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The role of behavioural theories in educational interventions for paediatric asthma

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Summary Controlling paediatric respiratory disease requires a significant change in the behaviour of all stakeholders: patient, family, clinician, community and health system. The good management of asthma by patients requires that they learn what works and does not work for them given their particular circumstances. Asthma interventions can help patients to improve their self-regulation and achieve better health status, quality of life and personal goals. Many asthma interventions do not, however, achieve change because they are not based on sound theories of behaviour. They fail to teach patients how to observe, judge and react appropriately to their change efforts. Successful interventions have been based on theoretical principles and have generally combined strategies for preventing and managing an asthma episode and managing the social and behavioural factors associated with the disease.

THE ROLE OF SOCIAL AND BEHAVIOURAL FACTORS IN ASTHMA CONTROL

Social and behavioural approaches to disease control and prevention have gained increased attention in recent years. Two or three factors have probably contributed to this interest. One is the significant advance in social and behavioural theory that has resulted from research and model development conducted over the past two decades.[1] Another is evidence to suggest that interventions based on theories of learning and change have produced desired health outcomes[2,3] and that those relying simply on providing information to patients have not. A third factor is the demonstration of the important influence that the behaviour of others has on the individual trying to maintain or acquire health or manage chronic disease.[4]

Asthma provides an excellent case study illustrating these advances. Until we can prevent or cure a chronic respiratory disease such as asthma, the most frequent and important steps to achieve control are taken by the patient. The patient him- or herself is literally at the centre of disease management. Research has shown[5,6] that the most influential others in a patient's attempt to manage asthma are the family members. Relatives greatly enable or deter an individual in carrying out recommended actions and they themselves can experience the negative bystander effects of living with asthma.[7,8]

Crucial to effective asthma management on the part of the patient is the set of therapeutic recommendations that the health-care professional provides and the support and education that must accompany the provision of the regimen. Without effective therapies, an understanding of how they are to be used and the skills to follow them through, the patient's chance of achieving optimum asthma control is very low. Significant people in the day-to day social environment also play a role. Classmates, co-workers, friends and neighbours can encourage good management or be an obstacle to desired practices. They can assist effectively in the case of an emergency or contribute to the confusion.[9] They can vocalise and support the establishment of effective community-wide systems to ensure asthma control or they can be silent and unconcerned.[10] The control of a disease such as asthma requires positive actions on the part of all those in patients' circles of influence.

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FINDINGS REGARDING SOCIAL/ BEHAVIOURAL FACTORS AND STRATEGIES

A number of studies of asthma interventions for children have been undertaken over the past 20 years. Furthermore, investigators have identified psychosocial predictors of poor control of asthma. Both types of study have confirmed the role of social and behavioural factors in asthma.

Psychosocial predictors of poor control of asthma

A classic article by Evans[10] acknowledged the role of psychosocial factors in one type of asthma mortality. Death resulting from sudden-onset asthma appears to affect patients with no distinguishing features and arises with inadequate time to intervene. On the other hand, mortality from slow-onset asthma, in which an episode evolves over hours or days and results in death, appears to be more evident in individuals with a history of little social support and poor disease management practices. Enabling patients to be more effective disease managers is literally a matter of life and death for a number of patients.

Psychosocial factors have also been associated with health-care use.[11–13] Janson-Bjerklie *et al.*[14] and Nouwen *et al.*,[15] for example, found a higher level of emergency facility usage among patients experiencing psychological distress and among those with low-level feelings of self-efficacy.

Those in the circle of influence of individuals with asthma can provide not only instrumental support for good management, for example encouraging the patient to use medicines appropriately, but also help with reducing stress and the psychological and other discomforts that can accompany the disease. For example, Wasilewski *et al.*[7] showed that when the fathers of children with asthma, even if they lived outside the household, assisted with asthma management tasks, the children's mothers experienced significantly less stress and disruption of daily life attributable to the disease.

Patients themselves, as well as those in their social environment, show resiliency and a capacity for managing their asthma effectively. Indeed, the parents of children with asthma have been shown to be much less pessimistic than those of healthy children about the impact of the disease on family lifestyle and relationships.[16] Adolescent patients' positive attitudes towards asthma medicines, feelings of self-efficacy and perceptions that key people in their social environment positively support their asthma management efforts have been significantly associated with their better adherence to the medical regimen. Adolescents with chronic disease who seek social support have been shown to experience more positive social adjustment, whereas those with a more passive disease coping style have been shown to experience less adjustment and more anxiety.[17]

Younger school-aged children with asthma who have greater feelings of self-competence have been shown to know more about their disease and those who have an active coping style have been shown to be more likely to follow asthma management recommendations.[18]

The control of asthma thus entails not only using an effective clinical regimen, but also the ability to handle the social and behavioural dimensions associated with having a chronic respiratory disease. The good management of asthma by patients requires that they learn what works and does not work for them individually given their particular circumstances.

