maori asthmatics are under-represented in the sample. Maori people comprise 12.4% of the total population (Kesten & Rebuck, 1991), and the prevalence of asthma in Maori and non-Maori populations are similar

(see Pomare et al., 1992; Shaw, Crane, O'Donnell, 1991), yet only 1.2% of the sample is Maori (see Table 1). It is not known whether or not the procedure delivers a representative group of adult asthmatics who belong to the two Asthma Societies sampled, since demographic information on the memberships of those Societies is unavailable. Regardless, sample representativeness is not a concern in the current study, where the objectives are to test two sets of theoretical relationships and generate some information of practical value to asthmatics. These objectives are achievable provided the sampling procedure delivers a "variety" of asthmatics, such that the study variables have sufficient variability. The study is not concerned with estimating population parameters (Note: see an article published by the current author in the *Marketing Bulletin*, at Appendix J).

Prior to the data collection, a power analysis was conducted to estimate the required number of participants. Since multiple regression analysis was planned, it was estimated that in excess of 300 subjects were required to obtain adequate statistical power. First, the rule of thumb requiring a minimum of participants equal to 10 times the number of variables was applied. Since the study involves 14 variables, excluding demographic variables, 300 subjects was considered adequate. Second, since it was anticipated that some of the bivariate relationships would be quite small, the power of the design was calculated to be 95% for any effect with r=.2, alpha=.05, two tailed, and N=300 (Cohen, 1977). Consequently, for any number of participants in excess of 300, the design will be sufficiently powerful to detect the effects anticipated.

2.3 Demographic Information

Demographic statistics were computed for the 412 participants that completed the first questionnaire. These statistics are presented in Table 1. Of the 412 respondents, 151 were male (36.7%) and 261 were female (63.3%). Respondents ranged in age from 18 to 85 years, with a mean age of 47.2 years (SD=16.2 years). Almost all of the

Table 1

Gender, age group, ethnicity, educational level, occupational status, and marital status for the sample at Time 1 (N=412).

		N	%
Gender			
	Male	151	36.7
	Female	261	63.3
Age group			
	18-19	17	4.1
	20-29	47	11.4
	30-39	73	17.7
	40-49	102	24.8
	50-59	64	15.5
	60-69	63	15.3
	70-79	39	9.5
	over 80	7	1.7
Ethnicity			
	European	386	93.7
	Maori	5	1.2
	Polynesian	3	0.7
	Other	16	3.9
	Unknown	2	0.5
Educational level			
	Some primary school	1	0.2
	Completed primary school	6	1.5
	Some high school	37	9.0
	Completed school to 5th Form	70	17.0
	Completed school to 6th Form	45	10.9
	Completed school to 7th Form	12	2.9
	Technical training	95	23.1
	Some university	52	12.6
	Graduated from university	68	16.5
	Other	26	6.3
Occupational status			
	Employed full-time	167	40.8
	Employed part-time	63	15.4
	Taking care of a home	60	14.7
	Looking for work	10	2.4
	Too unwell to work	9	2.2
	Retired	86	21.0
	Other	14	3.4
	(missing)	3	
Marital status			
	Single	68	16.6
	Married or de-facto	292	71.2
	Separated	11	2.7
	Divorced	20	4.9
	Widowed	19	4.6
	(missing)	2	

respondents (93.7%) were of European descent, with only 1.2% being Maori. A total of 10.7% had received less than Fifth Form education, 30.8% had completed Fifth to Seventh Form, and 52.2% had received some tertiary education. Approximately half of the participants (56.2%) were employed either full-time or part-time. There was participation by retired persons (21.0%), and 14.7% reported that they were taking care of a home. Most participants were either married or de-facto (71.2%), and 16.6% were single.

Although not demographic characteristics, information collected on duration of asthma and seasonal variation of asthma contributes usefully to the description of the sample. Duration of asthma ranged from less than one year to 73 years, with a mean duration of 25.7 years (SD = 16.4 years). A total of 107 respondents thought Winter was the worst season for their asthma, and 68 thought Spring was. Summer and Autumn were viewed as the best seasons for dealing with asthma. There was quite a large group (140) who did not experience seasonal variation in asthma.

2.4 Procedure

In the first instance, the Asthma Foundation of New Zealand was contacted for assistance in securing a sample of adult asthmatics. Provincial Asthma Societies in New Zealand are affiliated to this organisation. A request for access to the mailing lists of the Auckland and Canterbury Societies was declined by the Foundation. Approval was therefore sought to circulate the study information in the newsletter postings of these two Societies, which was granted. The study information consisted of an information sheet and a consent form. These were included as two separate pages for the circulation in Auckland (see Appendix A), and as one combined sheet for the Christchurch circulation (see Appendix B), to comply with the respective Area Health Board Ethics Committees involved. However, the same information was conveyed in both instances. A reply-paid self-addressed envelope was included in the

newsletter circulations so that respondents could return consent forms without incurring cost. Respondents consented to their participation by signing, dating and returning the consent form to the researcher.

On receipt of the consent forms, the first questionnaire was posted to participants. This posting included a covering letter (see Appendix C), a reply-paid return-addressed envelope to return the questionnaire, and the questionnaire itself. Reminder letters were sent to participants who did not return their questionnaires within 21 days. This did not include another copy of the questionnaire or a further return-addressed envelope.

The second questionnaire was substantially the same as the first. This questionnaire was posted to participants six months after the first questionnaire. The very few respondents who returned unusable first round data did not receive this posting. The second posting included a covering letter (see Appendix E) and a reply-paid self-addressed envelope to return the questionnaire. Reminder letters were once again sent to participants who did not furnish a return within 21 days.

The final procedure was to provide participants with a feedback sheet, summarizing the findings of the study. This was written simply and avoided complex technical detail. As a matter of courtesy, participants who returned unusable first round data, and who were not sent the second questionnaire, were provided with a feedback sheet. The summary was also sent to the two Asthma Societies involved, and the Asthma Foundation of New Zealand. The Foundation was also sent copies of in-press articles, based on the study findings.

2.5 Questionnaires

Before commencing the data collection, a pilot study was conducted on the

questionnaire. Twenty adult asthmatics who were known to the researcher or his colleagues and who reside in Palmerston North completed this questionnaire. Each was subsequently interviewed and asked to comment on it. In particular, each was asked about his or her interpretation of the single item measures in the study. This investigation revealed no major problems with the questionnaire, although some minor rewording of a few items was necessary.

The format of both questionnaires was designed for self-completion by participants. The first questionnaire contained measures of asthma symptoms, self-rated seriousness, perceived prevalence, perceived treatability, four aspects of asthma history (duration, average intensity over entire history, average intensity over the last six months, and frequency of attacks), RDS, response efficacy, personal efficacy, asthma health competencies, asthma medication adherence, seasonal variation in asthma, as well as demographics. The second questionnaire contained the same measures excluding duration, average intensity over entire history, RDS, seasonal variation in asthma, and the demographics. These excluded variables were considered stable characteristics and were only assessed once. Three additional variables (subjective health, perceived seriousness of the worst asthma attack in the last month, and a measure of coping) were included in the second questionnaire. However, these variables were not used in the current analyses. As such, there is no further reference to them in the text, and they are not included in Questionnaire 2, as it appears in Appendix F.

(i) Seriousness

The seriousness construct was assessed using three measures. The first of these was termed self-rated seriousness and was a single item:

"In your opinion, how serious a threat to your health is your asthma?"

This item was modified from a measure used in previous research (Jemmott et al.,

1988). Jemmott et al.'s measure was reworded slightly, to make it applicable to asthma. The modified item was rated on a 6-point scale ranging from 1 (Not at all serious) to 6 (Extremely serious). From the current study, the test-retest reliability for this measure is r=.67 over the six month period between measurement points.

The Asthma Symptom Checklist (ASC) (Brooks et al., 1989) provided two further measures of seriousness; frequency of symptoms and number of symptoms. Here, it is assumed that when asthmatics experience a greater frequency of symptoms or a larger number of symptoms their asthma is more serious. It should be noted that this is a key assumption in the current study, and verification for it will be sought when the data is analyzed. In passing, symptom severity scores cannot be computed from the ASC.

The ASC is a Likert-type instrument on which participants report the frequency with which 36 symptoms occur in connection with their asthma. Each symptom is rated on a 5-point scale ranging from 1 (Never) to 5 (Always). Brooks et al. constructed the ASC by investigating adult asthma symptomatology using an outpatient population. The authors conducted a principal components analysis which revealed five factors. They labelled these (i) panic-fear, (ii) airways obstruction, (iii) hyperventilation, (iv) fatigue, and (v) irritability. For the current study, one item (Tingling in spots) was deleted from the checklist, following the piloting of the first questionnaire. The meaning of this item was less than certain to the pilot participants.

Brooks et al. (1989) report alpha reliabilities for the factors ranging from .84 to .94, large standard deviations for those factors, and differences in mean factor scores that are consistent with clinical experience. They also report that the factors, especially panic fear, correlate in the expected direction with physician judgements of severity, and with efficacy in preventing attacks and controlling asthma, providing evidence for their validity. The current study provides additional evidence on the ASC's reliability, with full scale test-retest coefficients of r=.80 for frequency of symptoms, r=.70 for

number of symptoms, and an alpha reliability of .94 using data from the first questionnaire. Table 2 provides reliability information on the ASC factors from the present study. The alpha reliabilities are very acceptable. The test-retest reliabilities were generally satisfactory, although the coefficient for airways obstruction (number of symptoms) was surprisingly low (r=.29).

Table 2

Test-retest (frequency and number of symptoms) and alpha (Round 1 data) reliabilities for the ASC factors.

	Test-retest reliability		
ASC factor	Frequency of symptoms	Number of symptoms	Alpha reliability
Panic fear	.73	.73	.92
Airways obstruction	.57	.29	.89
Hyperventilation	.69	.59	.73
Fatigue	.62	.53	.92
Irritability	.68	.64	.87

(ii) Prevalence and treatability

Perceived prevalence and perceived treatability were assessed using single items:

"In your opinion, how common an illness is asthma in New Zealand?"

"In your opinion, how treatable is your asthma?"

These items were constructed by the researcher. For both items, study participants were required to respond on 10 cm visual analogue scales. The perceived prevalence scale used the anchors "Somewhat common" and "Extremely common", and the perceived treatability scale used "Only slightly treatable" and "Extremely treatable". Pilot study evidence suggested that these sets of anchors permit a full range of response, while optimizing scale sensitivity. Test-retest reliabilities from the current

study were r= .58 for prevalence and r= .53 for treatability. Scores were calculated for the prevalence scale by measuring the number of millimetres from the left hand anchor (i.e. "Somewhat common") to the response. Scores for the treatability measure were calculated in a similar fashion.

(iii) Asthma history

Asthma history was assessed with four single items concerning duration, intensity, and frequency. These items were constructed by the researcher.

Duration of asthma was assumed to be stable and was only assessed at Time 1. To measure it respondents were asked:

"In what year did you first experience problems with asthma?"

Average intensity of asthma was assessed using two items:

"On average, how intense has your asthma been since you first experienced it?"
"On average, how intense has your asthma been during the last six months?"

For both these items, respondents were required to respond to a 6-point scale ranging from 1 (Not at all intense) to 6 (Extremely intense). The average intensity over entire history item was assumed to be stable and was only assessed at Time 1. The current study provides a test-retest reliability of r= .56 for the average intensity over the last six months item.

Frequency of attacks was assessed using the following item:

"How frequently do you experience asthma attacks?"

For this item, participants were required to respond to a 7-point scale ranging from 1 (Not at all frequently) to 6 (Extremely frequently), and included the anchor 0 (Can't

say). The "Can't say" anchor was included to cover the possibility that some asthmatics only experience low level wheeze and not actual attacks. A test-retest reliability of r=.66 was found for this measure.

(iv) Health behaviour

Adult asthma health behaviour was assessed using two separate instruments. The first provided a comprehensive assessment of all adult asthma behaviours. As mentioned earlier, these were termed asthma health competencies (e.g., Wilson et al., 1990). The second provided an assessment of adherence to asthma medications.

The asthma health competency inventory was constructed on the basis of previous research (Wilson, 1993; Wilson et al., 1990; Wilson, Scamagas et al., 1993; Wilson-Pessano et al., 1987). Wilson-Pessano et al. (1987) identified 73 distinct asthma self-management competencies for adults using the critical incident technique (Flanagan, 1954), and Wilson et al. (1990) organised them into five major categories: (i) preventive medication competencies (skills to follow a medication programme), (ii) precipitant avoidance competencies (skills to avoid or minimize exposure to personal precipitants), (iii) symptom intervention competencies (skills to take care of acute symptoms), (iv) communication competencies (skills to improve personal knowledge of asthma, and to establish a good relationship with the physician) and, (v) health promotion competencies (skills to maintain or improve general physical and mental health, and thereby improve ability to deal with asthma). Wilson et al. (1990) claim this listing comprehensively captures the domain of interest (see Section 1.2.1 iii for more detail).

Based on the advice of a local physician some minor modifications were made to the listing. Seven items were deleted because they were not the usual medical practice in New Zealand, and some American terminology was adjusted to ensure appropriateness

to a New Zealand context. The inventory asked participants to indicate whether or not they engage in each of the competencies, by responding 'yes', 'no', or 'not applicable'. The scale was scored by summing the number of 'yes' responses.

From the current study, the test-retest reliability for the resulting 66 item scale was r=.84, and the alpha reliability was .90 using the first round data. Given the relative insensitivity of the yes/no/not applicable response scale used in the inventory, and the low number of items in some factors (see Table 18, Appendix I) it was viewed necessary to check the reliabilities of the factors. Respectively, this revealed alpha (based on Round 1 data) and test retest reliabilities as follows: preventive medication competencies r=.56, r=.57; precipitant avoidance competencies r=.85, r=.64; symptom intervention competencies r=.75, r=.54; communication competencies r=.66, r=.42; health promotion competencies r=.59; r=.51.

The adherence practices of participants were also assessed. Hindi-Alexander (1985) reports that asthma regimens can be complex, and may involve up to 4 or 5 different medications. Moreover, a variety of routes of administration can be used to achieve systemic distribution of these medications; namely, inhalation, orally, intravenously, or less frequently intramuscularly (S. Wilson, personal communication). Given the wide range of asthma medications available and the assortment of routes to administer them, the assessment of asthma adherence is complex. In the current study, adherence was assessed in two ways; inhalation versus all other routes.

Adherence to asthma medications was assessed using two scales that were developed from Morrisky, Green, and Levine's (1986) general scale of adherence (Bailey et al., 1987). Bailey et al. modified the Morrisky scale to make it applicable to asthma, by changing some words and adding items to assess overuse of medication. They constructed two six item scales to assess adherence to inhaled and to other

medications. Participants were asked to report on various aspects of their adherence, by responding to 5-point scales ranging from 1 (Never) to 5 (Always). Separate scores were created for adherence to inhaled and to other medications. To do this, all items were recoded so that higher scores indicate greater adherence, and then two total scores were computed by summing over each respective set of six items.

Brooks et al. (1994) report that the Bailey et al. (1987) scales have standard deviations large enough to detect variation in adherence, adequate reliability, and the ability to reflect the impact of an intervention designed to improve adherence. In the current study, the adherence to inhaled medications scale has an alpha reliability of $r=.66$ (Round 1 data) and a test-retest reliability of $r=.68$; and the adherence to other medication scale has an alpha of $r=.72$ and a test-retest of $r=.63$.

(v) Self-efficacy

In the first instance, the Asthma Self-Efficacy Scale (Tobin, Wigal, Winder, Holroyd, & Creer, 1987) was reviewed for its suitability to assess response and personal efficacies. However, it is not possible to investigate response efficacy by modifying this scale, and this option was unacceptable. Rather, it was decided to assess self-efficacy by using the five categories of asthma health competency reported earlier (e.g., Wilson et al., 1990). Based on previous research (Beck & Lund, 1981) items reflecting the definitions of response and personal efficacy were constructed. For example:

> *"How effective do you think your preventive medication competencies are in managing your asthma?"*
>
> *"How capable do you think you are at carrying out preventive medication competencies?"*

For each of the 5 categories of health competency a description was offered followed by the two efficacy items for that category. The response efficacy items were rated on 6-point scales ranging from 1 (Not at all effective) to 6 (Extremely effective), and the personal efficacy items were rated on 6-point scales ranging from 1 (Not at all capable) to 6 (Extremely capable). Scores were computed for personal and response efficacies by summing over each respective set of five items. For both, higher scores indicate greater efficacy.

From the current study, response efficacy has an alpha reliability of $r = .78$ (Round 1 data) and a test-retest reliability of $r = .67$; and personal efficacy has an alpha of $r = .83$ and a test-retest of $r = .68$.

(vi) Repressive defence style

Jamner and Schwartz (1986) report that the Self-Consciousness Scale (SCS) (Fenigstein, Scheier, & Buss, 1975) can be used to assess repressive defence style (RDS). Other studies (Carver & Scheier, 1981; Schwartz, 1984) report that this style is characterized by low self-monitoring. In broad terms, self-monitors are persons who seek out and monitor for information about (health) threat, as opposed to blunters who cognitively distract from and psychologically blunt that information (Miller, 1987; Miller, Brody, & Summerton, 1988). The SCS has three subscales; private self-consciousness, public self-consciousness, and social anxiety. Of these, the private self-consciousness subscale, consisting of ten items, assesses "attention to one's inner thoughts and feelings" (Fenigstein et al., 1975, p. 523) or self-monitoring. Consequently, lower scores on this subscale indicate greater RDS. Overall, the subscale provides a suitable assessment of RDS in the current study. The subscale is scored by reversing and summing items to provide total scores, so that higher scores indicate greater RDS.

The private self-consciousness subscale is reported to have a test-retest reliability of r=.79 (Fenigstein et al., 1975), and the complete instrument is reported to be valid (Carver & Glass, 1976; Carver & Scheier, 1978). From the current study, the subscale has an alpha of .86.

It should be noted that RDS is more commonly assessed using other instruments (see Jamner & Schwartz, 1986 for a list). These instruments typically include statements that are both universally true and psychologically threatening, which repressors respond to with false positives or false negatives (Jamner & Schwartz, 1986). Overall, these instruments were viewed to be inappropriate for studying asthmatics because of their intrusive nature.

(vii) Miscellaneous

Seasonal variation in asthma was assessed in the first questionnaire. This was measured by asking participants which season their asthma is at its worst (W. Bailey, personal communication, December 26, 1990). Participants could opt for one of the four seasons, or for "Same all seasons".

Finally, questions were included in the first questionnaire to collect demographic information. Data on age, gender, ethnicity, educational level, occupational status, and marital status was collected.

2.6 Statistical analysis

All data analysis for the current study was conducted using the SPSS/PC+ Advanced Statistics™ 4.0 statistics package (Norusis, 1990). The strategies used to examine the research questions were mainly correlation and multiple regression analyses. For each set of questions, preliminary correlational analyses were conducted, followed by an appropriate set of multiple regressions. Hierarchical multiple regression was used to

test for interaction effects. For each analysis, main effects were entered on the first step, and interaction effects represented by product terms on the second step. The product terms were computed by multiplying appropriate pairs of variables in deviation form (Jaccard, Turrisi, & Wan, 1990). Subsequent interpretation of interaction effects was undertaken by splitting the moderator at the median and then comparing unstandardized slopes for main effects within each of the two resulting groups.

2.7 Ethics

Participants were informed of all study features which might influence their willingness to participate (see Information Sheet/Consent Form - Appendices A and B). They were informed that there were two administrations of essentially the same questionnaire separated by six months, and that it would take approximately one hour to complete. They were told that they were free to opt out of the study at any time, and were not required to answer any question they objected to. They were also told they would be debriefed following the completion of the study. This involved each subject receiving a summary of the study results. They were informed that all data collected was regarded as strictly confidential. This was recognised as particularly important given that a health disorder was under investigation. Only the researcher was permitted to view completed questionnaires, and the respondent's name did not appear on either questionnaire. Subjects were identified by code numbers only. However, names and addresses were required so that the second questionnaire could be posted. Subjects were informed of all the steps taken to ensure confidentiality.

Ethical approval for the study was sought from three different Committees. First, a submission was made to the Massey University Human Ethics Committee, who approved the study in October 1990. With the research being conducted in Christchurch and Auckland, ethical approval was additionally sought from the Area

Health Board Ethics Committees involved. The submission to the Canterbury Area Health Board was successful at first attempt, and approved in July 1991. After some minor modifications to the Information Sheet/Consent Form the Auckland Area Health Board approved the study in August 1991.

CHAPTER III

RESULTS

The presentation of results is divided into two main sections; (i) determinants of seriousness and (ii) consequences of seriousness. The first section begins with the main analyses for the determinants of seriousness. In the first instance, univariate stability of variable levels and variability are examined. This is followed by a set of preliminary correlational analyses. Finally, multiple regression analysis is used to examine the relationships between the determinants and seriousness, at both times. These main analyses are extended to the subcomponent level, by examining the relationships between the determinants and factors of the ASC measure of seriousness. The second section commences with the main analyses for the consequences of seriousness. Again, univariate stability of variable levels and variability are examined, and a set of preliminary correlational analyses are conducted. Multiple regression analysis is used to examine the relationships between seriousness and the consequences, at both times. This is followed by two analyses at the subcomponent level. The first examines the relationships between the ASC factors and the consequences. The second involves seriousness, and corresponding subvariables of personal efficacy, response efficacy, and the health competencies. Finally, some exploratory analyses linking the determinants and consequences are presented.

In presenting the results three reporting strategies are used. First, a traditional top-down inferential approach is employed. As such, a significant result at the subcomponent level is only reported if the corresponding result was found at the main variable level. Second, and also a traditional approach, specific interaction effects are not reported unless the R^2 change for the interaction set is significant. Third, only replicated findings are reported. These three strategies are applied concurrently.

Collectively, their use helps to reduce the increased risk of Type I error, produced by multiple analyses.

Two preliminary tasks were completed prior to conducting the analyses. First, the data was screened for how well it met the assumptions of multiple regression analysis (Tabachnick & Fidell, 1989). In general, these assumptions were satisfactorily met. The univariate distributions revealed that the prevalence and treatability variables had mild negative skew and mild positive kurtosis at both times. However, these were not viewed to be serious infringements of the univariate normality assumption and applying square root or log transformations to these variables proved to be of no real advantage. Also, there was a need to delete a few multivariate outliers from most regression analyses. This was done when they exceeded a z-score of 3.5. Overall, the screening revealed that all variables could be retained in their original form, and all cases could be kept for analysis.

Second, four control variables were selected for the analyses: age, gender, educational level, and marital status. Age and gender were retained in their original forms, and groups were formed for educational level and marital status. Education level was divided into three groups: less than Fifth Form; completed Fifth to Seventh Form; and tertiary education, and two dummy variables (Education 1 & 2) were created using ordinal coding. Marital status was divided into two groups, married or de-facto versus others.

3.1 Determinants of seriousness

In the determinants model, the effects of prevalence, treatability, and asthma history on seriousness, and the possible moderating role of repressive defence style (RDS) were analyzed.

3.1.1 Main analyses

As signalled earlier, the main analyses for the determinants model are presented in three sections. First, the results of a repeated measures MANOVA are presented, which provide information on the stability of mean scores of each variable over time. Second, all bivariate relationships among variables are computed. Finally, the research questions are addressed at the multivariate level using multiple regression analysis.

(i) Univariate considerations

A repeated measures MANOVA was conducted on variables in the determinants model that were assessed at both times. The results are presented in Table 3. The overall F value for this analysis was significant ($F=9.07$, $p<.001$) suggesting some change over time. Specific differences were found for perceptions of the average intensity over the last six months, frequency of attacks, and self-rated seriousness.

Table 3

Means and standard deviations of determinants and seriousness measures, assessed at both times (N=302).

	Time 1		Time 2		
Variable	Mean	SD	Mean	SD	F
Prevalence	75.95	21.17	74.54	22.54	1.53
Treatability	77.42	21.08	76.73	19.78	.37
Intensity (6 months)	2.41	1.31	2.14	1.16	17.02 *
Frequency of attacks	2.55	1.32	2.24	1.30	25.69 *
Self-rated seriousness	3.22	1.30	2.86	1.23	37.75 *
Frequency of symptoms	78.90	20.75	78.14	23.25	.59
Number of symptoms	24.50	6.85	24.01	7.65	3.55

* $p<.001$

Note: Degrees of freedom were (1,301).

Consistently, the direction of these differences indicates that asthma was perceived to be more serious at Time 1 (Spring) compared to Time 2 (Autumn). A comparison of the magnitude of each difference with its corresponding total score reveals that the differences are not large. There were no differences in the prevalence or treatability variables across time. Despite the difference found in self-rated seriousness, there were no differences in the symptom measures of seriousness. Although MANOVA does not analyze changes in variability, the standard deviations in Table 3 are stable.

(ii) Cross-sectional bivariate relationships

Before examining the research questions using multiple regression techniques, three preliminary bivariate analyses were conducted. These were (i) the intercorrelations among the independent variables, comprised of the determinants and control variables (remembering that RDS is a determinant), (ii) the intercorrelations among the dependent variables, comprised of the seriousness measures, and (iii) the correlations between the independent and dependent variables.

Table 4 presents the cross-sectional intercorrelations among the independent variables, at both times. The reader is reminded that only replicated results are reported in the text. In general, associations among the determinants were weak. Asthmatics who perceived their illness to have higher prevalence judged it to be more treatable. Asthma was also viewed to be more treatable when it was perceived to have lower average intensity over entire history and over the last six months, and when the frequency of attacks was judged to be lower. Longer term asthmatics viewed their illness to have higher average intensity over entire history. The two average intensity measures were only weakly positively correlated, indicating that they are tapping separate aspects of average intensity. Asthmatics who perceived their illness to have higher average intensity over entire history and over the last six months perceived a higher frequency of attacks. In fact, average intensity over the last six months and

Table 4

Intercorrelations among determinants, RDS, and control variables at Time 1 (N=330) and Time 2 (N=322).

	1	2	3	4	5	6	7	8	9	10	11	12
1 Prevalence	.--	.12*	-.07	.09	.04	.02	-.17**	-.13*	-.23***	.04	-.05	.00
2 Treatability	.16**	.--	-.01	-.21***	-.28***	-.29***	-.03	.01	.02	.11*	.08	.09
3 Duration	-.18**	-.01	.--	.20***	.03	.10	.11*	.25***	.21***	.00	-.06	.14*
4 Intensity (entire history)	.00	-.14*	.17**	.--	.36***	.43***	-.04	.01	-.07	-.05	-.05	-.04
5 Intensity (6 months)	.01	-.39***	.08	.31***	.--	.61***	-.03	-.07	-.06	.03	.02	-.08
6 Frequency (attacks)	.03	-.39***	.09	.28***	.64***	.--	-.03	-.05	-.09	-.04	-.06	-.06
7 Repressive defence style		-.15**	-.01	.10	-.04	-.04	-.11	.--	.29***	.11*	-.18**	-.08.13*
8 Age	-.12*	.02	.24***	-.04	-.09	-.13*	.31***	.--	.21***	-.31***	-.13*	.22***
9 Gender	-.24***	-.03	.20***	-.12*	-.08	-.07	.09	.19**	.--	.06	.11*	.06
10 Education 1	-.01	.00	.00	-.01	.01	.05	-.14*	-.30***	.08	.--	.39***	-.03
11 Education 2	-.12*	.10	- .05	.00	-.08	-.09	-.04	-.08	.11	.40***	.--	.02
12 Marital status	.01	.07	.12*	-.07	-.07	-.09	.12*	.20***	.04	-.05	.01	.--

* $p < .05$ ** $p < .01$ *** $p < .001$

Notes: 1. Time 1 intercorrelations appear above diagonal, Time 2 appear below diagonal.

2. Age is a continuous variable, gender and marital status are dichotomous variables, education 1 and 2 are dummy variables.

frequency of attacks correlated at r=.61 at Time 1 and r=.64 at Time 2. Asthmatics with higher repression scores viewed their asthma to be less prevalent compared to asthmatics with lower repression scores, but repression scores were not associated with any other determinant variables.

Some weak relationships between the determinants and the control variables were found. Younger asthmatics viewed their illness to be more prevalent compared to older asthmatics, as did female asthmatics compared male asthmatics. Longer term asthmatics were generally older rather than younger individuals, and also tended to be women rather than men. They also were more likely to have a partner compared to shorter term asthmatics. Asthmatics with higher repression scores were generally older rather than younger individuals, they tended to be less educated rather than more educated, and they tended to have a partner rather than not.

Some intercorrelations were found among the control variables. Older asthmatics tended to be women rather than men, they tended to be less educated rather than more educated, and they were more likely to have a partner compared to younger asthmatics.

Table 5

Intercorrelations among the seriousness measures at Time 1 (N=367) and Time 2 (N=374).

	Self-rated seriousness	Frequency of symptoms	Number of symptoms
Self-rated seriousness	.--	.44*	.40*
Frequency of symptoms	.48*	.--	.74*
Number of symptoms	.48*	.77*	.--

* $p < .001$

Note: Time 1 intercorrelations appear above diagonal, Time 2 appear below diagonal.

Table 5 presents the cross-sectional intercorrelations among the dependent variables, at both times. These were comprised of the three measures of seriousness; self-rated seriousness, frequency of symptoms, and number of symptoms. Relationships among these measures were all moderate to strong. Asthmatics who perceived their illness to have higher self-rated seriousness were those who experienced either a higher frequency of symptoms or a larger number of symptoms. In passing, these findings provide some support for the study assumption that number and frequency of symptoms are seriousness measures. The symptom measures, both derived from the ASC data, were strongly associated. This indicates that asthmatics who reported a higher number of symptoms also reported a higher frequency of symptoms, and vice versa.

Table 6

Correlations between determinants, control variables and seriousness measures at Time 1 (N=303) and Time 2 (N=315).

	Self-rated seriousness		Frequency of symptoms		Number of symptoms	
	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
Prevalence	.11	.09	.12*	.15**	.07	.12*
Treatability	-.25***	-.31***	-.14*	-.15**	-.12*	-.24***
Duration	.15**	.07	-.02	.02	.02	-.01
Intensity (entire history)	.62***	.51***	.40***	.35***	.30***	.29***
Intensity (6 months)	.43***	.53***	.34***	.31***	.24***	.33***
Frequency (attacks)	.44***	.46***	.31***	.37***	.30***	.34***
RDS	-.05	-.01	-.25***	-.21***	-.25***	-.19**
Age	.01	.00	-.14*	-.12*	-.07	-.15**
Gender	-.12*	-.15**	-.20***	-.18**	-.23***	-.22***
Education 1	.00	-.08	-.06	.03	-.01	.04
Education 2	-.01	-.09	-.06	-.04	-.09	-.10
Marital Status	.00	-.11	-.12*	-.10	-.09	-.10

* $p < .05$ ** $p < .01$ ***$p < .001$

Table 6 presents the bivariate relationships between the determinants, control variables and seriousness measures, at both times. In general, weak to moderate associations were found between the determinants and seriousness. Prevalence positively related to frequency of symptoms, but was unrelated to self-rated seriousness and number of symptoms. As such, asthmatics who viewed their illness to be more prevalent reported a higher frequency of symptoms. Asthma was perceived to be more treatable when it was viewed to be less serious. This was found for all the seriousness measures. Three aspects of asthma history (average intensity over entire history, average intensity over the last six months, and frequency of attacks) were positively correlated with each of the seriousness measures. The remaining measure of asthma history, duration, was unrelated to seriousness. RDS showed a clear pattern of relationships with seriousness. Asthmatics with higher repression scores reported a lower frequency of symptoms and fewer symptoms than those with lower repression scores, but repression was unrelated to self-rated seriousness.

Some relationships were found between the control variables and seriousness. Younger asthmatics reported a higher frequency of symptoms compared to older asthmatics. There were gender differences in all the seriousness measures. Women viewed asthma to be more serious than men. Overall, it can be noted that many of the relationships are stable over time.

(iii) Cross-sectional multivariate relationships

Next, hierarchical multiple regression analysis was used to analyze the relationships in the determinants model. Six regression analyses were run, since there are three dependent variables (self-rated seriousness, frequency of symptoms, and number of symptoms) and two measurement points. For each regression, this involved entering the determinants and control variables on the first step, and the product variables for RDS and each of the determinants on the second step (see Section 2.6). The results of these analyses are

presented in Table 7.

In Table 7, and all other tables of multiple regression results, both standardized and unstandardized slopes are presented. Presenting both types of slope permits an examination of replication of relationships by comparing unstandardized slopes, and an examination of the relative magnitude of effects by comparing standardised slopes within any particular analysis.

Overall, the main variables met with some success in explaining seriousness, particularly self-rated seriousness. The main effects accounted for 48% of the variance in self-rated seriousness at Time 1, and 43% at Time 2. They were somewhat less successful in explaining the variance in frequency of symptoms or number of symptoms, at both times. They explained 27% of the variance in frequency of symptoms at Time 1, and 23% at Time 2; and they accounted for 18% of the variance in number of symptoms at Time 1, and 21% at Time 2.

Again, the reader is reminded that only replicated results are reported in the text. Few relationships emerged between the determinants and seriousness. Prevalence was not a determinant of seriousness, and the analyses also revealed that treatability and seriousness were unrelated. As such, they show that the bivariate associations between treatability and seriousness were confounded, probably by one or more of the asthma history variables. Of the asthma history variables, average intensity over entire history was associated with all the seriousness measures. Specifically, asthmatics who perceived their illness to have higher average intensity over entire history viewed it to be more serious. Asthmatics who judged their asthma to have higher average intensity over the last six months perceived it to have higher self-rated seriousness, but average intensity over the last six months was unrelated to the symptom measures of seriousness. Frequency of attacks also determined self-rated seriousness, but was unrelated to the symptom

Table 7

Regression coefficients, adjusted R^2, and R^2 change for regressions of seriousness on determinants and control variables at Time 1 and Time 2.

Seriousness variable	Self-rated seriousness				Frequency of symptoms				Number of symptoms			
	Time 1 N=312		Time 2 N=322		Time 1 N=318		Time 2 N=315		Time 1 N=330		Time 2 N=322	
Independent variables	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B
Step 1												
Prevalence	.046	0.003	.096	0.005*	.003	0.003	.106	0.111*	-.019	-0.006	.051	0.018
Treatability	-.045	-0.284	-.087	-0.006	-.006	-0.006	-.003	-0.004	-.008	-0.003	-.074	-0.031
Duration (entire history)	.049	0.004	-.022	-0.002	-.021	-0.027	.011	0.017	-.015	-0.006	-.013	-0.006
Intensity (entire history)	.499	0.530***	.378	0.368***	.306	5.248***	.248	4.695***	.179	1.010**	.183	1.142***
Intensity (6 months)	.188	0.180***	.277	0.286***	.179	2.770**	.080	1.636	.078	0.400	.114	0.759
Frequency (attacks)	.111	0.110*	.140	0.133*	.039	0.635	.213	3.964**	.134	0.706*	.109	0.658
Repressive defence style	-.035	-0.006	.041	0.006	-.229	-0.596***	-.139	-0.423**	-.241	-0.205***	-.124	-0.125*
Age	.077	0.006	.061	0.005	-.058	-0.074	.003	0.004	.045	0.019	-.018	-0.009
Gender	-.087	-0.236	-.075	-0.189	-.103	-4.479*	-.093	-4.607	-.165	-2.355**	-.158	-2.573**
Education 1	.058	0.244	-.031	-0.121	-.086	-5.778	.019	1.473	.030	0.658	.087	2.186
Education 2	.025	0.065	.000	0.000	-.050	-2.113	-.011	-0.541	-.079	-1.099	-.078	-1.244
Marital Status	.032	0.090	-.050	-0.135	-.044	-1.981	-.042	-2.211	-.034	-0.506	-.040	-0.697
	Adj R^2=.477		Adj R^2=.433		Adj R^2=.274		Adj R^2=.228		Adj R^2=.184		Adj R^2=.209	
	F(12,299)=24.60***		F(12,309)=21.45***		F(12,305)=10.97***		F(12,302)=8.74***		F(12,317)=7.18***		F(12,309)=8.08***	
Step 2												
RDS x Prevalence	.006	0.000	-.003	0.000	.085	0.009	.018	0.002	.053	0.002	-.041	-1.634
RDS x Treatability	.033	0.000	-.113	-0.001*	.075	0.011	.069	0.012	.012	0.001	.060	0.003
RDS x Duration	-.062	-0.001	-.045	0.000	.059	0.009	.014	0.003	.022	0.001	-.029	-0.002
RDS x Intensity (entire history)	-.042	-0.005	-.076	-0.009	-.089	-0.183	-.068	-0.158	-.052	-0.035	-.034	-0.027
RDS x Intensity (6 months)	-.026	-0.003	.006	0.001	-.066	-0.123	.145	0.378*	-.022	-0.014	.035	0.029
RDS x Frequency	.060	0.008	-.049	-0.006	.084	0.174	-.095	-0.240	.018	0.012	-.026	-0.022
	Adj R^2=.474		Adj R^2=.441		Adj R^2=.287		Adj R^2=.232		Adj R^2=.175		Adj R^2=.200	
	F(18,293)=16.60***		F(18,303)=15.09***		F(18,299)=8.10***		F(18,296)=6.26***		F(18,311)=4.88***		F(18,303)=5.46***	
	R^2 change=.008		R^2 change=.018		R^2 change=.026		R^2 change=.018		R^2 change=.006		R^2 change=.006	
	F change=0.80		F change=1.74		F change=1.95		F change=1.22		F change=0.43		F change=0.42	

* $p<.05$ ** $p<.01$ *** $p<.001$

measures. Asthmatics who perceived a higher frequency of attacks viewed asthma to have higher self-rated seriousness. The length of time asthmatics have had asthma did not influence seriousness. Consistent with the bivariate findings, asthmatics with higher repression scores reported less frequent and fewer symptoms than those with lower repression scores. RDS was not a determinant of self-rated seriousness.

The findings reveal that there was a gender difference in the experience of symptoms. Women reported a higher number of symptoms compared to men. In contrast, female asthmatics did not report more frequent symptoms or higher self-rated seriousness compared to male asthmatics, even though these relationships emerged at the bivariate level. Age, educational level, and marital status did not determine the seriousness measures.

The results show that including the product variables did not improve the determination of seriousness. All R^2 change statistics were insignificant. This indicates that RDS does not moderate the relationships between seriousness and the determinants.

There were two general findings. First, average intensity over entire history was a more influential determinant of self-rated seriousness compared to average intensity over the last six months. Second, the relationships that emerged between the determinants and seriousness were in a positive direction.

3.1.2 The symptom factors

The relationships between the determinants and seriousness can be examined more closely by analyzing the relationships between the determinants and the ASC factors; (i) panic fear, (ii) airways obstruction, (iii) hyperventilation, (iv) fatigue, and (v) irritability (Brooks et al., 1989).

For the first set of subanalyses the ASC factors were scored in terms of frequency of symptoms. Multiple regression analyses of these factors on the determinants and control variables were conducted. The independent variables were entered in two steps as for the main analyses, and the same control variables were used. Since these were subsidiary analyses, the results are presented in Table 14, at Appendix G. The main variables explained between 16% and 22% of the variance in the factors at Time 1, and between 15% and 21% at Time 2. Two variables accounted for these relationships. First, asthmatics who viewed asthma to have higher average intensity over entire history reported a higher frequency of all five symptom factors. Second, asthmatics with higher RDS scores reported a lower frequency of panic fear and irritability symptoms than those with lower repression scores.

In the second set of subanalyses, the factors were scored in terms of number of symptoms. Otherwise the regression analyses were conducted as for the first set of subanalyses. The results are presented in Table 15, at Appendix G. The main effects explained slightly less variance in the factors when they were scored in terms of number of symptoms, compared to when they were scored in terms of frequency of symptoms. This ranged from 8% to 18% at Time 1, and from 12% to 19% at Time 2. To some extent, this may reflect the relative ranges of the two types of measure. Asthmatics who perceived asthma to have higher average intensity over entire history reported a higher number of airways obstruction, fatigue, and irritability symptoms. Those with higher RDS scores reported fewer panic fear and irritability symptoms than those with lower RDS scores. Finally, women reported more panic fear, hyperventilation, and fatigue symptoms than men.

In summary, the main analyses revealed limited support for the determinants model. There were relationships between average intensity over entire history, average intensity over the last six months, frequency of attacks and self-rated seriousness.

Average intensity over entire history also related to the symptom measures of seriousness. All these relationships were in a positive direction. Prevalence, treatability, and duration were unrelated to seriousness. RDS was not a moderator of the seriousness relationships. Additionally, asthmatics with higher repression scores reported less frequent and fewer symptoms, and women reported a higher number of symptoms than men. The subanalyses on the ASC factors provided more detailed information on these relationships.

3.2 Consequences of seriousness

In the consequences model, the effects of seriousness on health behaviour, and the possible moderating role of self efficacy were analyzed.

3.2.1 Main analyses

The main analyses for the consequences model are presented in three sections. First, repeated measures MANOVA results are presented, which provide information on stability of mean scores of each variable over time. Second, all bivariate relationships among variables are calculated. Third, the research questions are addressed at the multivariate level using multiple regression analysis.

(i) Univariate considerations

Stability of variable levels was assessed using repeated measures MANOVA. All variables in the consequences model were assessed at both times. The analysis is complicated by the fact that one of the variables, 'adherence to other medications', has a reduced N because only 55% of the subjects use these medications. In the first instance, a MANOVA was run with all variables included. The overall F value for this analysis was significant ($F=4.95$; $df=1,148$; $p<.001$). Next, a second MANOVA analysis was run, where the variable 'adherence to other medications' was excluded. This also revealed a significant overall F value ($F=8.27$; $df=1,303$;

$p < .001$). Table 8 presents the differences for all variables from the second analysis, and the difference for 'adherence to other medication' from the first analysis.

Table 8

Means and standard deviations of seriousness measures, response and personal efficacies, and the health behaviour measures at both times (N=304).

	Time 1		Time 2		
Variable	Mean	SD	Mean	SD	F
Self-rated seriousness	3.21	1.32	2.84	1.24	38.56 **
Frequency of symptoms	78.68	20.68	77.96	23.09	.54
Number of symptoms	24.49	6.93	24.07	7.57	2.72
Response efficacy	22.72	3.62	23.27	3.62	11.25 *
Personal efficacy	23.50	3.69	24.18	3.62	16.33 **
Health competencies	42.01	9.97	42.58	10.12	3.11
Adherence (inhaled medication)	25.98	3.58	26.02	3.58	.05
Adherence (other medication) [a]	27.46	3.28	27.32	3.16	.34

* $p < .01$ ** $p < .001$
Note: [a] N equals 149

Consistent with the earlier MANOVA (see Table 3), asthmatics perceived higher self-rated seriousness at Time 1 (Spring) compared to Time 2 (Autumn), but there were no differences in the symptom measures of seriousness. The results also show that asthmatics perceived lower personal and response efficacy at Time 1 compared to Time 2. There were no differences in the use of the health competencies or the adherence measures. The standard deviations are also relatively stable, indicating no change in variability of responding over time.

(ii) Cross-sectional bivariate relationships

As before, three preliminary bivariate analyses were conducted. These were (i) the intercorrelations among the independent variables, comprised of the seriousness

Table 9

Intercorrelations among seriousness measures, response and personal efficacies, and control variables at Time 1 (N=327) and Time 2 (N=339).

	1	2	3	4	5	6	7	8	9	10
1. Self-rated seriousness	.--	.43***	.39***	-.08	-.03	.02	-.15**	-.03	.01	-.01
2. Frequency of symptoms	.48***	.--	.73***	-.10	-.10	-.13*	-.22***	-.05	-.04	-.12*
3. Number of symptoms	.48***	.76***	.--	-.20***	-.22***	-.05	-.24***	-.02	-.08	-.05
4. Response efficacy	-.17**	-.19***	-.25***	.--	.79***	.19***	-.06	-.08	.04	.23***
5. Personal efficacy	-.10	-.17**	-.24***	.80***	.--	.06	-.12*	-.01	.12*	.20***
6. Age	.02	-.10	-.10	.20***	.05	.--	.19***	-.34***	-.14*	.22***
7. Gender	-.13*	-.17**	-.21***	-.08	-.14*	.17**	.--	.04	.09	.07
8. Education 1	-.11*	.02	.01	-.05	.01	-.32***	.06	.--	.41***	-.06
9. Education 2	-.09	-.02	-.09	.07	.12*	-.10	.12*	.42***	.--	.00
10. Marital status	-.08	-.09	-.08	.13*	.06	.21***	.02	-.06	-.02	.--

* $p < .05$ ** $p < .01$ *** $p < .001$

Notes: 1. Time 1 intercorrelations appear above diagonal, Time 2 appear below diagonal.

2. Age is a continuous variable, gender and marital status are dichotomous variables, education 1 and 2 are dummy variables.

measures, response and personal efficacies, and control variables, (ii) the intercorrelations among the dependent variables, comprised of the health behaviour measures, and (iii) the correlations between the independent and dependent variables.

Table 9 presents the intercorrelations among the independent variables, at both times. Much of this table has been previously described, including the relationships among the seriousness measures (see Table 5), the relationships between the control variables and the seriousness measures (see Table 6), and the relationships among the control variables (see Table 4). Sometimes, the findings from the earlier and current analyses are not exactly equivalent, due to small differences in the deletion of cases in these analyses. Some results from the current analysis are new, and these are now presented.

Some relationships were found between self-efficacy and seriousness. Both response and personal efficacy related to number of symptoms. Asthmatics who viewed their health competencies to be more effective in managing asthma, or who felt more capable of carrying out those competencies reported fewer symptoms. Personal and response efficacies correlated strongly ($r=.79$ at Time 1; $r=.80$ at Time 2).

Some weak associations were found between self-efficacy and the control variables. Older asthmatics viewed their health competencies to be more effective in managing asthma compared to younger asthmatics. This was also true for asthmatics who had a partner compared to those who did not. Women viewed themselves as being more capable in carrying out the health competencies than men. More educated asthmatics also held this view compared to less educated asthmatics.

Table 10 presents the intercorrelations among the health behaviour measures. Asthmatics who adhered better to inhaled medications also had better adherence to

other medications. These associations were moderate to strong. The N's for these correlations are low because only 55% of the sample used other medications. Asthmatics who adhered better to inhaled medications used more health competencies, although this association was weak. Adherence to other medications was unrelated to the health competencies.

Table 10

Intercorrelations among the health behaviour measures at Time 1 (N=397) and Time 2 (N=374).

	Health competencies	Adherence to inhaled medication	Adherence to other medication
Health competencies	.--	.20**	.16*
Adherence to inhaled medication	.27**	.--	.69**
Adherence to other medication	.10	.61**	.--

* p < .05 ** p < .001

Notes: (i) Time 1 intercorrelations appear above diagonal, Time 2 appear below diagonal.
(ii) N's for Adherence to other medication intercorrelations are 221 (Time 1) and 218 (Time 2).

Table 11 presents the associations between seriousness, self-efficacy, control variables and health behaviour, at both times. Consistently, the seriousness measures related to the health competencies. Asthmatics who perceived asthma to have higher self-rated seriousness or who reported a higher frequency or a greater number of symptoms used more health competencies. In contrast, seriousness was unrelated to the adherence measures.

Response efficacy was related to all the health behaviour measures. Asthmatics who viewed their health competencies to be effective in managing asthma reported a higher

use of the competencies, and better adherence to inhaled and other medications. Personal efficacy was related to the health competencies and adherence to inhaled medication. Specifically, asthmatics who believed they were capable of carrying out the competencies reported a higher use of the competencies and better adherence to inhaled medications.

Some relationships were found between the control variables and the health behaviour measures. Older asthmatics adhered better to both inhaled and other medications compared to younger asthmatics. Female asthmatics reported using a higher number of health competencies compared to male asthmatics. Less educated asthmatics adhered better to both categories of medications compared to more educated asthmatics. Asthmatics with a partner adhered better to inhaled medication compared to those without a partner.