Theoretical underpinnings of disease management interventions

A significant body of theory exists to suggest how patients can best learn to be effective asthma managers. The primary advantage of using behavioural theory to guide the design of an asthma (or other respiratory disease) intervention is that a good theory explains the mechanisms by which change comes about. Understanding the mechanisms enables the selection or design of those programme components most likely to be effective. There is, however, considerable haziness in discussions of behavioural theories applicable to the control of respiratory disease. For the sake of discussion, one might categorise theories according to their intention and utility into (1) theories of behaviour, (2) conceptual framework for practice and (3) theoretical principles.

Category 1 theories attempt to predict or explain why people behave as they do in relation to their health. These may be theories that focus primarily on psychological factors such as the health belief model,[19] the health locus of control,[20] attribution theory,[21] or the theory of reasoned action.[22] Alternatively, they may address the interaction of psychological, behavioural and/or social environmental factors such as social cognitive theory and self-regulation,[23,24] Freire's psychosocial model[25] and theories of social support and social networks.[26]

Category 2 theories are conceptual frameworks for practice, that is, paradigms that describe the conditions within which interventions can be made to be effective and efficacious. These frameworks include, for example, the transtheoretical model (stages of change)[27] PRECEDE/ PROCEED,[28] the social ecological model[29–31] and a growing body of work on empowerment.[32] There are also a number of theoretical principles (category 3 theories) that have evolved from behavioural theories and conceptual frameworks for practice that have been associated with evidence that health status and/or behaviour change has occurred. These include, for example, the principle of tailoring advice and health messages,[33] contracting[34] and various communication techniques.[35,36]

Theories employed for predicting behaviour may also explain how change occurs but this is not always the case.

The health belief model,[19] for example (which is based on how susceptible a person feels to an illness, how serious he or she perceives illness to be and what he or she perceives to be the benefits and costs of the recommended action), has consistently been shown to account for about 30% of the variance in a health action. Nonetheless, although the elements of the model are valuable predictors of change, they do not in any way explain how individuals come, for example, to see themselves as susceptible to disease or perceive a disease to be serious.

Another example is the currently popular transtheoretical (stages of change) model. The model attempts to describe the categories of readiness of the person who is the subject of change (e.g. pre-contemplation, contemplation, preparation, action, maintenance of behaviour and termination or relapse).[37] However, the model provides no explanation of how people come to see themselves as ready or not for change. In addition, the stages of change model have been criticised as simply assigning people to arbitrary categories, ones that are neither mutually exclusive nor behaviourally sequential. The model, according to one critic,[38] uses circular logic: saying that high-stage status predicts enduring change is saying that the good maintainers of a behaviour are good maintainers of a behaviour. Successful interventions must be focused on the factors that cause behaviour so the explanatory capacity of a theory is very important.

A comprehensive explanatory and predictive theory garnering significant attention among behavioural scientists currently working in public health and health care is social cognitive theory (sometimes referred to as social learning theory) and its construct of self-regulation. This theory is particularly amenable to clinical aspects of asthma as patients must learn a range of control measures, such as monitoring symptoms (or peak flow rates) and taking actions that require being observant and making informed judgements. Social cognitive theory is best explicated by Bandura,[39] who describes a key concept as the reciprocal nature of the behaviour change process. The individual's own behaviour and perceptions influence and are influenced by the social and physical environment. Change strategies must consider all three determinants of behaviour. Furthermore, social cognitive theory details how people come to change behaviour. The motivation to change derives primarily from (1) outcome expectations, that is, the perception that undertaking an action will enable people to achieve their goals, and (2) efficacy expectancies (self-efficacy) – the perception that one is capable of the action. There are four sources of these expectations:

- personal mastery of a task or behaviour (performance accomplishment);
- vicarious experience (role models);
- verbal persuasion (from credible persuaders);
- physiological states (e.g. anxiety and stress are associated with anticipating failure).