Table 11

Correlations between seriousness measures, response and personal efficacies, control variables, and health behaviour measures at Time 1 (N=321) and Time 2 (N=328).

	Health competencies		Adherence to inhaled medication		Adherence to other medication	
	Time 1	Time 2	Time 1	Time 2	Time 1	Time 2
Self-rated seriousness	.25***	.19**	.04	-.04	.07	-.01
Frequency of symptoms	.23***	.16**	-.09	-.09	-.09	-.12
Number of symptoms	.35***	.32***	-.08	-.05	-.13	-.09
Response efficacy	.34***	.28***	.49***	.37***	.46***	.31***
Personal efficacy	.29***	.23***	.38***	.28***	.37***	.11
Age	.14**	.08	.34***	.33***	.30***	.26***
Gender	-.20***	-.18**	-.04	-.08	-.07	.02
Education 1	-.08	-.09	-.15**	-.16**	-.16*	-.16*
Education 2	-.08	-.04	-.03	-.05	.01	.03
Marital status	.14*	.08	.18**	.18**	.15*	.13

* $p < .05$ ** $p < .01$ *** $p < .001$

Note: N's for Other medication associations are 180 (Time 1) and 191 (Time 2).

(iii) Cross-sectional multivariate relationships

Hierarchical multiple regression analysis was used to investigate the relationships in the consequences model. Six regression analyses were run, since there are three measures of health behaviour and two measurement points. For each regression, this involved entering the seriousness measures, response and personal efficacies, and control variables on the first step, and the product variables for self-efficacy and seriousness on the second step (see Section 2.6). The control variables were the same as those used in analyzing the determinants model. The findings are presented in Table 12.

Overall, the main effects explained moderate amounts of variance in all the health behaviour measures. They accounted for 34% of the variance in the health competencies at Time 1, and 27% at Time 2. They explained 29% of the variance in adherence to inhaled medications at Time 1, and 27% at Time 2. Finally, they accounted for 24% of the variance in adherence to other medication at Time 1, but were less successful in explaining this measure at Time 2 (10%). Quite generally, the main variables provided a better explanation of the Time 1 health behaviour measures compared to the Time 2 measures.

The findings reveal only one reliable relationship between seriousness and health behaviour. Asthmatics who reported a higher number of symptoms used more health competencies. Moreover, the sizes of the beta weights indicates that number of symptoms was a relatively influential determinant of the health competencies. In passing, there was some tendency for frequency of symptoms to be negatively related to the use of the health competencies. However, this effect only occurred at Time 2, and is therefore viewed to be an unreliable result in the current study. Seriousness did not determine adherence to inhaled or other medication. Including the product variables did not significantly improve the explanation of health behaviour. As such,

Table 12

Regression coefficients, adjusted R^2, and R^2 change for regressions of health behaviour measures on seriousness measures, response and personal efficacies, and control variables at Time 1 and Time 2.

Health behaviour variable:	Health Competencies				Adherence to inhaled medication				Adherence to other medication			
	Time 1 N=327		Time 2 N=339		Time 1 N=321		Time 2 N=326		Time 1 N=179		Time 2 N=189	
Independent variables	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B
Step 1												
Self-rated seriousness	.148	1.138**	.102	0.833	.089	0.242	-.024	-0.069	.076	0.178	.011	0.025
Frequency of symptoms	-.131	-0.063	-.250	-0.107***	-.098	-0.017	-.105	-0.015	-.032	-0.005	-.061	-0.006
Number of symptoms	.476	0.690***	.558	0.725***	.048	0.025	.113	0.051	.000	0.000	.029	0.011
Response efficacy (RE)	.304	0.823***	.304	0.806***	.423	0.413***	.306	0.285***	.246	0.207*	.418	0.331***
Personal efficacy (PE)	.139	0.386	.090	0.242	.023	0.022	.053	0.050	.150	0.123	-.257	-0.187*
Age	.086	0.053	.035	0.021	.235	0.052***	.304	0.065***	.252	0.045**	.130	0.021
Gender	-.057	-1.213	-.072	-1.488	-.046	-0.345	-.066	-0.478	-.072	-0.460	.042	0.227
Education 1	.020	0.626	-.036	-1.101	-.028	-0.318	-.066	-0.708	-.079	-0.697	-.110	-0.818
Education 2	-.072	-1.483	.015	0.297	-.002	-0.011	.002	0.012	.050	0.304	.035	0.185
Marital status	.039	0.871	.040	0.878	.027	0.207	.050	0.383	.037	0.243	.062	0.344
	Adj R^2=.338		Adj R^2=.271		Adj R^2=.293		Adj R^2=.270		Adj R^2=.243		Adj R^2=.101	
	F(10,316)=17.62***		F(10,328)=13.58***		F(10,310)=14.29***		F(10,315)=13.03***		F(10,168)=6.71***		F(10,178)=3.12**	
Step 2												
RE x self-rated seriousness	-.001	-0.003	-.027	-0.053	-.129	-0.088	.013	0.009	-.044	-0.025	-.233	-0.156
RE x frequency of symptoms	-.075	-0.010	-.059	-0.006	.109	0.005	.083	0.003	.133	0.005	.392	0.012
RE x number of symptoms	.129	0.047	.000	0.000	.059	0.008	-.087	-0.010	-.018	-0.002	-.182	-0.019
PE x self-rated seriousness	.145	0.291	.171	0.380*	.089	0.063	.144	0.112	-.052	-0.031	.420	0.253**
PE x frequency of symptoms	.021	0.003	.005	0.001	.021	0.001	-.117	-0.004	.111	0.004	-.405	-0.011
PE x number of symptoms	-.085	-0.034	.022	0.007	-.200	-0.028	-.016	-0.002	-.069	-0.009	-.087	-0.009
	Adj R^2=.344		Adj R^2=.279		Adj R^2=.305		Adj R^2=.275		Adj R^2=.245		Adj R^2=.149	
	F(16,310)=11.67***		F(16,322)=9.17***		F(16,304)=9.76***		F(16,309)=8.72***		F(16,162)=4.62***		F(16,172)=3.06***	
	R^2 change=.018		R^2 change=.020		R^2 change=.024		R^2 change=.018		R^2 change=.028		R^2 change=.073	
	F change=1.49		F change=1.58		F change=1.83		F change=1.38		F change=1.09		F change=2.68*	

* p<.05 ** p<.01 *** p<.001

personal and response efficacies were not moderators in the relationships between seriousness and health behaviour.

Supplementary to the formal hypotheses, the analyses revealed that response efficacy was an important determinant of health behaviour. Asthmatics who felt that their health competencies were effective in managing asthma used more of those competencies, and also adhered better to inhaled and to other medications. In contrast, the analyses revealed that personal efficacy and the health behaviour measures were unrelated. Also, the findings show that older asthmatics adhered better to inhaled medications than younger asthmatics.

3.2.2 The symptom factors

The relationships in the consequences model can be further analyzed at the subcomponent level. In general terms, this involves analyzing the contribution of each of the five ASC factors in determining health behaviour. The main analyses revealed that number of symptoms determined the health competencies, whereas frequency of symptoms was unrelated to this outcome. They also revealed that seriousness is unrelated to adherence. Applying the top-down inferential approach reveals that it is necessary to conduct only one analysis. The health competencies were regressed onto the ASC factors (scored in terms of number of symptoms), personal and response efficacies, and the control variables, at both times. As for the main analyses, the independent variables were entered on two steps, and the same control variables were used. The results are presented in Table 16, at Appendix H.

The analyses revealed that none of the symptom factors determine the health competencies. Other relationships which emerged in these analyses were described earlier.

3.2.3 The health competency factors

A further subvariable analysis was conducted. In essence, this involved analyzing the contribution of seriousness, self-efficacy, and the control variables in determining each of the health competency factors: preventive medication competencies, precipitant avoidance competencies, symptom intervention competencies, communication competencies, and health promotion competencies.

Each health competency factor was regressed onto the seriousness measures, specific personal and response efficacy items, and control variables, at both times. The specific personal and response efficacy items were used in this analysis, rather than the full scale measures, since these items correspond directly to the factors. Again, the independent measures were entered on two steps, and the same control variable were used. The findings are presented in Table 17, at Appendix H.

Main effects accounted for between 21% and 34% of the variance in the factors at Time 1, and between 20% and 30% at Time 2. Asthmatics with higher numbers of symptoms used more of all five factors of health competency. Those who viewed their use of precipitant avoidance competencies, communication competencies, or health promotion competencies to be effective in managing asthma used more of each of these categories of competency, respectively.

In summary, the main analyses revealed limited support for the consequences model. Of the three measures of seriousness, only number of symptoms determined the use of the health competencies. There was no evidence that seriousness determines the adherence practices of asthmatics. Also, there was no evidence that response or personal efficacy moderate the relationships between seriousness and health behaviour.

Supplementary to the formal hypotheses, asthmatics who perceived their health

competencies to be effective in managing asthma used more of those behaviours and adhered better to inhaled and other medications. On the other hand, personal efficacy did not contribute to the explanation of health behaviour. Older asthmatics adhered better to inhaled medications compared to younger asthmatics. The subanalyses provided more detailed information on the relationships found in the main analyses.

3.3 Seriousness as a mediator

As mentioned earlier, the determinants and consequences models were developed independently of each other. They relied on separate theoretical and empirical considerations, and they generated two distinct sets of research questions. However, this does not preclude exploring the possibility that seriousness acts as a mediator between the determinants and the consequences. Exploratory analyses were conducted to investigate this and the results are presented in Table 13.

Baron and Kenny (1986) have described four criteria which must be met to establish a variable as a mediator in a relationship. The first two criteria are self-evident. In the current study, it must be demonstrated that relationship(s) exist between the determinants and seriousness, and between seriousness and the consequences. These relationships were established in earlier analyses. In the determinants model, it was found that average intensity over entire history, average intensity over the last six months, and frequency of attacks determined self-rated seriousness, and average intensity over entire history determined number and frequency of symptoms. In the consequences model, it was found that number of symptoms determined the health competencies (but not adherence). As a consequence, the current analyses must be restricted to analyzing number of symptoms as a possible mediator between average intensity over entire history and the health competencies. In passing, the analysis for mediating effects will attain much greater complexity if there is a need to account for the additional influence of moderators in the relationships described. However, in the

current study, this is not an issue. Quite generally, RDS was not a moderator in the

Table 13

Standardized regression coefficients (betas) for analyses examining seriousness as a mediator between determinants and consequences.

Relationship	Time 1	Time 2
Criterion 1		
Intensity (entire history)/self-rated seriousness	.499***	.378***
Intensity (6 months)/self-rated seriousness	.188***	.277***
Frequency (attacks)/self-rated seriousness	.111*	.140*
Intensity (entire history)/frequency of symptoms	.306***	.248***
Intensity (entire history)/number of symptoms	.179**	.183***
Criterion 2		
Number of symptoms/health competencies	.476***	.558***
Criterion 3		
Intensity (entire history)/health competencies	.199**	.233***
Criterion 4		
Intensity (entire history)/health competencies (Controlling for the paths between intensity over entire history and number of symptoms, and between number of symptoms and the health competencies)	.138*	.179**

* $p < .05$ ** $p < .01$ *** $p < .001$

relationships between the determinants and seriousness, and neither response nor personal efficacy were moderators of the relationships between seriousness and the consequences. The third criterion requires that a relationship be demonstrated between intensity over entire history and the health competencies. In order to do this, the health competencies were regressed onto the determinants and control variables, at

both times. This showed that average intensity over entire history determined the health competencies, at both times. The fourth criterion involves controlling the path between average intensity over entire history and number of symptoms, and between number of symptoms and the health competencies, and noting whether the previously significant relationship between average intensity over entire history and the health competencies weakens. To do this, the health competencies were regressed onto seriousness, determinants, and control variables at both times. This revealed that the relationship between average intensity over entire history and the health competencies weakens slightly at both times, providing evidence that number of symptoms is a weak mediator in this relationship.

CHAPTER IV

DISCUSSION

The discussion is structured by the two objectives of the study. These were to test the determinants and consequences models, and to suggest some potential applications of the findings. Of these two objectives, the model testing was viewed to be the central undertaking of the current study. In addition, some directions for future research are outlined.

4.1 The determinants of seriousness

The determinants model proposes that prevalence, treatability, and asthma history determine seriousness, and that repression moderates these relationships. Although repression was included in the model when the hypotheses were formulated, its role in moderating the seriousness relationships was not entirely clear on theoretical grounds. Some arguments suggested it would assume this role, and other arguments suggested it would not. Also, the directions of the seriousness relationships were not clear on theoretical grounds. All these issues were to be resolved empirically.

Overall, the main analyses revealed that the determinants model has limited empirical support. A few of the hypothesized relationships emerged, but many did not. These findings can be summarized as follows: (1) perceptions of average intensity over entire history related to all the seriousness measures, (2) perceptions of average intensity over the last six months and frequency of attacks related to self-rated seriousness, (3) perceptions of the prevalence and treatability of asthma, and the remaining measure of asthma history, duration of asthma, did not relate to seriousness, and (4) repression was not a moderator of the seriousness relationships.

(i) Seriousness

The findings support the study assumption that number and frequency of symptoms are indicators of seriousness. Results at the bivariate level show that self-rated seriousness correlates weakly to moderately with frequency of symptoms ($r = .44$) and with number of symptoms ($r = .40$) at Time 1, and these findings are replicated at Time 2 (see Table 5). Since there is little doubt that self-rated seriousness is a measure of seriousness (see e.g., Jemmott et al., 1986), the assumption that "more frequent symptoms or a higher number of symptoms means more serious asthma" is supported. However, the magnitude of the correlations just mentioned indicates that the symptom measures assess somewhat different aspects of the seriousness construct, compared to self-rated seriousness. This is consistent with the fact that participants are set quite different tasks in providing information on asthma's self-rated seriousness, compared to reporting their experience of its symptoms. Asthmatics are required to engage in a relatively complex decision making process to produce the self-rated seriousness rating. According to Janz and Becker (1984), they are required to evaluate the possible medical/clinical (e.g., death, pain) and social (e.g., effects on work, family life, and interpersonal relations) consequences of the illness to make this judgement. In contrast, the symptom measures reflect the assessment of well defined and specific aspects of participants' experience with the illness (Brooks et al., 1989). In conclusion, frequency and number of symptoms may be seen as measures of seriousness, but assess different aspects of this construct compared to self-rated seriousness.

(ii) Average intensity, frequency of attacks and seriousness

Average intensity over entire history was associated with all the seriousness measures, and average intensity over the last six months determined self-rated seriousness. In addition, average intensity over entire history determined the frequency of all the ASC symptom factors (panic fear, airways obstruction, hyperventilation, fatigue,

irritability), and the number of airways obstruction, fatigue, and irritability symptoms.

It was clear from the pilot study that asthmatics view the two measures of average intensity of asthma to be indices of the size of the illness as a problem in their lives. Thus, quite simply, asthmatics who view their illness to be a sizable problem judge it to be more serious. In passing, it should be noted that asthmatics who view their illness to be a "big problem" do not necessarily have medically severe asthma. Sometimes, mild asthmatics view their illness in this way. This was clear from anecdotal evidence provided by some participants.

One issue concerns the relative contribution of the two intensity measures in determining seriousness. Overall, average intensity over entire history was much more influential in determining self-rated seriousness compared to average intensity over the last six months. Paired sample t-tests reveal that the mean "average intensity over entire history" is higher than mean "average intensity over the last six months", at both times ($M_{(\text{entire history})}=3.4$, $M_{(6\text{ months})}=2.5$, $t=13.0$, $p<.001$ at Time 1; $M_{(\text{entire history})}=3.4$, $M_{(6\text{ months})}=2.2$, $t=17.4$, $p<.001$ at Time 2). As such, unrealistic positivity may play a role in asthmatics' judgements about recent average intensity, and weakens the relationship between average intensity over the last six months and self-rated seriousness. In other words, this relationship weakens under the influence of irrational processes. Overall, this suggests that asthmatics may quite generally appraise their current asthma in an unrealistically positive fashion compared to their past asthma. As an alternative interpretation it is possible that asthmatics simply acquire better control over their asthma as time progresses.

Perceived frequency of attacks was the other aspect of asthma history contributing to the determination of seriousness. Specifically, frequency of attacks determined self-rated seriousness, but not the symptom measures. An examination of beta weights

reveals that frequency of attacks was not as important as average intensity over entire history in determining self-rated seriousness.

Parsimonious explanations can be offered for this finding. Asthmatics who perceive a higher frequency of attacks will spend more time both experiencing and recovering from the illness. Clearly, both these processes are aversive to asthmatics and are likely to contribute to the judged seriousness of the illness. Entirely consistent with this explanation, the experience and recovery from acute asthma will involve expenditure of time, and this will be considered costly by most asthmatics. In other words, asthmatics with frequent asthma will be more likely to be taken off-task from activities of daily living (e.g., earning a living). As a consequence, asthmatics with frequent attacks judge their illness to be more serious, even though they do not report higher numbers or more frequent symptoms.

One general explanation why asthmatics use historical information to formulate seriousness judgements is that this adds predictive value to those judgements. It is reasonable to assume that most asthmatics will perceive their illness to be relatively stable. The current study provides some evidence that this perception is justified, where number and frequency of symptoms had test-retest coefficients of $r=.70$ and $r=.80$, respectively. As such, past asthma is a reasonably good predictor of current and future asthma. Clearly, asthmatics will have a strong interest in predicting their asthma, since this will provide them a sense of control over the illness (see Affleck, Tennen, Pfeiffer, & Fifield, 1987). Consequently, it is perhaps not surprising that they use historical information to formulate perceptions of their current illness, including judgements about its seriousness. As such, seriousness judgement itself is likely to predict the experience of current asthma. This suggestion receives some support in the current study, where self-rated seriousness and the symptom measures are related (see Table 5). In passing, this explanation suggests that predictability itself may be a

useful construct in future asthma research.

(iii) Duration, prevalence, treatability and seriousness

The remaining aspect of asthma history in the current study was duration of asthma, and this did not determine seriousness. Specifically, the number of years asthmatics have experienced asthma does not influence self-rated seriousness, or the experience of symptoms. The most likely explanation for this null finding is that asthmatics' have acquired knowledge of their illness which provides them with evidence that it is serious. For example, they will have learnt that the illness is not curable (e.g., Quirk & Jones, 1990) (but can be perceived to be treatable), involves the ongoing experience of symptoms (e.g., Creer et al., 1991), is likely to have an impact on lifestyle (Nocon & Booth, 1990; Snadden & Brown, 1992), and may even be life threatening (Buist, 1989; Jackson, Sears, Beaglehole, & Rea, 1988; Sly, 1988). In New Zealand, there have been two epidemics of asthma deaths during the period 1960 to 1985 (Mitchell & Jackson, 1989), which have attracted considerable attention from researchers (e.g., Pearce, Beasley, & Jackson, 1995; Sears & Rea, 1987; Sears et al., 1985; Sears et al., 1986) and, undoubtedly, from asthmatics themselves.

An alternative explanation is that methodological problems have produced the current finding. However, checks on a variety of methodological issues, such as the adequacy of the variability, reliability, and validity of the variables involved, reveals that this is unlikely. The possibility that non-linear relationships exist between duration and seriousness is also unlikely, since the preliminary data screening revealed general support for the linearity assumption in the current analyses. Overall, it is concluded that each asthmatic views his or her illness as having a certain level of seriousness, regardless of the number of years he or she has experienced it.

The findings reveal that prevalence and seriousness are unrelated. Based on Jemmott

et al.'s (1986) study it is reasonable to assume that recently diagnosed asthmatics downplay asthma's seriousness because it is prevalent. This assumption is sensible in the light of the demonstrated generality of this relationship (e.g., McCaul et al., 1992). The current finding reveals that, if this initial relationship exists, it has dissipated and dissolved with the progression of time. The most likely explanation is that it has been swamped by asthmatics' subsequent experiences with the illness. In essence, this is the earlier argument that asthmatics' experiences with and knowledge of asthma provides them with evidence that the illness is serious. This explanation was tested using multiple regression analysis by examining duration of asthma as a possible moderator of the prevalence/seriousness relationships. The results revealed no evidence that these relationships weaken as duration of asthma increases. This provides grounds for further speculation. It is possible that the prevalence/seriousness relationship is short lived, and dissipates and dissolves inside the first year of diagnosis. In other words, it is possible that the relationship between the strength of a prevalence/seriousness relationship and duration of asthma is not linear and, when plotted, takes the shape of a "threshold curve". However, there are far too few asthmatics with a diagnosis of one year or less in the sample (N=3, from frequency data on duration of asthma), and therefore inadequate power precludes testing this explanation. Another possible explanation is that methodological problems have produced the findings. However, checks on a variety of methodological issues reveal little that is of concern. It is worth noting that the prevalence variable had mild negative skew and mild positive kurtosis at both times, indicating that most asthmatics regard asthma to be a common illness. Regardless, this variable had sufficient variability.

The null relationship between treatability and seriousness can be discussed in a similar fashion. Based on Ditto et al.'s (1988) study, it is likely that recently diagnosed asthmatics who perceive their illness to be more treatable will view it to have higher

seriousness. However, the current finding reveals that, if this initial relationship exists, it has dissipated and dissolved. Again, it is probable that asthmatics increasing experience with and knowledge of asthma provides them with evidence that this illness is serious. This explanation was tested by examining duration of asthma as a possible moderator in the treatability/seriousness relationships. However, multiple regression analysis revealed no evidence that the these relationships weaken as duration of asthma increases. This raises the possibility that there are non-linear interaction effects involving duration of asthma, such that the strength of the treatability/seriousness relationships taper off rapidly shortly after diagnosis. Again, there are insufficient numbers of recently diagnosed asthmatics in the sample to test this explanation. In passing, there was no evidence that methodological problems have produced the current null findings. Similar to the prevalence variable, the treatability variable had mild negative skew and mild positive kurtosis at both times, indicating that most asthmatics regard asthma to be a treatable illness. Nevertheless, this variable also has sufficient variability.

(iv) Repression and seriousness

In the determinants model, repression can influence seriousness in one of two ways. First, it can have a direct influence on seriousness and, second, it can influence seriousness by acting as a moderator in the seriousness relationships. In the current study, most interest centred on the second of these two possibilities.

The findings reveal that asthmatics with higher repression scores report less frequent and fewer asthma symptoms, but that repression and self-rated seriousness are unrelated. In passing, this provides further support for the assertion that self-rated seriousness and the symptom measures of seriousness assess different aspects of seriousness. The relationship between repression and the experience of symptoms is consistent with a number of general studies (Bryne, Steinberg, & Schwartz, 1968;

Carroll, 1972; Pennebaker, 1982; Ward, Leventhal, & Love, 1988). For example, Pennebaker (1982) reports that repressors are less verbal about health threat and report fewer health problems, and Bryne et al. (1968) found that repressors report less illness than sensitizers. The most likely explanation for the current finding is that asthmatics with higher repression scores have less awareness of symptoms. This explanation is supported by Rubinfeld and Pain (1976) who report that 15% of asthmatics are unable to sense marked changes in airways obstruction, and by other studies (e.g., Harver, 1994; Steiner et al., 1987) who report that asthmatics vary widely in their ability to detect these changes. Further evidence of repressed symptom reporting was found for the symptom factors. Asthmatics with higher repression scores reported less frequent and fewer panic fear and irritability symptoms. It is noteworthy that both these categories of symptoms describe affective states, as opposed to the other symptom categories which describe physical states. As such, it would appear that only affective symptoms are repressed by asthmatics. Asthmatics may have more difficulty in repressing physical symptoms, because they are more obvious and not so easy to dismiss.

The hypothesis that repression moderates the seriousness relationships was unsupported. These null results are consistent with earlier findings, which revealed that three aspects of asthma history (average intensity over entire history, average intensity over the last six months, perceived frequency of attacks) are positive determinants of self-rated seriousness, and that average intensity over entire history positively determines both symptom measures of seriousness. The general direction of all these relationships suggest that rational information processing is involved in the determination of seriousness. This suggestion is supported by the result that repression, an irrational cognitive process, and self-rated seriousness are unrelated, although repression is related to the symptom measures of seriousness. As such, if rational information processing dominates the determination of seriousness, the notion

that repression will moderate the seriousness relationships becomes less likely. This explanation is consistent with a number of studies reporting that most chronic asthmatics are well adjusted to their illness (Benjamin, 1977a; 1977b; Ostrov & Ostrov, 1986; Spittle & Sears, 1984; Zealley, Aiken, & Rosenthal, 1971).

Alternatively, there are a variety of possible methodological explanations for the null findings. Jaccard et al. (1990) list a number of methodological concerns which may limit the ability of interaction analysis to detect real effects. These include multicollinearity, measurement error, inappropriate metrics, nonlinearity, and small sample size. However, all these methodological issues were reviewed during the preliminary data screening, and are unlikely to account for the current findings. Another study (McClelland & Judd, 1993) reports that it is especially difficult to detect interaction effects using survey methods. They report that tests of interaction effects in field studies often have less than 20% of the efficiency of optimal experimental tests, and argue that this is due to differences in the residual variance of interaction effects between the two research approaches, once main effects are partialled out.

(v) Gender differences in seriousness

Supplementary to the formal hypotheses, one of the demographic variables, gender, related to the experience of symptoms. Specifically, women reported a higher number of asthma symptoms than men. This was also true at the symptom factor level, where women reported more panic fear, hyperventilation, and fatigue symptoms than men. A number of general studies report findings consistent with this (Klonoff & Landrine, 1992; Reddy, Fleming, & Adesso, 1992; Ritchey, la-Gory, & Mullis, 1991). For example, Klonoff and Landrine (1992) report that women perceive more symptoms and use health care services more frequently than men. They outline a number of competing explanations for these findings. One of them is that sex role norms and

socialization regarding the expression of pain and discomfort discourages men from reporting symptoms. This is the message that "real" men do not "give in" to illness or pain. This explanation receives some support in the current study, where women report more panic fear symptoms than men. Another explanation offered by Klonoff and Landrine is that women generally have more role obligations which require continuous activity (e.g., looking after partner and/or children) and this may interfere with self-care. This explanation seems unlikely in the current study, where there were no sex differences in either the use of competencies or the adherence practices of asthmatics (see Table 12). Klonoff and Landrine offer a third possible explanation. They suggest that men are more likely to be in jobs that are difficult to reschedule and they resist defining themselves as ill or adopting the sick role compared to women. This explanation would also seem unlikely in the current study, where chi-square analysis reveals that occupational status (employed full-time or part-time versus others) is not associated with sex ($\chi^2 = .42$, $df = 1$, $p > .05$). This chi-square finding probably reflects the fact that asthmatics in the current study are generally middle aged ($M = 47.2$ years, $SD = 16.2$ years), and it is probable that many of the female participants have returned to employment after raising children. Overall, of the explanations offered, it is probable that the sex role norms/socialization explanation provides the best interpretation for the current findings.

(vi) Stability of the model

The study design permits an examination of the stability of the determinants model. Recall that asthmatics can be categorized as experiencing one of three types of asthma; extrinsic or seasonal asthma, intrinsic asthma, and mixed asthma (Creer et al., 1991). Seasonal asthmatics experience asthma when environmental allergen counts are high and may be symptom-free during the remainder of the year. In contrast, intrinsic asthmatics experience asthma on a perennial basis, and precipitating factors are difficult to identify. However, many asthmatics experience mixed asthma, where both

extrinsic and intrinsic stimuli precipitate asthma (Creer et al., 1991). The current study provides some support for these categories. A total of 107 participants thought winter was the worst season for their asthma, and 68 thought spring was. A substantial number (140) did not experience seasonal variation in asthma.

In the light of this descriptive data, and since the first questionnaire was administered in spring and the second in autumn, differences in the means of constructs in the determinants model over the two measurement points were expected. A repeated measures MANOVA analysis revealed that there were higher levels of intensity of asthma over the last six months, frequency of attacks, and self-rated seriousness during spring (Time 1) compared to autumn (Time 2) (see Table 3). The presence of extrinsic asthmatics in the sample provides the most likely explanation for these findings. However, rerunning the analysis on the 68 participants who thought spring was the worst season for their asthma revealed differences in self-rated seriousness and number of symptoms, but no differences in intensity of asthma over the last six months and frequency of attacks. Moreover, rerunning the analysis on the 140 participants who reported no seasonal variation in asthma revealed the same differences that were found for the whole sample. Clearly, both these additional analyses have lower power, which may influenced the accuracy of the findings. For example, lower power may have precluded the detection of some of the smaller differences. Regardless, it would seem that more complex explanations than the one offered are needed.

Overall, although some differences emerged, the determinants model is relatively stable over the two measurement points. This can be concluded from the fact that the magnitude of each difference found is small in comparison to its corresponding total score. This is true despite the fact that some asthmatics experience seasonal variation in the illness, which probably provides the most substantive "real-world" test of the

model's stability.

(vii) General issues in the model

A number of general issues arose during the model testing. The first issue concerns a general interpretative problem which arises as a result of using multiple regression techniques to analyze the data. In formulating the determinants model, there were theoretical reasons to assume that prevalence, treatability, and asthma history are not merely correlated with seriousness, but actually determine it. For example, the relationship that prevalence determines seriousness was proposed on the basis of research conducted by Jemmott et al. (1986), who experimentally manipulated prevalence (the IV) and measured seriousness (the DV). However, the multiple regression techniques used in the current study do not demonstrate determination, but rather only association (Tabachnick & Fidell, 1989). As such, for example, instead of average intensity over entire history determining seriousness, it is possible that seriousness determines average intensity over entire history. Still further, it is possible that these two constructs are reciprocally related. In conclusion, the notion that prevalence, treatability, and asthma history determine seriousness is supported by theory, but there is a need to acknowledge that relationships in the reverse direction or reciprocal relationships are also possible. Comparable arguments apply to relationships in the consequences model.

A second issue concerns the operationalization of the constructs in the determinants model. In general, all these constructs were operationalized by constructing items which focus on asthma, the illness. For example, treatability was assessed using the single item measure: "In your opinion, how treatable is your asthma?" On reflection, there may well have been some advantage in additionally measuring this construct using the items: "In your opinion, how treatable are your asthma attacks?" Similarly, other constructs in the model could have been measured using additional items. This

may have been justified from the viewpoint that asthmatics may well focus more on episodes of asthma in appraising their illness, rather than the illness itself. This suggestion rests on the argument that asthma "the illness" can be distinguished from asthma "the summation of episodes", which is justified because participants still view themselves to be asthmatics during the periods between episodes, when they are asymptomatic. As such, the probability of obtaining a relationship between, for example, treatability and seriousness may have increased. Overall, in retrospect, it is possible that perceptions of acute episodes may be more critical in determining seriousness. Comparable arguments apply to some constructs in the consequences model.

The third issue concerns the overall level of support for the determinants model. Although there were a number of theorized determinants, only average intensity over entire history, average intensity over the last six months, and frequency of attacks contributed to the determination of self-rated seriousness, and only average intensity over entire history contributed to the explanation of the symptom measures of seriousness. This raises the possibility that the determinants model can be reformulated. Clearly, this is a viable option, when seriousness is assessed using self-rated seriousness. The findings reveal that the determinants account for 47% of the variance in self-rated seriousness at Time 1, and 44% at Time 2 (see Table 7). As such, the determinants model can be reformulated, so that average intensity over entire history, average intensity over the last six months, and frequency of attacks are viewed to be the determinants of self-rated seriousness. On the other hand, the model simplifies to a singular relationship between average intensity over entire history and seriousness, when seriousness is assessed using number or frequency of symptoms.

The intention of the present study was to test a number of hypothetical relationships. Constructs were not selected with the intention of maximizing the explained variance

in seriousness. Regardless, it is clear that the model has missing constructs, since the determinants explain less than 50% of the variance in self-rated seriousness and less than 30% of the variance in number or frequency of symptoms (see Table 12). A review of the seriousness literature reveals few clues as to what these missing constructs might be, and this probably reflects Jemmott et al.'s (1986) comment that studies investigating seriousness as a dependent variable are sparse. Inside the model itself, it is worthwhile entertaining the idea that number and frequency of symptoms can be reconceptualized as determinants of self-rated seriousness. In other words, asthmatics' experience of symptoms might be viewed as contributing to their evaluation of the illness's self-rated seriousness. Clearly, this idea is a radical departure from the study assertion that number and frequency of symptoms are measures of seriousness, and it should be emphasized that it in no way contravenes that assertion.

The fourth issue concerns some general conclusions which can be drawn from comparing the work of Jemmott, Croyle, and colleagues and the current study. The determinants model was devised almost solely on the basis of work conducted by Jemmott, Croyle, and colleagues, who experimentally investigated psychological reactions to "diagnosis" (e.g., Ditto et al., 1988; Jemmott et al., 1986, Jemmott et al., 1988). In contrast, the current study tested the model in the context of studying a chronic illness, which revealed very limited support for the model. As such, and consistent with earlier discussion, it is reasonable to speculate that the nature of the seriousness relationships alter as asthmatics adjust to their illness. This is necessarily speculative, since no research, including the current study, has verified the structure of the model in the case of recently diagnosed asthmatics. Regardless, in a general sense, this idea is consistent with a number of studies (Bombardier, D'Amico, & Jordan, 1990; Brooks & Matson, 1982; Radley & Green, 1987; Taylor, 1983; Taylor, Lichtman, & Wood, 1984) which have examined how individuals adjust to chronic

illness. All these studies concur that adjustment to chronic illness is a dynamic process. For example, Taylor (1983) argues that the adjustment process centres around three themes; (i) a search for meaning in the experience, (ii) an attempt to regain mastery over the illness and over one's life more generally, and (iii) an effort to restore self-esteem through self-enhancing evaluations. In conclusion, the disparities between expectations and findings in the determinants model are consistent with the notion that the seriousness relationships are not static following diagnosis, but rather alter as the adjustment process proceeds (see Lazarus & Folkman, 1984).

The question then arises as to what mechanism is involved in the changing nature of the seriousness relationships. One possibility is that the relationships alter as the influence of denial attenuates with the progression of time. Consistent with earlier discussion, it is probable that this occurs quite rapidly to begin with and then tapers off as the individual moves into the chronic stages of the illness. In the first instance, Croyle, Jemmott, and colleagues provide clear experimental evidence that denial influences the seriousness relationships following "diagnosis". In fact, Croyle and Sande (1988) conclude that minimized seriousness provides direct evidence of denial. On the other hand, the current study provides evidence that denial plays a very limited role in the seriousness relationships, when studying chronic asthma. In particular, there was no evidence that the strength of the seriousness relationships are influenced by repression. Moreover, the direction of the few seriousness relationships which did emerge suggest that chronic asthmatics are rational actors. Overall, it is probable that asthmatics have a tendency toward greater rationality, reflected in the decreasing influence of denial, as the adjustment process unfolds.

Other lines of research support this explanation. Roth and Cohen (1986) evaluated the relative merits of avoiding versus approaching stress. They comment that there is evidence that avoidance is better than approach if the situation is uncontrollable,

whereas approach is better if there is potential control. Consequently, although recently diagnosed asthmatics may not recognise many opportunities for control, they will soon learn that these opportunities exist, as time progresses. Moreover, the motivation to approach the illness is likely to increase following diagnosis, since Staudenmeyer, Kinsman, Dirks, Spector, and Wangaard (1979) report that asthmatics who approach the onset of an attack have fewer serious attacks than those who avoid this. In this sense, asthma can be contrasted with persons who, for example, have paralysis, where there is no advantage of approach and where avoidance reduces anxiety and depression (Roth & Cohen, 1986). In conclusion, experienced asthmatics are likely to be in an approach mode, rather than an avoidance mode, because of the benefits they have accrued from their attempts to control the illness. The current study provides some evidence that this is true, where high percentages of participants report using the health competencies (see Appendix I).

Overall, it seems very likely that the seriousness relationships are not static following initial diagnosis, but change substantially as the individual moves into the chronic stages of their illness. The changing nature of these relationships probably reflects the declining influence of denial as the adjustment process unravels.

4.2 The consequences of seriousness

The consequences model proposes that seriousness is positively related to health behaviour, and that self-efficacy moderates this relationship. In contrast to the determinants model, there were clear expectations concerning the structure of this model, including the directions of the theorized relationships in it.

However, contrary to these expectations, the main analyses revealed limited support for the hypotheses in the consequences model. These findings can be summarized as

follows: (1) number of symptoms was related to the health competencies, but self-rated seriousness and frequency of symptoms were unrelated to this outcome, (2) seriousness was unrelated to adherence, and (3) self-efficacy was not a moderator of the seriousness/health behaviour relationships.

(i) Seriousness and health behaviour

Earlier, it was argued that self-rated seriousness and the symptom measures of seriousness assess somewhat different aspects of the seriousness construct. This is consistent with the current findings, where number of symptoms related to the health competencies but self-rated seriousness did not. In this sense, two aspects of the seriousness/health behaviour relationship are under investigation in the current study.

First, the findings revealed that asthmatics' perceptions of the self-rated seriousness of asthma did not determine their use of the health competencies. Self-rated seriousness can reasonably be viewed to be a traditional Health Belief Model (HBM) measure of seriousness (see Janz & Becker, 1984). As such, the current finding can be compared to the general results of HBM research. In a review of HBM research, Janz and Becker (1984) found that an association between seriousness and sick role behaviour emerged in 11 out of 13 studies. These figures were offered as support for the current hypothesis, since the use of the health competencies and the correct use of medications can be viewed to be sick role behaviours. Recall that sick role behaviour was defined as "actions taken after diagnosis of a medical problem in order to restore good health or prevent further disease progress" (Janz & Becker, 1984, p. 3). However, other lines of HBM research provide evidence that the seriousness/sick role behaviour relationship can be tenuous (e.g., Harrison et al., 1992). They conducted a meta-analytic review on HBM research and found a weighted mean size of effect for the relationship between seriousness and adherence to medical regimens of $r = .15$ ($p < .01$), based on 8 studies of chronic adult illness. These studies investigated renal

disease, diabetes, hypertension, and obesity. As such, it is not surprising that some investigations, including the present study, reveal null results for this relationship.

There is an alternative explanation for the null findings. Given that asthma is an episodic illness, most persons who suffer from it will be asymptomatic much of the time. This will be particularly true of asthmatics who have good control over their illness, who may seldom be required to deal with acute exacerbations. Moreover, there is evidence that asthmatics function normally between episodes, apparently unafflicted by the illness during these times (McFadden, 1987). As such, it is reasonable to argue that asthmatics practise preventive health behaviours much of the time, rather than sick role behaviours. Consequently, in one sense, the consequences model can be reframed as a formulation in which the dependent variable is preventive health behaviour. Janz and Becker (1984) also reviewed HBM studies on this type of health behaviour. They found a positive association between seriousness and preventive health behaviour in only 4 out of 11 studies. This led them to conclude that seriousness is the weakest of the four HBM components (vulnerability, seriousness, benefits, barriers) determining preventive health behaviour. This conclusion is consistent with findings from Harrison et al.'s meta-analytical review of HBM studies. They report a weighted mean size of effect for the relationship between seriousness and preventive health behaviour of .03 ($p > .05$), based on 5 studies. These were studies on screening procedures for various illnesses, such as breast cancer. Overall, if asthmatics primarily use the health competencies to prevent asthma, then the current null finding could be expected.

The remaining explanation for this null finding is that there are methodological inadequacies in the study, which have obstructed the detection of this relationship. However, a review of the methodological issues that might influence this relationship revealed only minor concerns. The most obvious of these concerns is the possibility

that the single item measure of self-rated seriousness is unreliable. The current study shows that it has a test-retest reliability of r=.67. Otherwise, there was some reason to question the use of the 'yes', 'no', 'not applicable' response scale used to assess the health competencies. The decision to use this response scale was made on the basis that the health competency inventory included a large number of items, and was therefore expected to generate variables with sufficient variability. Analysis reveals that this expectation is justified, with the health competencies variable having a satisfactory distribution, including adequate variability, at both times. Although the reliability of the single item measure of self-rated seriousness can be questioned, it would seem unlikely that inadequacies in method have produced the current null finding.

In contrast, the findings reveal that number of symptoms determines the use of the health competencies, although frequency of symptoms does not. In the first instance, this provides evidence that the two symptom measures of seriousness are distinguishable with respect to their ability to explain the competencies. In passing, it can be noted that there was actually some tendency for frequency of symptoms to be negatively related to the use of the health competencies. However, this only reached significance at Time 2, and was therefore viewed to be an unreliable finding.

Of all the independent variables in the consequences model, number of symptoms was the strongest determinant of the health competencies. This finding also emerged at the health competency factor level, where number of symptoms determined the use of all five categories of health competency; preventive medication competencies, precipitant avoidance competencies, symptom intervention competencies, communication competencies, and health promotion competencies (see Wilson et al., 1990). Hindi-Alexander and Throm (1987) have demonstrated a similar relationship between symptom experience and health behaviour in asthmatics. The findings are also

consistent with a number of other studies (e.g., Becker & Maiman, 1975; Blackwell, 1979; Ford et al., 1989; Jonsen, 1979), which argue that the presence of symptoms motivates the use of health behaviours. Along this line, two studies (Blackwell, 1979; Jonsen, 1979) have suggested that symptoms are cues that elicit health behaviour. In passing, it should be noted that it was not possible to compute a measure of symptom severity in the current study, since the Asthma Symptom Checklist does not lend itself to this possibility. As such, further clarification of the relationship between symptom experience and the health competencies is not possible.

The suggestion that symptom experience cues the use of health behaviour is consistent with the observed behaviour of many asthmatics, where the onset of symptoms often prompts the use of inhaled medications. However, the current findings reveal that none of the seriousness measures, including number of symptoms, determine the adherence practices of asthmatics. One possible explanation for this finding is that asthmatics sometimes overuse medications when experiencing overt symptoms (Voyles & Menendez, 1983). A more general explanation is that there are two competing influences which shape the seriousness/adherence relationship in asthmatics. On the one hand, there is evidence that individuals higher in seriousness are more motivated to use medications correctly, compared to those lower in seriousness (e.g., Becker & Maiman, 1975). On the other hand, Bond et al. (1992) report that for patients with a relatively severe chronic illness there is some evidence that threat is negatively associated with adherence to complex regimens. This may be true of asthma, which is a moderately serious illness (Rosenberg et al., 1987) and which often involves the use of complex medication regimens (e.g., Voyles & Menendez, 1983). As such, it is possible that the net effect of these two influences yields no association at all.

(ii) Self-efficacy and health behaviour

Self-efficacy was the other major construct in the consequences model. It can influence

health behaviour in one of two ways. First, it can have a direct influence on health behaviour and, second, it can influence health behaviour by acting as a moderator in the seriousness/health behaviour relationships. In the current study, there was most interest in the second of these two possibilities.

The findings reveal that self-efficacy directly influences the use of health behaviours. They show that when asthmatics perceive the health competencies to be effective in managing asthma they use more of those competencies, and they adhere better to inhaled and other medications. Moreover, the relative sizes of the beta weights indicates that response efficacy accounts for notable amounts of variance in these outcomes (see Table 12). There was further evidence for this relationship at the health competency factor level, where specific response efficacy items determined precipitant avoidance competencies, communication competencies, and health promotion competencies. For example, asthmatics who believe that precipitant avoidance competencies are effective in managing asthma use more of those competencies. All these findings are consistent with previous research reporting that outcome expectancy is an important determinant of health behaviour (O'Leary, 1985; Strecher et al., 1986).

In offering hypotheses, both personal and response efficacies were expected to be important in determining health behaviour. Both these expectancies were assumed to be influential in illnesses with health behaviours that are difficult to change and that have uncertain consequences (Strecher et al., 1986). This was thought to be true of asthma, where the individual is often required to follow a complex regimen (e.g., Voyles & Menendez, 1983) to control an unpredictable illness (e.g., Hilton, 1986; Rachelefsky, 1987). However, the findings reveal that personal efficacy does not determine the use of health behaviour. Specifically, asthmatics who feel capable of carrying out health competencies do not necessarily use more of those behaviours, or

adhere better to inhaled or other medications. Possible explanations for these findings are that asthmatics underestimate the complexity of using the health competencies or adhering to medication regimens, or simply do not regard these competencies as being important. The current study suggests that the second of these two explanations is less likely with respect to the use of the health competencies, since high percentages of participants report using the competencies (see Appendix I). In contrast, there is a relatively strong relationship between response efficacy and health behaviour.

The current study hypothesized that self-efficacy would moderate the relationship between seriousness and health behaviour. This hypothesis was grounded in protection motivation theory (e.g., Prentice-Dunn & Rogers, 1986), which proposes the same relationship. It is also consistent with other lines of research suggesting that self-efficacy is likely to moderate the relationship between knowledge of asthma and performance of health behaviour (see Creer, 1987; Creer & Kotses, 1990). However, contrary to expectations, no moderating effects were found.

The explanation for these null findings is not clear. The hypothesis was based on strong theoretical arguments, and it seemed entirely plausible, for example, that if asthmatics viewed their illness to be serious and viewed themselves capable of carrying out the health competencies then they would use higher numbers of health competencies and adhere better to medications. The emergence of these null findings led to supplementary analyses. It was postulated that asthmatics may be unlikely to view the two self-efficacy expectations in isolation, and that their combination may be more influential in the seriousness relationships. As such, each participant's personal and response efficacies scores were added together, and the analyses for moderating effects were rerun. However, this still revealed no effects.

In the absence of explanations for the null findings, it would seem likely that

methodological inadequacies have obstructed the detection of the moderating effects. Consistent with explanations offered for the absence of relationships between seriousness and health behaviour, it is possible that the "moderating influence" of self-efficacy on the seriousness relationships is so small that it could not be detected by the current design. The current study provides some support for this explanation, where personal efficacy moderated the relationship between self-rated seriousness and the health competencies at Time 2, but not at Time 1. Thus, a design with greater power may be needed to detect these effects. Second, it is possible that the relationships between the strength of the seriousness/health behaviour relationships and self-efficacy are not linear, and the current analyses will not detect non-linear interaction effects. It was not felt necessary to check this possibility, since there are no substantive theoretical reasons to suspect this type of effect. Third, the arguments of McCelland and Judd (1993) offered earlier may be relevant here. They argue that tests of interaction effects in field studies often have less than 20% of the efficiency of optimal experimental tests. As such, it is possible that the hypothesized moderating effects do actually exist and may even be quite strong, but the study design failed to detect them. In essence, the issues raised by McClelland and Judd (1993) reduce to the earlier point on insufficient statistical power to detect effects.

(iii) Age differences in adherence

The findings revealed that older asthmatics adhere better to inhaled medications than younger asthmatics. A number of previous studies report similar findings. Bailey et al. (1992, p. 25) conducted a study using the same adherence measures as those used in the current study, and concluded that "older patients were significantly more likely to report improved compliance with their oral asthma medications and had a tendency toward better compliance with inhaled bronchodilators." In another study, Jones et al. (1987) found that older asthmatics are more likely to make and keep appointments than younger asthmatics.

The current finding may be partly due to the fact that age was correlated ($r = .22$, $p < .001$) with duration of asthma. Thus, as a function of their longer experience with asthma, older asthmatics may have developed greater recognition of the efficacy of inhaled medications. Also, older asthmatics may be more accepting of pharmacological approaches to asthma management than younger asthmatics. The finding is also consistent with reports that health has increased importance to older persons (Laird & Chamberlain, 1990), and that older individuals score more highly on measures of health promoting lifestyle, health responsibility, nutrition, and stress management compared to younger individuals (Walker, Volkan, Sechrist, & Pender, 1988).

(iv) Stability of the model

The remaining issue concerns the stability of the consequences model. Earlier, it was argued that the determinants model is relatively stable at the group level, despite small differences in some constructs. The findings reveal that the consequences model is also relatively stable (see Table 8). In this model, small differences were found in self-rated seriousness, and both response and personal efficacies. The directions of these differences suggest that asthmatics perceive lower personal and response efficacy in managing asthma in spring (Time 1) compared to autumn (Time 2), when they perceive it to have higher self-rated seriousness. Again, the presence of extrinsic asthmatics in the sample provides the most plausible explanation for these findings. As such, larger differences in self-rated seriousness, personal and response efficacies might be expected in the 68 participants who identified spring as the worst season for their asthma. However, analysis using the current data reveals no support for this suggestion. In fact, this analysis revealed a different pattern of results, where there were differences in self-rated seriousness, number of symptoms, and personal efficacy, but not response efficacy. Consequently, the presence of extrinsic asthmatics in the sample does not provide an adequate explanation for the findings. Again, it would seem that more elaborate explanations than the one offered are required.