Another tenet of social cognitive theory is that expectations and performance are not generalisable but particular to given tasks, For example, one is not, in general, self-efficacious. Rather, one has a sense of efficacy about a specific task, perhaps using asthma medicines correctly.

Of the range of behavioural theories currently utilised in health-related studies and interventions,[40] social cognitive theory is the most robust. It accounts for a wide range of psychosocial determinants of health behaviour: feelings of efficacy; the physical, social and self-evaluative aspects of outcome expectations; the role of both proximal and distal goals; personal, situational and health system environments;[38] and processes of self-regulation.[24]

Self-regulation as an important model for chronic disease management

Self-regulation is an especially relevant construct from social cognitive theory for developing interventions to control a disease such as asthma. We have proposed a model of disease management by the patient (Fig. 1) in which the ability of a person to be self-regulating is central to achieving desired health end-points.[41,42] Being self-regulating means being observant and making judgements based on observation (vs. habit, fear, tradition, etc.). It entails reacting appropriately to one's own efforts to bring about change. The model is also predicated on the idea that self-regulation processes are continuous and reciprocal. Observations, judgements and reactions generate information, behaviour, understanding, feelings and conclusions. These products, as they relate to any one element of the model (e.g. intrapersonal or external factors, or management strategies, or end-points), continually influence the other elements. A person is motivated to be self-regulating by his or her desired goal or end-point. The more salient the goal, the more self-regulating the person will try to be. The power of the goal is associated with how closely held a value it represents for the individual.

The model, as presented in Figure 1, suggests that intrapersonal and external factors lead a person to undertake disease management strategies (including modification of the physical and social environments) in order to achieve a desired end-point or goal. One reaction to the process is to determine whether the action taken produced the expected outcome (outcome expectation). Another reaction is whether one feels the confidence to continue the action (self-efficacy).[43] Over time, continuous observation, judgement and reaction lead to a modification of management strategies and sometimes modification of the goal itself.

Our model has been evaluated with asthma patients. One study[41] with 637 children with asthma and their parents found, for example, that, at three separate time points spanning two years, components of the model exhibited the same pattern of relationships. This suggests that the model is stable over time. Furthermore, patients'