Overall, the consequences model is relatively stable over the two measurement points. Again, this can be concluded from the fact that the magnitude of each difference found is small in comparison to its corresponding total score.

4.3 Seriousness: A salient illness cognition?

The current study commenced with the general assertion that seriousness is a salient illness cognition. A number of studies provided support for this. For example, Jemmott et al. (1986, p. 899) expressed the view that "the judgement of seriousness is interesting because it captures, in a simple way, a critical part of what is on the layperson's mind when considering a health disorder." Another study reports that seriousness is an underlying structure organising an individual's common sense illness schema (Turk et al., 1986), and Taylor (1990) reports a convergence of findings indicating that seriousness is one central determinant of health behaviour.

The findings for the consequences model bear directly on the question of the salience of seriousness. First, contrary to Taylor's (1990) general conclusion, self-rated seriousness was unrelated to health behaviour. In passing, Taylor's conclusion pertains to studies investigating the relationship between traditional measures of seriousness, such as those used in HBM research, and health behaviour. In the current study, self-rated seriousness can reasonably be viewed to be a traditional HBM measure of seriousness, whereas the symptom measures of seriousness can not. Second, there was no evidence that seriousness interacts with self-efficacy to explain health behaviour. Third, there was very limited evidence that seriousness acts as mediator between the determinants and the consequences, although number of symptoms was a weak mediator between average intensity over entire history and the use of the health competencies. As such, there is very limited support for the view that seriousness is salient from the viewpoint that it acts as a "pivotal" or "organizing" construct between the two models. However, there was evidence that number of symptoms determines

the use of the health competencies. Collectively, these findings suggest that seriousness is not a salient illness cognition, despite evidence that the part of the seriousness construct measured by number of symptoms is important in determining the health competencies.

However, it is possible to reconcile the original assertion that seriousness is salient and the study findings. Paradoxically, it is likely that seriousness is among the most important illness cognitions determining health behaviour, but it nevertheless explains limited variance in this outcome. This interpretation is consistent with the finding that, at best, less than 10% of the variance in health behaviour is explained by any one dimension of the HBM (Harrison et al., 1992). It is also consistent with the notion that numerous factors are presumed to contribute to the explanation of health behaviour. One study (Best & Cameron, 1986) points to a complex interplay between biological, psychological, and sociocultural factors in their determination. Overall, cognitive constructs, such as seriousness, are likely to be "constrained" in their efforts to explain meaningful amounts of variance in health behaviour. They will be "constrained" from the viewpoint that, apart from the contribution of biological and sociocultural constructs, there are likely to be a substantial number of psychological constructs which play minor roles in determining health behaviour.

In conclusion, the current findings reveal that seriousness is not a salient illness cognition determining health behaviour. However, paradoxically, it is still likely to be among the most important cognitions determining this outcome.

4.4 Applications: Adult asthma self-management

(i) Clinical applications

The health competency inventory used in the current study was developed from a checklist provided by Wilson et al. (1990). According to Wilson et al. this checklist

is a useful summary against which to evaluate an individual's self-management practices. In particular, it is useful for identifying specific weaknesses in an individual's health competencies, which often have major implications for symptom control (Wilson et al., 1990). Thus far, Wilson and colleagues have not published normative data on the health competencies. This would complement the listing itself, and provide asthma educators and clinicians with a "hit list" of poorly employed health competencies.

Information of this type was calculated using the current data. In the present study, participants were asked to indicate their use of each health competency by responding 'yes', 'no', or 'not applicable'. In the current analysis, the data was analyzed by counting the number of 'yes' responses for each competency. The results appear in Table 18, at Appendix I. Overall, the results revealed that high percentages of participants use most of the health competencies, although the precipitant avoidance competencies were generally less well employed. This data forms the basis of an article currently being written for the *Journal of Asthma*.

The second clinical application concerns the targeting of groups of asthmatics weak in particular areas of self-management. Analyses were conducted to examine variations in the adherence practices and use of health competencies by age, gender, educational level, and number of symptoms. This revealed that older asthmatics adhere better and use more competencies than younger asthmatics, women use more health competencies than men, and asthmatics with higher numbers of symptoms use more competencies than those with lower numbers. There were no differences in the self-management practices by educational level. As mentioned earlier, the better adherence practices in older asthmatics may be due to their having developed greater recognition of the efficacy of medications. The more extensive use of competencies by older people reflects previous findings that this group values health more and engages in less health

threatening behaviours in general (Walker et al., 1988). The same explanation can be offered for the gender difference in the use of the competencies (Kristiansen, 1990). The results also suggest that experiencing symptoms motivates the use of health behaviour. This material was published (Laird, Chamberlain, & Spicer, 1994) and appears at Appendix K.

(ii) Other applications

Earlier, it was concluded that seriousness is not an important determinant of asthma health behaviour, although number of symptoms determined the health competencies. Moreover, asthmatics' judgements of the prevalence and treatability of asthma, and three of the asthma history variables (duration, average intensity over the last six months, frequency of attacks) are not important in explaining health behaviour. However, the remaining measure of asthma history, average intensity over entire history, was found to determine the health competencies. This group of results was found when seriousness was analyzed as a possible mediator between the determinants and consequences (see Section 3.3). Thus, only two variables, number of symptoms and intensity over entire history, relate to the health competencies. Clearly, it is not ethically possible to use either of these variables to promote the use of health behaviour.

However, the findings reveal that response efficacy accounts for notable amounts of variance in the health competencies, and adherence to inhaled and other medications. Accordingly, attempts by clinicians to strengthen the response efficacy expectation in asthmatics may result in improved use of health behaviour. The next few years will see the development of individualized self-management programmes, and clinicians will be able to meet the specific training needs of individual asthmatics more effectively (Kotses et al., 1991). The recommendation of the current study is that developers of individualized programmes should pay some attention to finding ways

to incorporate the notion of response efficacy.

4.5 Future directions

The current study points to a number of specific future directions for research. First, given the relative success of response efficacy in explaining asthma health behaviour, it may be worthwhile making this the focal/pivotal point of a further asthma study. The theory building and testing could proceed in a similar fashion to the current study, centred around response efficacy instead of seriousness. In such a study, an examination of the cognitive determinants of response efficacy would be of particular interest. Bandura (1977) points to the influence of such factors as vicarious experience and verbal persuasion as determinants of self-efficacy expectations, but few investigations have looked at the cognitive determination of self efficacy (see Schwarzer, 1994). The identification of these determining constructs would provide a mechanism to manipulate levels of response efficacy in asthmatics, and it was previously suggested that response efficacy may be clinically important in determining health behaviour.

The second direction for future research concerns earlier suggestions that the nature of the seriousness relationships may be contingent on illness stage. It was theorized that the strength of a relationship between treatability or prevalence and seriousness is maximal immediately following diagnosis but declines as asthmatics adjust to their illness, and is effectively zero in fully adjusted asthmatics. However, duration of asthma did not moderate the prevalence/seriousness or treatability/seriousness relationships, leading to the suggestion that these seriousness relationships may be short lived, following diagnosis. It was not possible to test this idea using the current data, since there were insufficient numbers of recently diagnosed asthmatics in the sample. It would be interesting to investigate this phenomenon in a detailed way, which would provide useful information on how asthmatics adjust to their illness.

The third direction for future research concerns a suggestion early in the discussion that asthmatics may quite generally appraise their current asthma in an unrealistically positive fashion compared to their past asthma. This was offered as a possible explanation for the finding that average intensity over the last six months was much less influential in determining self-rated seriousness, compared to average intensity over entire history. This explanation is consistent with other lines of research (e.g., Weinstein, 1982; 1983; 1987) reporting that people often hold unrealistically optimistic views on the likelihood that they will develop major health problems. As such, the current study signals a potentially interesting future study on asthmatics' appraisals of current asthma compared to past asthma.

The final direction for future research concerns the issue of replicating the current study using other chronic illnesses. The current study revealed limited support for both the determinants and consequences models when studying adult asthmatics. The study could be repeated for illnesses with both lower (e.g., chronic bronchitis) and higher (e.g., heart attack) 'objective' seriousness, compared to asthma (see Rosenberg et al., 1987).

The determinants model was formulated on the basis of experimental work conducted by Croyle, Jemmott, and colleagues, where the fictitious TAA enzyme deficiency was portrayed as having relatively low seriousness. As such, and in the light of the current findings, it is possible that the determinants model may yield stronger effects for illnesses lower in 'objective seriousness'.

The consequences model was seemingly firmly based on the Health Belief Model (e.g., Janz and Becker, 1984) and Protection Motivation Theory (e.g., Prentice-Dunn & Rogers, 1986). However, studies employing these established formulations yield only weak associations between cognitions and health behaviour (see e.g., Harrison

et al., 1992). Speculating, and in contrast to the determinants model, it is possible that the consequences model may yield stronger effects for illnesses higher in 'objective seriousness'.

Overall, based on the current study, it is tempting to conclude that "seriousness should not be taken all that seriously" as an illness cognition. Regardless, the study generated some interesting findings and discussion, and some important future directions for research.

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APPENDIX A: CONSENT FORM/INFORMATION SHEET (AUCKLAND)

RESEARCH PROJECT ON ASTHMA

Information Sheet

What is the study about?

The aim of this research is to explore how you think about your asthma, and how these thoughts influence what you do about your asthma. We are mainly interested in what you do to look after your asthma. We believe that research of this type is extremely valuable, in that it improves our understanding of asthma and how it is managed in New Zealand. The project has the support of the Asthma Foundation of New Zealand and the Auckland Asthma Society. It is being run by Richard Laird in consultation with Kerry Chamberlain and John Spicer of the Psychology Department of Massey University, and is funded by Massey University.

Am I eligible to take part?

You are eligible to take part if you are 18 years of age or over, and have been diagnosed as having asthma. A further requirement is that you do not have any other major medical problem.

What would I have to do?

If you are willing to help us with this project then you will be required to fill out a questionnaire we will mail to you, and also a second questionnaire which will be mailed to you in six months time. Both questionnaires are quite straight forward and easy to complete. Each will take about one hour to complete, at a time convenient to you.

What can I expect from the researchers?

As a participant:

1) you have the right to refuse to answer any particular question, and to withdraw from the study at any time.
2) you provide information on the understanding that it is confidential to the researchers. Both questionnaires are seen only by the researchers, and you will be identified only by code number. It will not be possible to identify individuals in any published reports.
3) you can expect to be informed of the results of the study. This will be done by posting you a summary of the findings.

It is important to emphasize that we shall ***not*** be offering advice about your health, since the information we shall be collecting will not be suitable for that purpose. If you encounter health problems during the study we assume that you will take appropriate action, as you would normally.

If you have any questions at all about this study please call Richard Laird **collect** at Massey University, Palmerston North (06) 3569099, extension 7922. If you wish to participate in this study, please sign your name and supply us with your address on the Consent Form attached. Please then place this form in the envelope provided and post it back to us. You do not need to put a stamp on this.

RESEARCH PROJECT ON ASTHMA

Subject Consent Form

I have read the Subject Information Sheet for the above research study to be performed by Richard Laird.

I agree to participate in this study. I have had the opportunity to ask questions. I understand I may withdraw my permission at any time without giving any reason. A decision not to participate or to withdraw will not affect my future treatment.

Name: _____

Signed: _____

Date: _____

Please **print** your address here so that we can mail the questionnaires to you.

Address: _____

_____

_____

APPENDIX B: CONSENT FORM/INFORMATION SHEET (CHRISTCHURCH)

RESEARCH PROJECT ON ASTHMA

What is the study about?

The aim of this research is to explore how you think about your asthma, and how these thoughts influence what you do about your asthma. We are mainly interested in what you do to look after your asthma. We believe that research of this type is extremely valuable, in that it improves our understanding of asthma and how it is managed in New Zealand. The project has the support of the Asthma Foundation of New Zealand and the Canterbury Asthma Society. It is being run by Richard Laird in consultation with Kerry Chamberlain and John Spicer of the Psychology Department of Massey University, and is funded by Massey University.

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2) you provide information on the understanding that it is confidential to the researchers. Both questionnaires are seen only by the researchers, and you will be identified only by code number. It will not be possible to identify individuals in any published reports.
3) you can expect to be informed of the results of the study. This will be done by posting you a summary of the findings.

It is important to emphasize that we shall ***not*** be offering advice about your health, since the information we shall be collecting will not be suitable for that purpose.

If you have any questions at all about this study please call Richard Laird **collect** at Massey University, Palmerston North (06) 3569099, extension 7922.

(please cut along dotted line and return lower portion)

Research Project on Asthma

The details of this study have been adequately explained to me, and I wish to participate under the stated conditions.

Signed:_____

Please **print** your name and address here so that we can mail the questionnaires to you.

Name:_____

Address:_____

_____

APPENDIX C: ACCOMPANYING LETTER (QUESTIONNAIRE ONE)

RESEARCH PROJECT ON ASTHMA

Thank you for agreeing to help us with this study. Your participation is greatly appreciated, and we believe you will find it an enjoyable and worthwhile experience.

We are now sending you the first questionnaire which you agreed to complete for us. It should take no longer than one hour to complete. To a large extent it involves the circling of numbers, and no writing is involved.

We would like to remind you that everything you put down is completely confidential. You have the right to refuse to answer any particular question, and you can withdraw from the study at any time. In due course we will provide you with a summary of the findings of the study.

We would now ask you to read the instructions for the enclosed questionnaire, complete it at the earliest convenient time for yourself, and post it back to us. You can send the questionnaire back to us in the enclosed addressed envelope. Note that you do not need to put a stamp on it - just drop it in the nearest mailbox.

Remember that if you have any questions you can call me collect at Massey University, Palmerston North (06) 3569099, extension 7922.

With much appreciation

Richard Laird
Researcher

APPENDIX D: QUESTIONNAIRE ONE

MASSEY UNIVERSITY

MASSEY
UNIVERSITY
LOGO

RESEARCH PROJECT ON ASTHMA
QUESTIONNAIRE ONE

Please read the following instructions and follow them carefully.

Remember that all the information you give us is confidential. The information gathered by this questionnaire will be used only for the purposes of this study.

Remember that you have the right to withdraw from the study at any time, and you can refuse to answer any particular question.

This questionnaire will take about one hour to complete. We would like you to find a time when you will not be disturbed, and to answer all the questions in one session if possible. Please do this at the earliest convenient time for you after receiving the questionnaire.

It is important that you give your own answers to the questions. Therefore, we would ask that you do not discuss the questions with others. Of course, if you need help to read the material or with the meaning of some of the questions, you should ask someone to help you.

There are no right or wrong answers to the questions asked. An answer is correct if it is true for you. It is best not to think about any one question for too long since your first answer is usually the best one.

Please try to answer all the questions, and be careful not to skip any pages.

When you have finished, please return the questionnaire to us in the enclosed envelope provided. You do not have to put a stamp on this.

In the first few questions we would like you to think about your asthma symptoms. Please indicate <u>how often</u> each of the following symptoms occurs when you experience your asthma. Please circle the appropriate number opposite each question below:

Please do not write in this column

☐☐☐ 3

Never. 1
Sometimes. 2
Frequently 3
Almost always 4
Always 5

Cramps	1 2 3 4 5	☐
Numbness	1 2 3 4 5	☐
Mucous congestion	1 2 3 4 5	☐
Uncomfortable	1 2 3 4 5	☐
Frightened	1 2 3 4 5	☐
Hard to breathe	1 2 3 4 5	☐
Headache	1 2 3 4 5	☐ 10
Edgy	1 2 3 4 5	☐
Afraid of being left alone	1 2 3 4 5	☐
Irritable	1 2 3 4 5	☐
Short of breath	1 2 3 4 5	☐
Chest congestion	1 2 3 4 5	☐
Cranky	1 2 3 4 5	☐
Afraid of dying	1 2 3 4 5	☐ 17
Frustrated with things	1 2 3 4 5	☐
Dizzy	1 2 3 4 5	☐
Worn out	1 2 3 4 5	☐
Panicky	1 2 3 4 5	☐ 21

Never 1
Sometimes 2
Frequently 3
Almost always 4
Always 5

Weak	1 2 3 4 5	☐ 22
Pins and needles feelings	1 2 3 4 5	☐
Wheezing	1 2 3 4 5	☐
Worried about attack	1 2 3 4 5	☐
Chest tightening	1 2 3 4 5	☐
Tired	1 2 3 4 5	☐
Scared	1 2 3 4 5	☐
Nervous	1 2 3 4 5	☐
Fatigued	1 2 3 4 5	☐
Helpless	1 2 3 4 5	☐
Chest filled up	1 2 3 4 5	☐ 32
Short tempered	1 2 3 4 5	☐
Worried	1 2 3 4 5	☐
Chest pain	1 2 3 4 5	☐
Exhausted	1 2 3 4 5	☐
Coughing	1 2 3 4 5	☐
No energy	1 2 3 4 5	☐ 38

Next, we are concerned with the general impressions you have of your asthma. Please provide your answer to each of the following questions.

In your opinion, how serious a threat to your health is your asthma?

Not at all serious	1
Only slightly serious	2
Somewhat serious	3
Moderately serious	4
Very serious	5
Extremely serious	6

☐ 39

In your opinion, how treatable is your asthma? Please indicate your answer by placing a cross on the line below.

Only slightly treatable — Extremely treatable

|_____|

☐☐

In what year did you first experience problems with asthma? 19_____

☐☐

On average, how intense has your asthma been since you first experienced it?

Not at all intense	1
Only slightly intense	2
Somewhat intense	3
Moderately intense	4
Very intense	5
Extremely intense	6

☐

How frequently do you experience asthma attacks?

Can't say	0
Not at all frequently	1
Only slightly frequently	2
Somewhat frequently	3
Moderately frequently	4
Very frequently	5
Extremely frequently	6

☐ 45

On average, how intense has your asthma been during the last six months?

Not at all intense	1
Only slightly intense	2
Somewhat intense	3
Moderately intense	4
Very intense	5
Extremely intense	6

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The next group of questions are concerned with what you can do to control your asthma. For the first few questions in this section imagine you are experiencing early warning signs of asthma. Please indicate what you do in this situation by circling Yes or No or Not applicable (NA) as appropriate.

I recognise early warning symptoms of an attack . . . . . Yes No NA

I calm down and get control of emotions when they are the trigger . . . . . Yes No NA

I stop or decrease exercise when it is the trigger . . . . . Yes No NA

I leave areas where triggers are concentrated . . . . . Yes No NA

I improve ventilation or otherwise rid myself of contact with triggers . . . . . Yes No NA

I obtain appropriate treatment if respiratory infection is a trigger . . . . . Yes No NA

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I begin additional medication when appropriate . . . . . Yes No NA

I make use of further medication when an additional dose does not relieve symptoms but I do not exceed the recommended dose . . . . . Yes No NA

I use specific calming techniques (e.g. self-hypnosis) to reduce anxiety related to the attack . . . . . Yes No NA

I avoid exertion and either rest or engage in quiet activity . . . . . Yes No NA

I begin breathing exercises, take deep breaths and control my breathing . . . . . Yes No NA

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I drink warm and soothing beverages but avoid mucus producing or irritating foods or beverages . . . . . Yes No NA

I take a hot shower or otherwise inhale water vapour . . . Yes No NA

I position my body to allow easy breathing . . . . . Yes No NA

I treat other discomfort such as sinus congestion . . . . . Yes No NA

These next questions are about the things you can do more generally to control your asthma. Once again, please circle either Yes or No or Not applicable (NA).

I accept the need for and begin a medication program when it is prescribed . . . . . Yes No NA

I take medication according to the prescribed schedule . . Yes No NA

When experiencing side effects of the medication, I adopt appropriate ways to minimize them, including reporting to a doctor . . . . . Yes No NA

When symptoms decrease or disappear, I seek the doctor's advice before decreasing medication below prescribed level . . . . . Yes No NA

I use my inhaler properly as prescribed . . . . . Yes No NA

I use my home nebuliser as prescribed . . . . . Yes No NA

I observe and report things that seem to trigger symptoms . . . . . Yes No NA

I stop or reduce smoking tobacco or other substances . . . Yes No NA

I avoid or treat respiratory infections if they trigger my asthma . . . . . Yes No NA

I choose the best type, the best location for, and the right level of physical exertion that avoids triggering my asthma . . . . . Yes No NA

I take precautionary medicine before exercising so I can exercise adequately . . . . . Yes No NA

I handle strong emotions in a manner that does not trigger my asthma . . . . . Yes No NA

I avoid medications that trigger symptoms of my asthma .	Yes No NA	74
I choose low dust furnishings or cover furnishings that are dust traps	Yes No NA	
I clean effectively to minimize house dust and other triggers	Yes No NA	
I do not have pets that trigger my asthma or I minimize contact with them	Yes No NA	
I find ways to carry out indoor and outdoor house maintenance that minimizes exposure to airborne triggers	Yes No NA	
I stop or effectively restrict smoking in the house	Yes No NA	
I remove any other triggers or irritants from the house . .	Yes No NA	80
I would move house or change my living situation when it is not otherwise possible to reduce exposure to triggers to an acceptable level	Yes No NA	2/1
I minimize exposure to co-workers' or customers' tobacco smoke	Yes No NA	
I use a mask, respirator, or proper ventilation to avoid airborne triggers present in the workplace	Yes No NA	
I make minor or temporary adjustments to work responsibilities to avoid triggers or irritants in the workplace	Yes No NA	
I would change occupation or leave my job when it is not otherwise possible to reduce exposure to triggers to an acceptable level	Yes No NA	
I request non-smoking areas or minimize exposure to tobacco smoke in hotels, restaurants, and other enclosed places . .	Yes No NA	
I avoid exposure to other triggers and irritants in enclosed places	Yes No NA	
I avoid vehicle exhaust fumes due to heavy traffic or idling engines	Yes No NA	8

I avoid unnecessary exposure to seasonal or occasional triggers such as cold air, air pollution, or pollens . . . . . Yes No NA ☐ 9

I choose outdoor recreation or holiday spots free of triggers and/or use precautionary medication . . . . . Yes No NA ☐

I move to a different area when it is not otherwise possible to reduce exposure to triggers to an acceptable level . . . Yes No NA ☐

I have begun a program to avoid triggers specific to me despite conflict with my preferred or current lifestyle . . . Yes No NA ☐

I have balanced the requirements of this program against competing responsibilities, commitments, and desires . . . Yes No NA ☐

I have balanced the need to take proper corrective actions against competing responsibilities, commitments and desires . . . . . Yes No NA ☐

When self treatment, including taking medication, does not work or when symptoms are severe or prolonged I seek medical help . . . . . Yes No NA ☐ 15

I follow medical recommendations to manage a severe or prolonged attack . . . . . Yes No NA ☐

I establish and maintain a relationship with my doctor for the management of my asthma . . . . . Yes No NA ☐

I report any increase in symptoms of my asthma to my doctor for re-evaluation . . . . . Yes No NA ☐

I effectively communicate my medical history and my own health care requirements, especially to a new or temporary doctor . . . . . Yes No NA ☐

I obtain information from my doctor to understand my asthma . . . . . Yes No NA ☐

I obtain basic information about asthma from books, pamphlets, health educators, and other reliable sources . . Yes No NA ☐

I establish ways to share ideas and support with other sufferers . . . . . Yes No NA ☐

I get regular exercise . . . . . Yes No NA ☐ 2

I maintain proper weight and nutrition . . . . . Yes No NA [24]

I maintain adequate fluid intake . . . . . Yes No NA

I get adequate rest and avoid exhaustion . . . . . Yes No NA

I make use of stress reduction techniques routinely . . . . Yes No NA

I resolve negative or stressful situations in my personal or family life . . . . . Yes No NA

I avoid excessive overwork due to high-pressure job or overly demanding self-expectations . . . . . Yes No NA

I resolve disabling psychological or addictive problems . . Yes No NA [30]

When my partner or others are overconcerned about my management of my asthma I resolve these issues . . . . . Yes No NA

I effectively deal with the misunderstandings or prejudices of others concerning asthma and its management . . . . . Yes No NA

Next, we are interested in whether you feel the things you do to manage your asthma are effective, and if you feel capable of doing these things. Below are some short descriptions of the general things you may do to manage your asthma. Each description is followed by two questions. Read each description and then answer the two questions. Once again, please circle the answer that is correct for you.

Preventive medication competencies refer to things you do to successfully follow your medication program. These include accepting the need to begin a medication program, taking the medications as prescribed, and deciding on strategies to make sure you always take your medication. Also included is adjusting your medication to suit your needs, in accordance with the prescription or after seeking medical advice.

How effective do you think **your** preventive medication competencies are in managing your asthma?

Not at all effective 1
Only slightly effective 2
Somewhat effective 3
Moderately effective 4
Very effective 5
Extremely effective . . . . . 6 [33]

How capable do you think you are at carrying out preventive medication competencies?

Not at all capable	1
Only slightly capable	2
Somewhat capable	3
Moderately capable	4
Very capable	5
Extremely capable	6

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Trigger avoidance competencies refer to things you do to avoid or minimize exposure to triggers of your asthma. These include avoiding triggers in the home, workplace, or elsewhere. Also included are avoiding exertion, emotions, or foods/beverages/ other medications that have been identified as triggers.

How effective do you think **your** trigger avoidance competencies are in managing your asthma?

Not at all effective	1
Only slightly effective	2
Somewhat effective	3
Moderately effective	4
Very effective	5
Extremely effective	6

How capable do you think you are at carrying out trigger avoidance competencies?

Not at all capable	1
Only slightly capable	2
Somewhat capable	3
Moderately capable	4
Very capable	5
Extremely capable	6

Symptom intervention competencies refer to things you do to take care of your symptoms. These include recognising early warning signs of asthma episodes, attempting to remove any triggers of an episode, and correctly using medications to alleviate symptoms. Also included is making good decisions about the urgency of treatment.

How effective do you think **your** symptom intervention competencies are in managing your asthma?

Not at all effective	1
Only slightly effective	2
Somewhat effective	3
Moderately effective	4
Very effective	5
Extremely effective	6

37

How capable do you think you are at carrying out symptom intervention competencies?

Not at all capable	1
Only slightly capable	2
Somewhat capable	3
Moderately capable	4
Very capable	5
Extremely capable	6

38

Communication competencies refer to things you do to improve your personal knowledge of how to manage your asthma, and the things you do to establish a good relationship with your doctor. These include reading and asking questions about asthma, talking openly with your doctor and keeping him or her informed about any changes in symptoms.

How effective do you think **your** communication competencies are in managing your asthma?

Not at all effective	1
Only slightly effective	2
Somewhat effective	3
Moderately effective	4
Very effective	5
Extremely effective	6

How capable do you think you are at carrying out communication competencies?

Not at all capable	1
Only slightly capable	2
Somewhat capable	3
Moderately capable	4
Very capable	5
Extremely capable	6

Health promotion competencies refer to things you do to maintain or improve your general physical and mental health, and thus improve your ability to deal with your asthma. These include getting regular exercise, maintaining proper weight and nutrition, and getting adequate rest. It also includes such things as not overworking, resolving stressful situations in your personal life, and resolving disabling psychological and addictive problems.

How effective do you think **your** health promotion competencies are in managing your asthma?

Not at all effective	1
Only slightly effective	2
Somewhat effective	3
Moderately effective	4
Very effective	5
Extremely effective	6

41

How capable do you think you are at carrying out health promotion competencies?

Not at all capable 1
Only slightly capable 2
Somewhat capable 3
Moderately capable 4
Very capable 5
Extremely capable . . . . . 6 ☐ 42

Please now think about the medications you use to control your asthma. Please use the scale below to answer the following questions.

Never *1*
Occasionally *2*
Sometimes *3*
Frequently *4*
Always *5*

During the last 3 months, have you been careless at times about using your inhaler or nebuliser? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever forgotten to use your inhaler or nebulizer? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever stopped using your inhaler or nebulizer because you felt better? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever used your inhaler or nebulizer less than the doctor prescribed because you felt better? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever stopped using your inhaler or nebulizer because you felt worse? . . . . . 1 2 3 4 5 ☐ 47

During the last 3 months, have you ever used your inhaler or nebulizer more than the doctor prescribed because you felt you were having an attack? . . . . . 1 2 3 4 5 ☐

Do you take any medication other than your inhaler or nebuliser for your asthma? If Yes, please answer the following questions. If No, please go to the next block of questions on page 13.

During the last 3 months, have you been careless at times about taking your asthma medicine? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever forgotten to take your asthma medicine? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever stopped taking your asthma medicine because you felt better? . . . . 1 2 3 4 5 ☐ 51

Never 1
Occasionally 2
Sometimes 3
Frequently 4
Always 5

During the last 3 months, have you ever taken less of your asthma medicine than the doctor prescribed because you felt better? . . . . . 1 2 3 4 5 ☐ 52

During the last 3 months, have you ever stopped taking your asthma medicine because you felt worse? . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever taken more of your asthma medicine than the doctor prescribed because you felt you were having an attack? . . . . . 1 2 3 4 5 ☐

The next block of questions looks at some of the more general impressions you have of yourself. Please indicate how much each of the following statements is like you by circling the appropriate number.

0---------1---------2---------3---------4

Not like me at all — *Extremely like me*

Generally, I'm very aware of myself . . . . . 0 1 2 3 4 ☐

I reflect about myself a lot . . . . . 0 1 2 3 4 ☐

I'm always trying to figure myself out . . . . . 0 1 2 3 4 ☐

I'm often the subject of my own fantasies . . . . . 0 1 2 3 4 ☐

I always scrutinize myself . . . . . 0 1 2 3 4 ☐

I'm generally attentive to my inner feelings . . . . . 0 1 2 3 4 ☐ 60

I'm constantly examining my motives . . . . . 0 1 2 3 4 ☐

I sometimes have the feeling that I'm off somewhere watching myself . . . . . 0 1 2 3 4 ☐

I'm alert to changes in my mood . . . . . 0 1 2 3 4 ☐

I'm aware of the way my mind works when I work through a problem . . . . . 0 1 2 3 4 ☐ 64

We are now interested in gathering some information on your general circumstances. Please provide your answer to each of the following questions.

During which season is your asthma at its worst?

Spring	1
Summer	2
Autumn	3
Winter	4
Same all seasons	5

□ 65

In your opinion, how common an illness is asthma in New Zealand? Please indicate your answer by placing a cross on the line below.

Somewhat Common — Extremely Common

|_____|

□□

In what year were you born? 19____

□□

Are you:

Male	1
Female	2

□

Would you say you are:

European	1
Maori	2
Polynesian	3
Other (please specify) ____	4

□

What is the highest level of schooling you have reached?

Some primary school	1
Completed primary school	2
Some high school	3
Completed high school to 5th form	4
Completed high school to 6th form	5
Completed high school to 7th form	6
Technical training beyond high school	7
Some university	8
Graduated from university	9
Other (please specify)____	10

□□ 73

Would you classify yourself as primarily:

Employed full-time	1
Employed part-time	2
Taking care of a home	3
Looking for work	4
Too unwell to work	5
Retired	6
Other (please specify)_____	7

74

Are you:

Single	1
Married or de-facto	2
Separated	3
Divorced	4
Widowed	5

75

Please now write in today's date: _____

Finally, we would be very interested in any comments you would like to make about the questionnaire you have just filled out. Any comments of a more general nature would also be appreciated. Please use the space provided.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you. That is all the questions we have for the moment. We appreciate the time you have taken to complete the questionnaire. Please place it in the envelope provided and post it back to us. We would like to remind you that you do not need to put a stamp on this.

APPENDIX E: ACCOMPANYING LETTER (QUESTIONNAIRE TWO)

RESEARCH PROJECT ON ASTHMA

First, we would like to thank you most sincerely for completing the first questionnaire which we sent to you six months ago. Thank you.

We are now sending the second and final questionnaire which you agreed to complete for us. The purpose of the second questionnaire is to see if there have been any changes in how you think about your asthma or the things you do to manage it over the last six months. This questionnaire is substantially the same as the first one, though there are a few changes. It should still take no longer than one hour to complete.

We would like to remind you that everything you put down is completely confidential. When the study has been completed we will mail you a summary of our findings.

We would now ask you to read the instructions for the second questionnaire, complete it at the earliest convenient time for yourself, and post it back to us. Please try to do this as soon as you can so that we can keep the time between questionnaires as close to six months as possible. Please also try to answer all the questions, it is very important we have complete sets of data for each participant. Send the questionnaire back in the enclosed addressed envelope. Note that you do not need to put a stamp on it - just drop it in the nearest mailbox.

Remember that if you have any questions you can contact me by either writing to the above address or by phoning Palmerston North (06) 3569099, extension 7922. If cost is a concern call me briefly, and I will phone you back immediately.

With much appreciation

Richard Laird
Researcher

APPENDIX F: QUESTIONNAIRE TWO

M A S S E Y U N I V E R S I T Y

MASSEY
UNIVERSITY
LOGO

RESEARCH PROJECT ON ASTHMA
QUESTIONNAIRE TWO

Please read the following instructions and follow them carefully.

Remember that all the information you give us is confidential. The information gathered by this questionnaire will be used only for the purposes of this study.

Remember that you have the right to withdraw from the study at any time, and you can refuse to answer any particular question.

This questionnaire will take about one hour to complete. We would like you to find a time when you will not be disturbed, and to answer all the questions in one session if possible. Please do this at the earliest convenient time for you after receiving the questionnaire.

It is important that you give your own answers to the questions. Therefore, we would ask that you do not discuss the questions with others. Of course, if you need help to read the material or with the meaning of some of the questions, you should ask someone to help you.

There are no right or wrong answers to the questions asked. An answer is correct if it is true for you. It is best not to think about any one question for too long since your first answer is usually the best one.

Please try to answer all the questions, and be careful not to skip any pages.

When you have finished, please return the questionnaire to us in the enclosed envelope provided. You do not have to put a stamp on this.

In the first few questions we would like you to think about your asthma symptoms. Please indicate <u>how often</u> each of the following symptoms occurs when you experience your asthma. Please circle the appropriate number opposite each question below:

Please do not write in this column

☐☐☐ 9

Never. 1
Sometimes. 2
Frequently 3
Almost always 4
Always 5

Cramps	1 2 3 4 5	☐
Numbness	1 2 3 4 5	☐
Mucous congestion	1 2 3 4 5	☐
Uncomfortable	1 2 3 4 5	☐
Frightened	1 2 3 4 5	☐
Hard to breathe	1 2 3 4 5	☐
Headache	1 2 3 4 5	☐ 10
Edgy	1 2 3 4 5	☐
Afraid of being left alone	1 2 3 4 5	☐
Irritable	1 2 3 4 5	☐
Short of breath	1 2 3 4 5	☐
Chest congestion	1 2 3 4 5	☐
Cranky	1 2 3 4 5	☐
Afraid of dying	1 2 3 4 5	☐ 17
Frustrated with things	1 2 3 4 5	☐
Dizzy	1 2 3 4 5	☐
Worn out	1 2 3 4 5	☐
Panicky	1 2 3 4 5	☐ 21

Never 1
Sometimes 2
Frequently 3
Almost always 4
Always 5

Weak	1 2 3 4 5	22
Pins and needles feelings	1 2 3 4 5	
Wheezing	1 2 3 4 5	
Worried about attack	1 2 3 4 5	
Chest tightening	1 2 3 4 5	
Tired	1 2 3 4 5	
Scared	1 2 3 4 5	
Nervous	1 2 3 4 5	
Fatigued	1 2 3 4 5	
Helpless	1 2 3 4 5	
Chest filled up	1 2 3 4 5	32
Short tempered	1 2 3 4 5	
Worried	1 2 3 4 5	
Chest pain	1 2 3 4 5	
Exhausted	1 2 3 4 5	
Coughing	1 2 3 4 5	
No energy	1 2 3 4 5	3

Next, we are concerned with the general impressions you have of your asthma. Please provide your answer to each of the following questions.

In your opinion, how serious a threat to your health is your asthma?

Not at all serious	1
Only slightly serious	2
Somewhat serious	3
Moderately serious	4
Very serious	5
Extremely serious	6

☐ 39

How frequently do you experience asthma attacks?

Can't say	0
Not at all frequently	1
Only slightly frequently	2
Somewhat frequently	3
Moderately frequently	4
Very frequently	5
Extremely frequently	6

☐

On average, how intense has your asthma been during the last six months?

Not at all intense	1
Only slightly intense	2
Somewhat intense	3
Moderately intense	4
Very intense	5
Extremely intense	6

☐

In your opinion, how treatable is your asthma? Please indicate your answer by placing a cross on the line below.

Only slightly treatable — Extremely treatable

|_____|

☐☐

In your opinion, how common an illness is asthma in New Zealand? Please indicate your answer by placing a cross on the line below.

Somewhat Common — Extremely Common

|_____|

☐☐ 45

The next group of questions are concerned with what you can do to control your asthma. For the first few questions in this section imagine you are experiencing early warning signs of asthma. Please indicate what you do in this situation by circling Yes or No or Not applicable (NA) as appropriate.

I recognise early warning symptoms of an attack	Yes No NA	46
I calm down and get control of emotions when they are the trigger	Yes No NA	
I stop or decrease exercise when it is the trigger	Yes No NA	
I leave areas where triggers are concentrated	Yes No NA	
I improve ventilation or otherwise rid myself of contact with triggers	Yes No NA	
I obtain appropriate treatment if respiratory infection is a trigger	Yes No NA	
I begin additional medication when appropriate	Yes No NA	
I make use of further medication when an additional dose does not relieve symptoms but I do not exceed the recommended dose	Yes No NA	53
I use specific calming techniques (e.g. self-hypnosis) to reduce anxiety related to the attack	Yes No NA	
I avoid exertion and either rest or engage in quiet activity	Yes No NA	
I begin breathing exercises, take deep breaths and control my breathing	Yes No NA	
I drink warm and soothing beverages but avoid mucus producing or irritating foods or beverages	Yes No NA	
I take a hot shower or otherwise inhale water vapour . . .	Yes No NA	
I position my body to allow easy breathing	Yes No NA	
I treat other discomfort such as sinus congestion	Yes No NA	60

These next questions are about the things you can do more generally to control your asthma. Once again, please circle either Yes or No or Not applicable (NA).

I accept the need for and begin a medication program when it is prescribed . . . . . Yes No NA ☐ 61

I take medication according to the prescribed schedule . . . . . Yes No NA ☐

When experiencing side effects of the medication, I adopt appropriate ways to minimize them, including reporting to a doctor . . . . . Yes No NA ☐

When symptoms decrease or disappear, I seek the doctor's advice before decreasing medication below prescribed level . . . . . Yes No NA ☐

I use my inhaler properly as prescribed . . . . . Yes No NA ☐

I use my home nebuliser as prescribed . . . . . Yes No NA ☐

I observe and report things that seem to trigger symptoms . . . . . Yes No NA ☐ 67

I stop or reduce smoking tobacco or other substances . . . Yes No NA ☐

I avoid or treat respiratory infections if they trigger my asthma . . . . . Yes No NA ☐

I choose the best type, the best location for, and the right level of physical exertion that avoids triggering my asthma . . . . . Yes No NA ☐

I take precautionary medicine before exercising so I can exercise adequately . . . . . Yes No NA ☐

I handle strong emotions in a manner that does not trigger my asthma . . . . . Yes No NA ☐

I avoid medications that trigger symptoms of my asthma . Yes No NA ☐

I choose low dust furnishings or cover furnishings that are dust traps . . . . . Yes No NA ☐

I clean effectively to minimize house dust and other triggers . . . . . Yes No NA ☐ 75

I do not have pets that trigger my asthma or I minimize contact with them . . . . . Yes No NA ☐ 76

I find ways to carry out indoor and outdoor house maintenance that minimizes exposure to airborne triggers . . . . . Yes No NA ☐

I stop or effectively restrict smoking in the house . . . . . Yes No NA ☐

I remove any other triggers or irritants from the house . . Yes No NA ☐

I would move house or change my living situation when it is not otherwise possible to reduce exposure to triggers to an acceptable level . . . . . Yes No NA ☐ 80

I minimize exposure to co-workers' or customers' tobacco smoke . . . . . Yes No NA ☐ 2/1

I use a mask, respirator, or proper ventilation to avoid airborne triggers present in the workplace . . . . . Yes No NA ☐

I make minor or temporary adjustments to work responsibilities to avoid triggers or irritants in the workplace . . . . . Yes No NA ☐

I would change occupation or leave my job when it is not otherwise possible to reduce exposure to triggers to an acceptable level . . . . . Yes No NA ☐

I request non-smoking areas or minimize exposure to tobacco smoke in hotels, restaurants, and other enclosed places . . Yes No NA ☐

I avoid exposure to other triggers and irritants in enclosed places . . . . . Yes No NA ☐

I avoid vehicle exhaust fumes due to heavy traffic or idling engines . . . . . Yes No NA ☐

I avoid unnecessary exposure to seasonal or occasional triggers such as cold air, air pollution, or pollens . . . . . Yes No NA ☐

I choose outdoor recreation or holiday spots free of triggers and/or use precautionary medication . . . . . Yes No NA ☐

I move to a different area when it is not otherwise possible to reduce exposure to triggers to an acceptable level . . . Yes No NA ☐ 10

I have begun a program to avoid triggers specific to me despite conflict with my preferred or current lifestyle . . .	Yes No NA	☐ 11
I have balanced the requirements of this program against competing responsibilities, commitments, and desires . . .	Yes No NA	☐
I have balanced the need to take proper corrective actions against competing responsibilities, commitments and desires	Yes No NA	☐
When self treatment, including taking medication, does not work or when symptoms are severe or prolonged I seek medical help	Yes No NA	☐
I follow medical recommendations to manage a severe or prolonged attack	Yes No NA	☐
I establish and maintain a relationship with my doctor for the management of my asthma	Yes No NA	☐
I report any increase in symptoms of my asthma to my doctor for re-evaluation	Yes No NA	☐
I effectively communicate my medical history and my own health care requirements, especially to a new or temporary doctor	Yes No NA	☐ 18
I obtain information from my doctor to understand my asthma	Yes No NA	☐
I obtain basic information about asthma from books, pamphlets, health educators, and other reliable sources . .	Yes No NA	☐
I establish ways to share ideas and support with other sufferers	Yes No NA	☐
I get regular exercise	Yes No NA	☐
I maintain proper weight and nutrition	Yes No NA	☐
I maintain adequate fluid intake	Yes No NA	☐
I get adequate rest and avoid exhaustion	Yes No NA	☐
I make use of stress reduction techniques routinely	Yes No NA	☐ 26

I resolve negative or stressful situations in my personal or family life . . . . . Yes No NA [27]

I avoid excessive overwork due to high-pressure job or overly demanding self-expectations . . . . . Yes No NA

I resolve disabling psychological or addictive problems . . Yes No NA

When my partner or others are over concerned about my management of my asthma I resolve these issues . . . . . Yes No NA

I effectively deal with the misunderstandings or prejudices of others concerning asthma and its management . . . . . Yes No NA [31]

Next, we are interested in whether you feel the things you do to manage your asthma are effective, and if you feel capable of doing these things. Below are some short descriptions of the general things you may do to manage your asthma. Each description is followed by two questions. Read each description and then answer the two questions. Once again, please circle the answer that is correct for you.

Preventive medication competencies refer to things you do to successfully follow your medication program. These include accepting the need to begin a medication program, taking the medications as prescribed, and deciding on strategies to make sure you always take your medication. Also included is adjusting your medication to suit your needs, in accordance with the prescription or after seeking medical advice.

How effective do you think **your** preventive medication competencies are in managing your asthma?

Not at all effective 1
Only slightly effective 2
Somewhat effective 3
Moderately effective 4
Very effective 5
Extremely effective 6

How capable do you think you are at carrying out preventive medication competencies?

Not at all capable 1
Only slightly capable 2
Somewhat capable 3
Moderately capable 4
Very capable 5
Extremely capable . . . . . 6 [33]

Trigger avoidance competencies refer to things you do to avoid or minimize exposure to triggers of your asthma. These include avoiding triggers in the home, workplace, or elsewhere. Also included are avoiding exertion, emotions, or foods/beverages/ other medications that have been identified as triggers.

How effective do you think **your** trigger avoidance competencies are in managing your asthma?

Not at all effective	1
Only slightly effective	2
Somewhat effective	3
Moderately effective	4
Very effective	5
Extremely effective	6

34

How capable do you think you are at carrying out trigger avoidance competencies?

Not at all capable	1
Only slightly capable	2
Somewhat capable	3
Moderately capable	4
Very capable	5
Extremely capable	6

Symptom intervention competencies refer to things you do to take care of your symptoms. These include recognising early warning signs of asthma episodes, attempting to remove any triggers of an episode, and correctly using medications to alleviate symptoms. Also included is making good decisions about the urgency of treatment.

How effective do you think **your** symptom intervention competencies are in managing your asthma?

Not at all effective	1
Only slightly effective	2
Somewhat effective	3
Moderately effective	4
Very effective	5
Extremely effective	6

How capable do you think you are at carrying out symptom intervention competencies?

Not at all capable	1
Only slightly capable	2
Somewhat capable	3
Moderately capable	4
Very capable	5
Extremely capable	6

37

Communication competencies refer to things you do to improve your personal knowledge of how to manage your asthma, and the things you do to establish a good relationship with your doctor. These include reading and asking questions about asthma, talking openly with your doctor and keeping him or her informed about any changes in symptoms.

How effective do you think **your** communication competencies are in managing your asthma?

Not at all effective	1
Only slightly effective	2
Somewhat effective	3
Moderately effective	4
Very effective	5
Extremely effective	6

38 ☐

How capable do you think you are at carrying out communication competencies?

Not at all capable	1
Only slightly capable	2
Somewhat capable	3
Moderately capable	4
Very capable	5
Extremely capable	6

☐

Health promotion competencies refer to things you do to maintain or improve your general physical and mental health, and thus improve your ability to deal with your asthma. These include getting regular exercise, maintaining proper weight and nutrition, and getting adequate rest. It also includes such things as not overworking, resolving stressful situations in your personal life, and resolving disabling psychological and addictive problems.

How effective do you think **your** health promotion competencies are in managing your asthma?

Not at all effective	1
Only slightly effective	2
Somewhat effective	3
Moderately effective	4
Very effective	5
Extremely effective	6

☐

How capable do you think you are at carrying out health promotion competencies?

Not at all capable	1
Only slightly capable	2
Somewhat capable	3
Moderately capable	4
Very capable	5
Extremely capable	6

41 ☐

Please now think about the medications you use to control your asthma. Please use the scale below to answer the following questions.

Never	*1*
Occasionally	*2*
Sometimes	*3*
Frequently	*4*
Always	*5*

During the last 3 months, have you been careless at times about using your inhaler or nebuliser? . . . . . 1 2 3 4 5 ☐ 42

During the last 3 months, have you ever forgotten to use your inhaler or nebulizer? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever stopped using your inhaler or nebulizer because you felt better? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever used your inhaler or nebulizer less than the doctor prescribed because you felt better? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever stopped using your inhaler or nebulizer because you felt worse? . . . . . 1 2 3 4 5 ☐ 46

During the last 3 months, have you ever used your inhaler or nebulizer more than the doctor prescribed because you felt you were having an attack? . . . . . 1 2 3 4 5 ☐

Do you take any medication other than your inhaler or nebuliser for your asthma? If Yes, please answer the following questions. If no, please go to page 13 and fill in today's date.

During the last 3 months, have you been careless at times about taking your asthma medicine? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever forgotten to take your asthma medicine? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever stopped taking your asthma medicine because you felt better? . . . . . 1 2 3 4 5 ☐

During the last 3 months, have you ever taken less of your asthma medicine than the doctor prescribed because you felt better? . . . . . 1 2 3 4 5 ☐ 51

Never 1
Occasionally 2
Sometimes 3
Frequently 4
Always 5

During the last 3 months, have you ever stopped taking your asthma medicine because you felt worse? . . . . . 1 2 3 4 5 ☐ 52

During the last 3 months, have you ever taken more of your asthma medicine than the doctor prescribed because you felt you were having an attack? . . . . . 1 2 3 4 5 ☐ 53

Please now write in today's date: _____

Finally, we would be very interested in any comments you would like to make about the questionnaire you have just filled out. Any comments of a more general nature would also be appreciated. Please use the space provided.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you. We appreciate the time you have taken to complete this questionnaire. Please place it in the envelope provided and post it back to us. We would like to remind you that you do not need to put a stamp on this.

APPENDIX G

Multiple regression analyses for subcomponents of determinants model (Tables 14 and 15).

Table 14

Regression coefficients, adjusted R^2, and R^2 change for regressions of ASC factors (frequency of symptoms) on determinants and control variables at Time 1 and Time 2.

ASC factor:	Panic fear				Airways obstruction				Hyperventilation			
	Time 1 N=326		Time 2 N=313		Time 1 N=324		Time 2 N=317		Time 1 N=327		Time 2 N=318	
Independent variables	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B
Step 1												
Prevalence	-.049	-0.016	.064	0.020	.003	0.001	.092	0.037	.103	0.014	.089	0.012
Treatability	-.006	-0.002	-.034	-0.013	.068	0.027	.027	0.013	-.101	-0.014	.053	0.009
Duration	-.094	-0.040	-.078	-0.035	-.044	-0.022	.050	0.028	.042	0.007	.050	0.010
Intensity (entire history)	.199	1.146***	.196	1.104***	.306	2.094***	.236	1.720***	.132	0.314*	.141	0.345*
Intensity (6 months)	.118	0.619	-.013	-0.082	.207	1.278**	.112	0.881	.222	0.479***	.194	0.508**
Frequency (attacks)	.085	0.459	.254	1.404***	-.017	-0.109	.188	1.344**	.001	0.003	.160	0.382*
Repressive defence style	-.281	-0.246***	-.163	-0.147**	-.114	-0.118*	-.097	-0.113	-.066	-0.023	-.053	-0.021
Age	.083	0.036	.062	0.027	-.122	-0.063*	-.068	-0.039	-.017	-0.003	-.026	-0.005
Gender	-.136	-1.976*	-.117	-1.718*	-.034	-0.583	-.032	-0.610	-.156	-0.933**	-.128	-0.817*
Education 1	.006	0.147	-.006	-0.135	-.046	-1.261	.059	1.749	-.079	-0.733	-.112	-1.126
Education 2	-.145	-2.048**	-.130	-1.877*	.010	0.160	.027	0.499	.049	0.282	.033	0.204
Marital Status	-.075	-1.136	-.062	-0.966	-.042	-0.763	-.055	-1.120	-.050	-0.314	-.048	-0.325
	Adj R^2=.220		Adj R^2=.210		Adj R^2=.186		Adj R^2=.206		Adj R^2=.161		Adj R^2=.179	
	F(12,313)=8.65***		F(12,300)=7.91***		F(12,311)=7.15***		F(12,304)=7.84***		F(12,314)=6.23***		F(12,305)=6.75***	
Step 2												
RDS x Prevalence	.056	0.002	-.039	-0.001	.094	0.004	.017	0.001	.119	0.002*	.028	0.000
RDS x Treatability	.048	0.002	.052	0.003	.096	0.006	.074	0.005	-.029	-0.001	.027	0.001
RDS x Duration	.000	0.000	.031	0.002	.060	0.004	.020	0.001	.151	0.003**	.123	0.003*
RDS x Intensity (entire history)	-.084	-0.059	-.092	-0.064	-.037	-0.030	-.005	-0.004	-.091	-0.026	-.035	-0.011
RDS x Intensity (6 months)	-.098	-0.062	.127	0.099	-.020	-0.015	.115	0.116	-.007	-0.002	.205	0.069**
RDS x Frequency (attacks)	.059	0.041	-.108	-0.081	.136	0.109	-.044	-0.043	-.046	-0.013	-.215	-0.070**
	Adj R^2=.231		Adj R^2=.214		Adj R^2=.197		Adj R^2=.200		Adj R^2=.187		Adj R^2=.208	
	F(18,307)=6.44***		F(18,294)=5.73***		F(18,305)=5.39***		F(18,298)=5.39***		F(18,308)=5.18***		F(18,299)=5.62***	
	R^2 change=.025		R^2 change=.019		R^2 change=.025		R^2 change=.009		R^2 change=.040		R^2 change=.043	
	F change=1.75		F change=1.28		F change=1.70		F change=0.62		F change=2.67*		Fchange=2.86*	

* p<.05 ** p<.01 *** p<.001

Table 14 (cont.)

Regression coefficients, adjusted R^2, and R^2 change for regressions of ASC factors (frequency of symptoms) on determinants and control variables at Time 1 and Time 2.

ASC factor:	Fatigue				Irritability			
	Time 1 N=330		Time 2 N=320		Time 1 N=325		Time 2 N=319	
Independent variables	Beta	B	Beta	B	Beta	B	Beta	B
Step 1								
Prevalence	.011	0.003	.095	0.027	.023	0.005	.127	0.030*
Treatability	-.014	-0.004	-.028	-0.010	-.064	-0.015	-.062	-0.018
Duration	.000	0.000	.017	0.007	-.011	-0.003	.008	0.003
Intensity (entire history)	.258	1.334***	.218	1.137***	.245	0.987***	.242	1.015***
Intensity (6 months)	.193	0.905**	.103	0.575	.020	0.072	-.008	-0.035
Frequency (attacks)	.029	0.142	.136	0.687	.076	0.284	.156	0.641*
Repressive defence style	-.131	-0.102*	-.103	-0.087	-.253	-0.152***	-.192	-0.130***
Age	.013	0.005	.075	0.031	-.089	-0.027	-.041	-0.013
Gender	-.094	-1.232	-.111	-1.504*	-.016	-0.158	-.010	-0.108
Education 1	-.054	-1.104	.019	0.406	-.074	-1.184	.019	0.318
Education 2	-.014	-0.182	.026	0.342	-.024	-0.235	-.002	-0.023
Marital Status	-.036	-0.486	-.027	-0.386	.027	0.284	-.002	-0.025
	Adj R^2=.175		Adj R^2=.151		Adj R^2=.163		Adj R^2=.169	
	F(12,317)=6.80***		F(12,307)=5.73***		F(12,312)=6.24***		F(12,306)=6.39***	
Step 2								
RDS x Prevalence	.039	0.001	.043	0.001	.072	0.002	-.015	0.000
RDS x Treatability	.081	0.003	.099	0.005	.080	0.003	.049	0.002
RDS x Duration	.073	0.003	-.015	-0.001	-.010	0.000	-.023	-0.001
RDS x Intensity (entire history)	-.095	-0.059	-.068	-0.044	-.104	-0.050	-.113	-0.058*
RDS x Intensity (6 months)	-.089	-0.050	.132	0.095	-.001	0.000	.095	0.055
RDS x Frequency (attacks)	.094	0.057	-.086	-0.059	.029	0.014	-.038	-0.021
	Adj R^2=.188		Adj R^2=.160		Adj R^2=.171		Adj R^2=.171	
	F(18,311)=5.24***		F(18,301)=4.36***		F(18,306)=4.72***		F(18,300)=4.64***	
	R^2 change=.028		R^2 change=.024		R^2 change=.024		R^2 change=.017	
	F change=1.89		F change=1.51		F change=1.54		F change=1.11	

* $p<.05$ ** $p<.01$ *** $p<.001$

Table 15

Regression coefficients, adjusted R^2, and R^2 change for regressions of ASC factors (number of symptoms) on determinants and control variables at Time 1 and Time 2.

ASC factor:	Panic fear				Airways obstruction				Hyperventilation			
	Time 1 N=330		Time 2 N=322		Time 1 N=326		Time 2 N=317		Time 1 N=330		Time 2 N=322	
Independent variables	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B
Step 1												
Prevalence	-.007	-0.001	.029	0.005	-.145	-0.007*	.014	0.001	.078	0.007	.051	0.004
Treatability	-.012	-0.002	-.085	-0.016	.084	0.004	-.067	-0.004	-.066	-0.005	.019	0.002
Duration	-.088	-0.019	-.073	-0.016	-.002	0.000	.085	0.007	.035	0.004	.055	0.006
Intensity (entire history)	.111	0.319	.147	0.417**	.179	0.160**	.143	0.142*	.083	0.121	.131	0.180*
Intensity (6 months)	-.022	-0.058	.040	0.120	.163	0.129*	.129	0.135	.177	0.233**	.194	0.284**
Frequency (attacks)	.168	0.450*	.161	0.444*	.029	0.023	.026	0.025	.037	0.050	.103	0.138
Repressive defence style	-.260	-0.112***	-.159	-0.073**	-.117	-0.016*	-.058	-0.009	-.066	-0.015	-.009	-0.002
Age	.110	0.023	.026	0.006	-.017	-0.001	-.105	-0.008	.034	0.004	-.011	-0.001
Gender	-.174	-1.257**	-.153	-1.127**	-.091	-0.202	-.160	-0.413**	-.170	-0.623**	-.160	-0.570**
Education 1	.046	0.516	.071	0.804	.039	0.137	.107	0.432	.016	0.090	-.095	-0.523
Education 2	-.127	-0.890*	-.154	-1.111**	-.053	-0.114	-.007	-0.019	-.009	-0.031	.029	0.101
Marital Status	-.109	-0.825*	-.056	-0.442	.020	0.046	.065	0.178	-.027	-0.105	-.086	-0.330
	Adj R^2=.177		Adj R^2=.186		Adj R^2=.083		Adj R^2=.123		Adj R^2=.101		Adj R^2=.146	
	F(12,317)=6.90***		F(12,309)=7.10***		F(12,313)=3.46***		F(12,304)=4.70***		F(12,317)=4.08***		F(12,309)=5.59***	
Step 2												
RDS x Prevalence	.047	0.001	-.039	-0.001	.056	0.000	-.088	-0.001	.086	0.001	.029	0.000
RDS x Treatability	.029	0.001	.092	0.002	.032	0.000	.009	0.000	-.049	-0.001	-.017	0.000
RDS x Duration	-.019	-0.001	-.023	-0.001	.008	0.000	-.042	0.000	.159	0.002**	.095	0.001
RDS x Intensity (entire history)	-.045	-0.016	-.026	-0.009	-.099	-0.011	-.072	-0.009	-.069	-0.012	-.011	-0.002
RDS x Intensity (6 months)	-.052	-0.016	.000	0.000	.072	0.007	.042	0.006	.010	0.001	.123	0.023
RDS x Frequency (attacks)	.097	0.033	-.006	-0.002	.010	0.001	.038	0.005	-.062	-0.011	-.169	-0.031*
	Adj R^2=.170		Adj R^2=.180		Adj R^2=.077		Adj R^2=.121		Adj R^2=.119		Adj R^2=.155	
	F(18,311)=4.75***		F(18,303)=4.93***		F(18,307)=2.51***		F(18,298)=3.41***		F(18,311)=3.47***		F(18,303)=4.26***	
	R^2 change=.009		R^2 change=.010		R^2 change=.011		R^2 change=.015		R^2 change=.033		R^2 change=.024	
	F change=0.57		F change=0.67		F change=0.66		F change=0.87		F change=2.08		F change=1.50	

* p<.05 ** p<.01 *** p<.001

Table 15 (cont.)

Regression coefficients, adjusted R^2, and R^2 change for regressions of ASC factors (number of symptoms) on determinants and control variables at Time 1 and Time 2.

ASC factor:	Fatigue				Irritability			
	Time 1 N=326		Time 2 N=322		Time 1 N=330		Time 2 N=322	
Independent variables	Beta	B	Beta	B	Beta	B	Beta	B
Step 1								
Prevalence	-.119	-0.009*	.053	0.005	-.020	-0.002	.101	0.009
Treatability	.010	0.001	-.125	-0.014*	-.043	-0.004	-.097	-0.011
Duration	.094	0.009	.030	0.004	.013	0.002	-.018	-0.002
Intensity (entire history)	.298	0.387***	.168	0.273**	.130	0.208*	.165	0.275**
Intensity (6 months)	.070	0.082	.110	0.189	-.003	-0.004	.039	0.069
Frequency (attacks)	-.004	-0.005	.082	0.129	.143	0.213*	.084	0.137
Repressive defence style	-.161	-0.031**	-.024	-0.006	-.257	-0.062***	-.173	-0.047**
Age	-.024	-0.002	.025	0.003	-.045	-0.005	-.050	-0.006
Gender	-.142	-0.468*	-.150	-0.634**	-.019	-0.078	-.018	-0.077
Education 1	-.009	-0.045	.139	0.900*	.003	0.020	.097	0.652
Education 2	-.083	-0.265	-.035	-0.146	.002	0.006	-.071	-0.301
Marital Status	-.042	-0.143	-.052	-0.233	.060	0.254	.013	0.063
	Adj R^2=.161		Adj R^2=.148		Adj R^2=.105		Adj R^2=.123	
	F(12,313)=6.19***		F(12,309)=5.65***		F(12,317)=4.20***		F(12,309)=4.77***	
Step 2								
RDS x Prevalence	.003	0.000	-.051	-0.001	.033	0.000	-.025	0.000
RDS x Treatability	.069	0.001	.054	0.001	-.011	0.000	.026	0.000
RDS x Duration	-.010	0.000	-.055	-0.001	-.031	0.000	-.007	0.000
RDS x Intensity (entire history)	.002	0.000	-.037	-0.007	-.037	-0.007	-.082	-0.017
RDS x Intensity (6 months)	.043	0.006	.014	0.003	-.067	-0.012	-.024	-0.006
RDS x Frequency (attacks)	.008	0.001	-.004	-0.001	.029	0.006	.032	0.007
	Adj R^2=.150		Adj R^2=.139		Adj R^2=.096		Adj R^2=.115	
	F(18,307)=4.18***		F(18,303)=3.89***		F(18,311)=2.94***		F(18,303)=3.32***	
	R^2 change=.005		R^2 change=.008		R^2 change=.008		R^2 change=.008	
	F change=0.34		F change=0.48		F change=0.49		F change=0.50	

* p<.05 ** p<.01 *** p<.001

APPENDIX H

Multiple regression analyses for subcomponents of consequences model (Tables 16 and 17).

Table 16

Regression coefficients, adjusted R^2, and R^2 change for regressions of health competencies on ASC factors (number of symptoms), response and personal efficacies, and control variables at Time 1 and Time 2.

	Health competencies			
	Time 1 N=363		Time 2 N=351	
Independent variables	Beta	B	Beta	B
Step 1				
Number of symptoms				
Panic fear	.073	0.210	.087	0.244
Airways obstruction	.142	1.165*	.125	0.782
Hyperventilation	.088	0.505	.109	0.622
Fatigue	.098	0.583	.089	0.441
Irritability	.176	0.918**	.114	0.551
Response efficacy (RE)	.318	0.846***	.276	0.736***
Personal efficacy (PE)	.120	0.329	.119	0.317
Age	.117	0.072*	.055	0.034
Gender	-.093	-1.966	-.071	-1.468
Education 1	.019	0.601	-.055	-1.693
Education 2	-.059	-1.216	-.009	-0.176
Marital status	.000	-0.006	.041	0.911
	Adj R^2=.323		Adj R^2=.237	
	F(12,350)=15.40***		F(12,338)=10.04***	
Step 2				
RE x Panic fear	.069	0.052	.000	0.000
RE x Airways obstruction	.126	0.216	.202	0.304
RE x Hyperventilation	-.153	-0.229	-.193	-0.305*
RE x Fatigue	-.137	-0.210	-.054	-0.063
RE x Irritability	.142	0.193	.009	0.011
PE x Panic fear	-.176	-0.135	-.035	-0.026
PE x Airways obstruction	.003	0.007	-.330	-0.562*
PE x Hyperventilation	.196	0.297*	.260	0.408**
PE x Fatigue	.074	0.134	.097	0.128
PE x Irritability	-.035	-0.053	.117	0.155
	Adj R^2=.338		Adj R^2=.256	
	F(22,340)=9.38***		F(22,328)=6.48***	
	R^2 change=.032		R^2 change=.040	
	F change=1.76		F change=1.88*	

* $p<.05$ ** $p<.01$ *** $p<.001$

Table 17

Regression coefficients, adjusted R^2, and R^2 change for regressions of health competency categories on seriousness, corresponding personal and response efficacy items, and control variables at Time 1 and Time 2.

Health competency category:	Preventive medication competencies				Precipitant avoidance competencies				Symptom intervention competencies			
	Time 1 N=335		Time 2 N=345		Time 1 N=339		Time 2 N=344		Time 1 N=339		Time 2 N=346	
Independent variables	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B	Beta	B
Step 1												
Self-rated seriousness	.227	0.205***	.213	0.215***	.160	0.658**	.078	0.342	.145	0.334**	.080	0.198
Frequency of symptoms	-.041	-0.002	-.183	-0.010*	-.131	-0.034	-.185	-0.043*	-.130	-0.019	-.218	-0.028**
Number of symptoms	.200	0.034**	.344	0.055***	.378	0.294***	.443	0.310***	.539	0.235***	.578	0.227***
Response efficacy (RE)	.101	0.132	.214	0.282***	.317	1.538***	.279	1.332***	.073	0.244	.055	0.196
Personal efficacy (PE)	.171	0.245**	.087	0.130	.136	0.679*	.126	0.668	.179	0.616**	.128	0.451
Age	.253	0.019***	.203	0.015***	-.009	-0.003	-.073	-0.024	.073	0.014	-.003	-0.001
Gender	-.085	-0.211	-.111	-0.283*	-.006	-0.071	-.037	-0.414	-.098	-0.629*	-.107	-0.677*
Education 1	.011	0.043	-.001	-0.003	.004	0.075	-.035	-0.590	.017	0.165	-.124	-1.166
Education 2	-.096	-0.233	-.031	-0.078	-.028	-0.309	.041	0.443	-.087	-0.545	.056	0.345
Marital status	-.024	-0.063	.006	0.018	.023	0.276	.038	0.453	.026	0.174	.010	0.066
	Adj R^2=.224		Adj R^2=.220		Adj R^2=.258		Adj R^2=.195		Adj R^2=.311		Adj R^2=.235	
	F(10,324)=10.65***		F(10,334)=10.70***		F(10,328)=12.74***		F(10,333)=9.33***		F(10,328)=16.26***		F(10,335)=11.57***	
Step 2												
RE x self-rated seriousness	-.021	-0.020	.061	0.059	-.024	-0.082	-.055	-0.198	.085	0.211	.009	0.024
RE x frequency of symptoms	.158	0.010	-.132	-0.008	-.007	-0.002	.063	0.013	.037	0.006	.207	0.031
RE x number of symptoms	-.095	-0.017	.015	0.002	.006	0.004	-.104	-0.063	-.035	-0.017	-.147	-0.066
PE x self-rated seriousness	-.021	-0.022	-.130	-0.163*	.120	0.423	.126	0.548	.005	0.013	.072	0.217
PE x frequency of symptoms	-.003	0.000	.102	0.006	-.092	-0.022	-.179	-0.037	-.079	-0.013	-.253	-0.038
PE x number of symptoms	-.043	-0.009	.003	0.001	.089	0.064	.225	0.152*	.086	0.043	.126	0.057
	Adj R^2=.222		Adj R^2=.221		Adj R^2=.259		Adj R^2=.204		Adj R^2=.308		Adj R^2=.234	
	F(16,318)=6.95***		F(16,328)=7.11***		F(16,322)=8.37***		F(16,327)=6.50***		F(16,322)=10.41***		F(16,329)=7.60***	
	R^2 change=.012		R^2 change=.015		R^2 change=.014		R^2 change=.022		R^2 change=.010		R^2 change=.012	
	F change=0.84		F change=1.11		F change=1.07		F change=1.61		F change=0.78		F change=0.84	

* p<.05 ** p<.01 *** p<.001

Table 17 (cont.)

Regression coefficients, adjusted R^2, and R^2 change for regressions of health competency categories on seriousness, corresponding personal and response efficacy items, and control variables at Time 1 and Time 2.

Health competency category:	Communication competencies				Health promotion competencies			
	Time 1 N=336		Time 2 N=347		Time 1 N=341		Time 2 N=348	
Independent variables	Beta	B	Beta	B	Beta	B	Beta	B
Step 1								
Self-rated seriousness	.065	0.063	-.029	-0.030	-.026	-0.039	.017	0.029
Frequency of symptoms	-.050	-0.003	-.001	0.000	-.010	-0.001	-.184	-0.016*
Number of symptoms	.233	0.043***	.252	0.041***	.243	0.069**	.339	0.090***
Response efficacy (RE)	.377	0.411***	.365	0.440***	.334	0.643***	.323	0.661***
Personal efficacy (PE)	.114	0.142	.081	0.104	.156	0.334*	.169	0.361*
Age	.215	0.017***	.254	0.020***	.046	0.006	.084	0.011
Gender	-.078	-0.214	-.002	-0.004	.002	0.010	.010	0.043
Education 1	.067	0.279	.138	0.545**	.011	0.073	-.014	-0.091
Education 2	-.085	-0.227	-.085	-0.216	-.093	-0.382	-.056	-0.235
Marital status	.034	0.097	.065	0.184	.067	0.297	.011	0.049
	Adj R^2=.338		Adj R^2=.297		Adj R^2=.210		Adj R^2=.222	
	F(10,325)=18.11***		F(10,336)=15.60***		F(10,330)=10.03***		F(10,337)=10.90***	
Step 2								
RE x self-rated seriousness	.007	0.005	-.022	-0.020	.038	0.051	-.033	-0.055
RE x frequency of symptoms	-.149	-0.008	-.088	-0.004	.151	0.012	.062	0.005
RE x number of symptoms	.125	0.018	.007	0.001	.046	0.011	.035	0.009
PE x self-rated seriousness	.107	0.096	.110	0.114	-.069	-0.102	.081	0.141
PE x frequency of symptoms	.092	0.005	.078	0.004	-.146	-0.012	-.041	-0.003
PE x number of symptoms	-.276	-0.045**	-.068	-0.011	.026	0.007	-.019	-0.005
	Adj R^2=.360		Adj R^2=.296		Adj R^2=.209		Adj R^2=.216	
	F(16,319)=12.80***		F(16,330)=10.11***		F(16,324)=6.62***		F(16,331)=6.97***	
	R^2 change=.033		R^2 change=.012		R^2 change=.013		R^2 change=.007	
	F change=2.89**		F change=0.97		F change=0.94		F change=0.55	

* $p<.05$ ** $p<.01$ *** $p<.001$

APPENDIX I

Percentage of asthmatics who use specific health competencies.

The following table presents the 66 health competencies, grouped into five categories (preventive medication competencies, precipitant avoidance competencies, symptom intervention competencies, communication competencies, and health promotion competencies). Participants were asked to respond 'yes', 'no', or 'not applicable' to each of these individually. To determine the number of asthmatics who thought a particular health competency was relevant to them, all who responded 'yes' or 'no' were identified and those responding 'not applicable' were excluded. As such, the N's for each item are those asthmatics who thought the item was applicable to them. Finally, the percentage of asthmatics responding 'yes' were calculated from the total who responded either 'yes' or 'no'. Table 18 presents the N's and percentages for each health competency.

Table 18

Percentage of asthmatics who use specific health competencies (N=412).

Competency	%	N
Preventive Medication		
Accepts the need for and begins a medication program when it is prescribed.	97.2	400
Takes medication according to the prescribed schedule.	91.4	408
When experiencing side effects of the medication, adopts appropriate ways to minimize them, including reporting to a doctor.	89.6	279
When symptoms decrease or disappear, seeks the doctor's advice before decreasing medication below the prescribed level.	41.6	351
Uses an inhaler properly as prescribed	95.3	407
Uses a nebulizer properly as prescribed	85.9	99
Precipitant avoidance		
Observes and reports things that seem to trigger symptoms.	72.7	366
Stops or reduces smoking tobacco or other substances.	90.5	74
Avoids or treats respiratory infections if they are a trigger.	97.6	368
Chooses the best type, the best location for, and the right level of physical exertion that avoids triggering asthma.	81.9	364
Takes precautionary medicine before exercising so as to exercise adequately.	83.4	355
Handles strong emotions in a manner that does not trigger asthma.	63.8	271
Avoids medications that trigger symptoms of asthma.	91.8	207
Chooses low dust furnishings or covers furnishings that are dust traps.	51.5	355
Cleans effectively to minimize house dust or other triggers.	77.3	375
Does not have pets that trigger asthma or minimizes contact with them.	67.8	348

Competency	%	N
Finds ways to carry out indoor or outdoor house maintenance that minimizes exposure to airborne triggers.	56.3	323
Stops or effectively restricts smoking in the house.	89.8	352
Removes any other triggers or irritants from the house.	74.2	345
Would move house or change living situation when it is not otherwise possible to reduce exposure to triggers to an acceptable level.	51.7	323
Minimizes exposure to co-workers' or customers' tobacco smoke.	89.5	315
Uses a mask, respirator, or proper ventilation to avoid airborne triggers present in the workplace.	35.0	206
Makes minor or temporary adjustments to work responsibilities so as to avoid triggers or irritants in the workplace.	59.9	217
Would change occupation or leave the job when it is not otherwise possible to reduce exposure to triggers to an acceptable level.	61.1	229
Requests non-smoking areas or minimizes exposure to tobacco smoke in hotels, restaurants, or other enclosed places.	87.5	391
Avoids exposure to other triggers and irritants in enclosed places.	88.6	370
Avoids vehicle exhaust fumes due to heavy traffic or idling engines.	65.7	388
Avoids unnecessary exposure to seasonal or occasional triggers such as cold air, air pollution, or pollens.	74.9	394
Chooses outdoor recreation or holiday spots free of triggers and/or uses precautionary medication.	75.3	365
Would move to a different area when it is not otherwise possible to reduce exposure to triggers to an acceptable level.	59.5	328
Initiates a program to avoid personal triggers despite conflict with preferred or current lifestyle.	30.2	298
Balances the requirements of this program against competing responsibilities, commitments, and desires.	59.9	212

Competency	%	N
Symptom intervention		
Recognises early warning signs of an attack.	96.2	395
Calms down and gets control of emotions when they are a trigger.	81.4	263
Stops or decreases exercise when it is a trigger.	88.8	347
Leaves areas where triggers are concentrated.	85.1	328
Improves ventilation or otherwise rids self of contact with triggers.	91.2	351
Obtains appropriate treatment if respiratory infection is a trigger.	97.6	376
Begins additional medication when appropriate.	98.2	399
Makes use of further medication when an additional dose does not relieve symptoms but does not exceed the recommended dose.	90.9	385
Uses specific calming techniques (e.g. self-hypnosis) to reduce anxiety related to the attack.	29.7	330
Avoids exertion and either rests or engages in quiet activity.	83.4	392
Begins breathing exercises, takes deep breaths and controls breathing.	63.2	383
Drinks warm and soothing beverages but avoids mucus producing or irritating foods or beverages.	53.1	367
Takes a hot shower or otherwise inhales water vapour.	22.5	369
Positions body to allow easy breathing.	82.2	383
Treats other discomfort such as sinus congestion.	70.9	330
Balances the need to take proper corrective actions against competing responsibilities, commitments and desires.	72.7	289
When self-treatment, including taking medications, does not work or when symptoms are severe or prolonged seeks medical help.	97.7	386
Follows medical recommendations to manage a severe or prolonged attack.	98.4	373

Competency	%	N
Communication		
Establishes and maintains a relationship with the doctor to manage the asthma.	93.6	406
Reports any increase in symptoms of asthma to the doctor for reevaluation.	87.8	392
Effectively communicates medical history and personal health care requirements, especially to a new or temporary doctor.	90.9	373
Obtains information from the doctor to understand asthma.	85.6	396
Obtains basic information about asthma from books, pamphlets, health educators, and other reliable sources.	92.4	409
Establishes ways to share ideas and support with other sufferers.	48.1	395
Health promotion		
Gets regular exercise.	80.0	409
Maintains proper weight and nutrition.	81.4	404
Maintains adequate fluid intake.	94.6	409
Gets adequate rest and avoids exhaustion.	78.5	410
Makes use of stress reduction techniques routinely.	31.8	368
Resolves negative or stressful situations in personal or family life.	76.6	372
Avoids excessive overwork due to high-pressure job or overly demanding self-expectations.	51.9	318
Resolves disabling psychological or addictive problems.	81.5	216
Resolves overconcern on the part of partner or others concerning personal management of asthma.	91.9	271
Effectively deals with the misunderstandings or prejudices of others concerning asthma and its management.	86.6	332

APPENDIX J

Laird, R. J. (1993). Securing respondent cooperation by circulating consent forms in a society newsletter. ***Marketing Bulletin*****, *4*, 58-60.**

Introduction

It is widely accepted that postal surveys are an inexpensive way of collecting large amounts of information (Blumberg, Fuller, & Hare, 1973). However, a well-known disadvantage of this method is that return rates can be low if appropriate steps are not taken. Much research has addressed the issue of how to enhance response rates in postal surveys (see Fox, Crask, & Kim, 1988 for a meta-analysis; Linsky, 1975 for a review). One feature of postal survey design which has attracted research attention is gaining participant cooperation through prior commitment.

Linsky (1975) reviewed 12 studies involving pre-contacting respondents before they receive a questionnaire, and concluded that response rate was increased in each of these studies. This precontact took the form of identifying the researchers, discussing the study's purpose, and requesting cooperation. Linsky concluded that precontact by letter, postcard, telephone, or personal contact all increase response rate, especially precontact by telephone. Seeking prior commitment (e.g. by attempting to secure informed consent) to participate in a survey has received less research attention than pre-contact (Childers & Skinner, 1979), but would appear to have similar advantages (see Heaton, 1965). Hinrichs (1975) investigated prior commitment and concluded that it increases response rate. According to Cannell, Oskenberg, and Converse (1977) the effect of prior commitment is to obligate the respondent to fill out the questionnaire. They comment further that prior commitment procedures generally lead to good quality data being returned.

In this paper, the prior commitment procedure of seeking informed consent, before posting out questionnaires, was employed in a major study on adult asthma, and we report the resulting response rates.

Method

Subjects

Members of the Auckland and Canterbury Asthma Societies formed the subject pool for the study. The Auckland Society has approximately 3000 members and the Canterbury Society approximately 1000 members. Eligibility to take part in the study was determined by three inclusion criteria: a respondent must be diagnosed as having asthma; be 18 years of age or over; and not be experiencing substantial symptoms other than those that relate to asthma.

Materials

The Information Sheet used in the study was organised under four headings (What is the study about? Am I eligible to take part? What would I have to do? What can I expect from the researchers?). It contained statements on the salience of the survey topic to the respondent and the social utility of the research. It also included statements advising that the research was University sponsored, assuring confidentiality, and offering debriefing at the conclusion of the study.

Procedure

The Asthma Foundation of New Zealand was contacted for assistance in securing a sample of asthmatics. Provincial Asthma Societies in New Zealand are affiliated to this organisation. Approval to circulate the study information in the newsletter postings of the Auckland and Canterbury Societies was granted.

In the first instance, the Auckland and Canterbury Societies distributed Information Sheets/Consent Forms to all their members. A reply-paid return-addressed envelope was included in the newsletter postings so that respondents could return Consent Forms without incurring cost.

On receipt of the Consent Forms, the first questionnaire was posted to participants. Six months later, those who had completed the first questionnaire received the second questionnaire. A covering letter and a reply-paid return-addressed envelope (to return the questionnaire) were included as part of both postings. A reminder letter procedure was employed in both waves of the data collection.

Results and Discussion

The percentage of Consent Forms returned from the total number circulated was 10.8% (430 from 4000). This figure is surprisingly low. Given there is no control in the study, explanation for this result is speculative. It seems clear, though, that the inclusion criteria operating in the study cannot explain it. Of the first wave questionnaires that were sent out 97.9% (412 from 421) were returned completed. For the second wave questionnaire, sent six months later, a total of 92.7% (382 from 412) were returned completed. These high rates of returned questionnaires are partly explained by the effectiveness of the reminder letter procedure. Data quality for both waves was high. Only four questionnaires were eliminated (due to a high level of missing data) from the first wave, and three were eliminated from the second wave. The findings therefore support the assertions of Cannell et al (1977) that prior commitment obligates response and ensures good quality data. Moreover, the findings indicates that this obligation extends for a period of at least six months.

The underlying focus of the present investigation was to test a model of some variables pertinent to asthma, and not to estimate population parameters. Sample representativeness was, therefore, not an issue. The sample obtained in this study is clearly not representative of adults who suffer from asthma in New Zealand. Given the low rate of return of Consent Forms, it follows that the sample obtained may not even be representative of asthmatics who are members of the two Asthma Societies involved (see DeMaio, 1980). The effectiveness of the prior commitment procedure

in delivering a representative sample must therefore be questioned.

In conclusion, the methodology used in this study is unlikely to be an effective market research strategy: First, it only delivers a relatively small percentage of the subject pool. Moreover, after initially using the procedure there is no latitude for subsequent followup, to secure further participation. Second, the procedure does not generate a representative sample, and market researchers are nearly always interested in this. It is suggested that market researchers should consider variations on these procedures if they require higher response rates, and a representative sample.

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Notes

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APPENDIX K

Laird, R. J., Chamberlain, K., & Spicer, J. (1994). Self-management practices in adult asthmatics. ***New Zealand Medical Journal*****,** ***107*****, 73-75.**

Abstract

Aim: to examine how adherence to medications and use of competencies (e.g., avoiding personal precipitants and managing an acute attack) vary by age, sex, education and number of symptoms in a sample of adult asthmatics.

Methods: 412 adult asthmatics, members of two Asthma Societies, participated in a mailed survey. The questionnaire contained measures of asthma medication adherence, asthma health competencies, asthma symptoms, and demographic characteristics.

Results: older asthmatics were more likely to adhere and to use more competencies. Females used more competencies than males. Asthmatics with higher numbers of symptoms used more competencies. No differences were found by educational level.

Conclusions: better adherence in older asthmatics may be due to their having developed greater recognition of the efficacy of medications. The more extensive use of competencies by older people and by women reflects previous findings that these groups value health more and engage in less health threatening behaviours in general. The results also suggest that experiencing asthma symptoms motivates better self-management practices. The study raises awareness of the role of competencies in controlling asthma, and should assist health professionals to identify specific differences in self-management.

Introduction

The principal form of treatment for both the prevention and control of asthma is pharmacological, and the asthmatic must assume responsibility for self-management by adhering to prescribed regimens [1]. In practice, however, studies suggest that the adherence levels for adult asthmatics are far from ideal [2-5]. Nonadherence to asthma medications is variously reported to be between 54% and 67%, depending on the type of medication involved [1]. One study found that only 33% of asthmatics use "prescribed-as-needed" medication appropriately [6], and another reported that only 11% use pressurized aerosol inhalers correctly [7].

In addition to adhering to prescribed medications, successful self-management depends on the asthma patient establishing and practising a range of skills, such as avoiding personal triggers, employing effective strategies to manage an acute attack and developing generally healthy habits and attitudes [8]. Wilson et al. have developed a comprehensive list of these "competencies" for asthmatic children [9], for parents of infants and young children with asthma [10], and for adult asthmatics [11,12]. The adult competencies have been trialed in two forms of education programme, with the conclusion that such programmes can improve patients' understanding of asthma and its treatment, patient adjustment, adherence rates, and, consequently, symptom control [11]. Other multifaceted self-management programs have been developed for adults with asthma [8], and similar conclusions have been reached [13]. However, little is known about the extent to which competencies are practised in New Zealand.

In the present study adherence levels and competencies of a convenience sample of New Zealand adult asthmatics were examined. The study focused on the ways in which adherence and competencies vary according to age, gender, education, and number of symptoms. This information should be useful to medical practitioners and asthma educators who can thereby target their efforts to help adults with asthma more

effectively.

Methods

Procedure: Ethical approval for the study was granted by the Auckland and Canterbury Area Health Boards. Eligibility to participate in the study was determined by three criteria: a diagnosis of asthma; an age of 18 years or over; and an absence of comorbidity. Study information and consent forms were circulated to members of the Auckland and Canterbury Asthma Societies in their newsletter postings. A total of 421 eligible asthmatics returned consent forms and were sent questionnaires. Data was collected over a two month period during Spring, by mailed questionnaire.

Sample: Of the 421 consenting individuals, 412 (151 men and 261 women) returned completed questionnaires. Respondents ranged in age from 18 to 85 years, with a mean age of 47.2 years (S.D. = 16.2 years). A total of 11% had received less than Fifth Form education, 31% had completed Fifth to Seventh Form, and 52% had received some tertiary education. Almost all respondents (94%) were of European descent. Duration of asthma ranged from less than one year to 73 years, with a mean duration of 25.7 years (S.D. = 16.4 years).

Questionnaire: The questionnaire assessed asthma medication adherence, asthma health competencies, asthma symptoms, age, gender, and educational level. Adherence to inhaled medications was assessed with six items which asked respondents to rate various aspects of their adherence over the last three months [14], on a 5-point scale from 'never' to 'always'. For example, participants were asked "During the last three months, have you ever used your inhaler or nebulizer more than the doctor prescribed because you felt you were having an attack?" Adherence to all other asthma medications was assessed by repeating the same six items with appropriate wording changes [14]. These two measures assess adherence in terms of delivery system. They

are reported to be reliable and to be sensitive enough to detect variation in adherence and the effects of an intervention designed to improve adherence [14].

Health competencies were assessed with a checklist that we developed from a comprehensive list of 73 adult asthma self-management competencies identified by Wilson et al. [11,12]. These were classified into five categories: preventive medication competencies (skills to follow a medication program); precipitant avoidance competencies (skills to avoid or minimize exposure to personal precipitants); symptom intervention competencies (skills to take care of acute symptoms); communication competencies (skills to improve personal knowledge of asthma, and to establish a good relationship with the physician); and health promotion competencies (skills to maintain or improve general physical and mental health, and thereby improve ability to deal with asthma) [11,12]. On the advice of a physician, we deleted seven items which do not relate to accepted practice in New Zealand. Participants were asked to indicate their use of the remaining 66 competencies, by responding 'yes', 'no', or 'not applicable'.

Asthma symptoms were assessed with the Asthma Symptom Checklist [15]. This checklist includes 36 symptoms (e.g., wheezing, chest tightening, fatigue) rated on a 5-point scale from 'never' to 'always', and has been found to be reliable and valid for adult asthmatics in the general population [15].

Results

Adherence and competencies were analyzed by age, gender, education, and number of symptoms. To do this, adherence to inhaled medications and to other medications were calculated as continuous measures, by summing over each respective set of six items. For both, a lower score indicates better adherence. Competencies were scored by summing the number of 'yes' responses for each category, with higher scores

indicating greater competency. Differences in adherence levels and competencies were analyzed using one-way between-subjects ANOVA with a minimum alpha of .01. For analysis, age was divided into four groups: less than 30 years; between 30 and 44 years; between 45 and 59 years; and 60 years and over. Education was divided into three groups: less than Fifth Form; completed Fifth to Seventh Form; and tertiary education. Symptom level was scored by summing the number of symptoms, and dividing into tertiles, with the resulting levels labelled low, medium, and high.

Table 1 shows how the self-management practices differ by age group. Older asthmatics tend to adhere better than younger asthmatics to both inhaled and to other

Table 1: Self-management practices by age group. Means (and standard deviations).

	Age Group (years)				
Practice	18-29 (N=62)	30-44 (N=137)	45-59 (N=95)	60-85 (N=103)	F
Adherence:					
Inhaled medication	11.8 (4.1)	10.5 (3.4)	9.3 (3.1)	8.6 (3.1)	14.96 *
Other medication [a]	10.4 (3.8)	8.7 (3.1)	8.5 (3.3)	7.7 (2.3)	5.64 *
Competencies:					
Preventive medication	3.5 (1.3)	3.9 (1.2)	4.0 (1.1)	4.4 (1.0)	10.02 *
Precipitant avoidance	13.2 (4.9)	15.7 (5.3)	15.6 (5.0)	14.5 (6.0)	3.76
Symptom intervention	11.6 (3.0)	12.5 (3.0)	12.9 (2.5)	12.1 (3.6)	2.61
Communication	4.2 (1.6)	4.8 (1.3)	4.9 (1.3)	5.2 (1.0)	8.17 *
Health promotion	6.0 (2.2)	6.2 (1.9)	6.7 (2.1)	6.8 (1.9)	3.23

$p < .001$

[a] N's for Other medication, used by approximately half the sample, are 33, 61, 61, and 69 respectively.

medications. For competencies, differences emerged in the areas of preventive

medication and communication, with older asthmatics reporting higher levels of skill in following their medication programmes, and in gathering asthma information and communicating with health professionals effectively. There were no age differences for other competencies.

Gender differences in self-management practices are shown in Table 2. The results revealed no differences in adherence practices between male and female asthmatics for either category of medication. However, gender differences were found for four competency categories; preventive medication, precipitant avoidance, symptom intervention, and communication. Females reported more skills than males in using

Table 2: Self-management Practices by gender. Means (and standard deviations).

	Gender		
Practice	Male (N=146)	Female (N=251)	F
Adherence:			
Inhaled medication	9.9 (3.7)	10.0 (3.4)	0.04
Other medication [a]	8.9 (3.0)	8.5 (3.2)	0.76
Competencies:			
Preventive medication	3.8 (1.1)	4.1 (1.2)	7.76 *
Precipitant avoidance	13.8 (5.6)	15.7 (5.2)	11.04 **
Symptom intervention	11.3 (3.4)	13.0 (2.7)	27.95 **
Communication	4.6 (1.5)	5.0 (1.2)	7.81 *
Health promotion	6.2 (1.9)	6.6 (2.1)	2.37

* $p < .01$ ** $p < .001$

[a] N's for Other medication are 75 and 149 respectively.

medications, avoiding personal triggers, managing acute symptoms, and communicating effectively.

There were no differences in either adherence or competencies by educational level. This finding was not anticipated. However, some previous research has reported that education does not predict other aspects of adherence, making and keeping appointments [5]

Table 3 reports differences in self-management practices as a function of symptom level. Adherence to medication did not vary by number of symptoms, but some

Table 3: Self-management practices by number of symptoms. Means (and standard deviations).

	Number of Symptoms			
Practice	Low (N=117)	Medium (N=134)	High (N=146)	F
Adherence:				
Inhaled medication	9.6 (3.5)	9.8 (3.4)	10.3 (3.7)	1.57
Other medication [a]	8.1 (2.5)	8.4 (2.9)	9.0 (3.6)	1.68
Competencies:				
Preventive medication	3.5 (1.1)	4.2 (1.1)	4.2 (1.2)	15.12 **
Precipitant avoidance	13.0 (5.2)	15.0 (5.5)	16.6 (5.0)	15.20 **
Symptom intervention	10.3 (3.1)	12.8 (2.7)	13.5 (2.6)	46.10 **
Communication	4.6 (1.4)	4.7 (1.3)	5.1 (1.1)	6.11 *
Health promotion	6.1 (1.7)	6.5 (1.8)	6.6 (2.3)	2.20

* $p < .01$ ** $p < .001$

[a] N's for Other medication are 48, 79, and 97 respectively.

competency categories did. Asthmatics with high numbers of symptoms use more preventive medication, precipitant avoidance, symptom intervention, and communication competencies than asthmatics with low numbers of symptoms.

Some of these effects could be confounded by associations between the classification variables, age, gender, education, and symptom level. Chi-square analyses between pairs of variables revealed that only gender was associated with both age ($\chi^2=16.03$, $df=3$, $p<.01$) and symptom level ($\chi^2=26.10$, $df=2$, $p<.01$). However, repeating the ANOVA analyses for each of these factors with the other factor controlled revealed no notable changes in the findings presented above, suggesting that the effects are not subject to confounding.

The data also allowed us to calculate adherence rates in this sample for inhaled and other medication use. For each type of use, respondents were classified as adherers if they scored 3 or higher on all six items. This method provides relatively stringent estimates of adherence rate, and revealed that 47% adhered to inhaled medications, and 70% adhered to other medications.

Discussion

Previous research has documented low rates of adherence to adult asthma medications [2-5], and this is supported by the present findings. Our results are consistent with reports that inhalers are particularly prone to misuse [13], and suggest that asthmatics need most education and encouragement in the correct use of the more common inhaled medications.

Major reasons for the poor adherence practices reported for asthmatics include incomplete understanding of physician instructions, and insufficient information about

medication side effects [13]. A further reason is that some asthma medications do not have a perceptible effect on symptoms, and the asthmatic consequently discontinues their use [13]. Moderate to severe asthmatics may also have difficulty in adhering due to the complexity of their medication schedules [16]. In general, low adherence levels can be attributed to poor self-management practices and inadequate understanding of asthmatics. This receives some support in the present study by the finding that communication competencies are correlated with adherence to inhaled medications ($r=-.29$, $p<.001$) and other medications ($r=-.20$, $p<.005$).

When adherence was analyzed by age, gender, education and symptom level, only age effects were found. Older asthmatics tended to adhere better to both inhaled and other medications than younger asthmatics. This may be partly due to the fact that age was correlated ($r=.22$, $p<.001$) with the duration of asthma. As a function of their longer experience with asthma, older asthmatics may have developed greater recognition of the efficacy of medications. Also, older asthmatics may be more accepting of pharmacological approaches to asthma management than younger asthmatics.

In contrast, few age differences were found for competencies. Only preventive medication and communication competencies showed significant differences by age. The finding that older asthmatics use higher numbers of preventive medication competencies is consistent with the age differences in adherence, as most competencies in this category can be viewed as further aspects of adherence. Older asthmatics also report higher use of competencies to improve their personal knowledge of asthma and to relate to their physician. This may reflect the fact that health has increased salience for older persons [17]. Overall, the results support previous research reporting that older individuals score more highly on measures of health promoting lifestyle, health responsibility, nutrition, and stress management compared to younger individuals [18].

Consistent patterns of results were found when competencies were analyzed by gender and symptom level. Female rather than male, and severe rather than mild asthmatics used greater numbers of competencies. The gender difference in the use of preventive medication competencies is not consistent with the absence of similar effects for adherence. The explanation for this is unclear. Women also report greater levels of skill in communication, avoiding personal precipitants and taking care of acute symptoms. In general, these findings are consistent with previous research showing that women value health more and engage in less health risk behaviour than men [19].

The finding that asthmatics with high numbers of symptoms generally use more competencies than those with low numbers was fully anticipated. This is consistent with the finding that asymptomatic individuals have less motivation to carry out health behaviours, and are more likely to discontinue those behaviours than symptomatic individuals [20]. The present study demonstrates these effects for adult asthmatics. The absence of differences in health promotion competencies by symptom level suggest asthmatics regard these as ineffectual in controlling asthma.

The effects described in this study are relatively small. As a consequence, health professionals should not interpret these findings in isolation, but rather view them in the light of other available information. Also, since the participants were Asthma Society volunteers, who are likely to be more knowledgeable and motivated, they may not adequately represent the general population of adult asthmatics.

In conclusion, these findings should be useful to medical practitioners and asthma educators in three ways. First, the findings may assist health professionals target asthmatics who are limited in particular areas of self-management. Second, the study should serve to raise awareness about the role of competencies in asthma self-

management. Although the control of asthma is primarily achieved through the correct use of medications [1], there is a range of other important competencies available to asthmatics which deserve attention. Third, and perhaps most important, the study serves to bring issues concerning the self-management of asthma into focus. The importance of asthma self-management has been highlighted, and its acceptance by health professionals advocated [21]. The high personal and economic costs of adult asthma cannot be attributed to a lack of efficacious medications, but rather to poor self-management practices [4]. There is evidence that improving these practices can substantially improve adherence to treatment regimens and, consequently, improve functional status [2]. Nearly all asthmatics, apart from those with the most severe and intractable asthma, can be helped to achieve a satisfactory level of control.

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