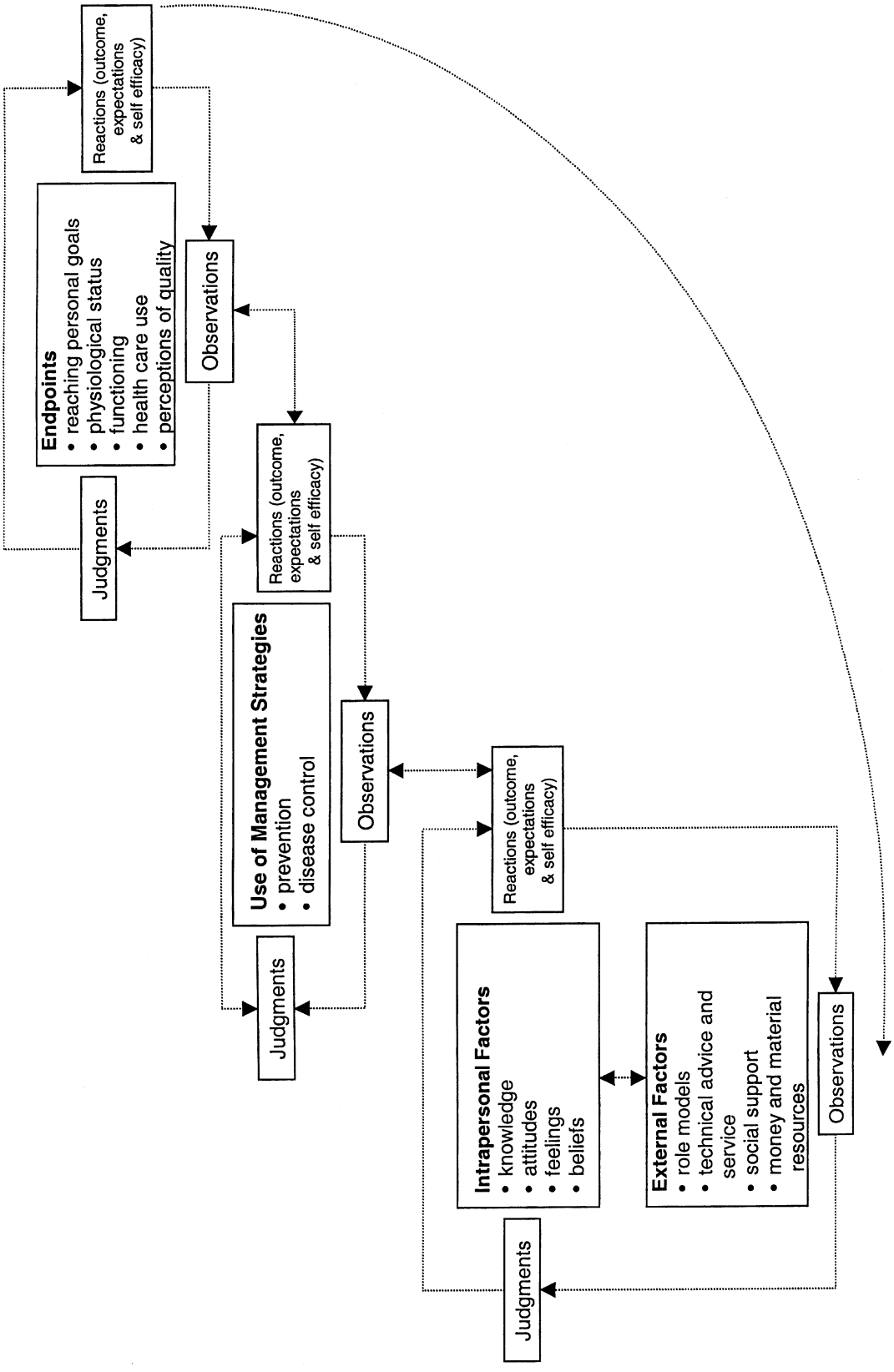

Figure 1 The continuous and reciprocal nature of self-regulation process in disease prevention and management.

Table 1 Examples of evaluated interventions for children with asthma.

Investigators	Population	Intervention	Findings	Theory
Clinical settings				
Charlton *et al.* (1994)[45]	$n = 91$ 3–14 years old	One 45-minute session Individual Facilitator: nurse Accompanying parent was included in out-patient sessions	Nurse intervention group increased asthma knowledge Better response to acute attack ($P < 0.01$) and fewer inappropriate responses ($P < 0.02$) Less activity restriction ($P < 0.05$) Daily lung function by % of time significantly less than 30% best peak expiratory flow ($P < 0.05$)	Principles of self-monitoring
Clark *et al.* (1984,[49] 1986,[54] 1986[55])	$n = 310$ 4–14 years old African-American and Hispanic	Open airways Six 1-hour sessions once per month Group size: 10–15 families Facilitator: health educator Parents included in groups (met separately)	Significant change in academic grades index (+0.01 vs. −0.51, $P < 0.05$) Decreased use of ED ($P < 0.05$) Significant reduction in number of hospitalisations ($P < 0.05$) Parents scored higher self-management index (+1.57 vs. −0.83, $P < 0.0001$) Increased knowledge: attack management ($P < 0.05$) and preventive measures ($P < 0.05$) Children reported increased management steps: productive cough ($P < 0.004$), breathing and relaxation exercises ($P < 0.05$) and attempts to stay calm ($P < 0.05$)	Social cognitive theory
Kelly *et al.* (2000)[57]	$n = 80$ 2–16 years old White, African-American	One-on-one asthma education sessions Facilitator: physicians, asthma outreach nurse Parents included	Decreased number of ED visits from 3.6 to 1.7 per child ($P < 0.05$) Decreased number of hospitalisations from 0.6 to 0.2 per child ($P < 0.001$)	Principles of self-monitoring and reinforcement
Madge *et al.* (1997)[58]	$n = 201$ Under 14 years of age	Three sessions, 45 minutes total Facilitator: nurse Administered during a hospital admission Parents included	Programme was significantly associated with a reduced risk of readmission ($P < 0.0001$; $P = 0.03$) Children in the intervention group had decreased number of episodes of day ($P = 0.0005$) and night ($P = 0.002$) morbidity	Principles of self-monitoring
Clinic and home settings				
Evans *et al.* (1999)[60]	$n = 1033$ 5–11 years old African-American and Hispanic	Based on A+ Asthma programme Group and individual sessions Facilitator: Masters' level social workers Parents included	Decreased number of symptom days in the 2 weeks before follow-up ($P = 0.004$) Decreased number of hospitalisations ($P < 0.071$) At 2 years, decreased number of symptom days across 2 week follow-up was maintained ($P = 0.007$) At year 2, lower number of hospitalisations approached significance ($P < 0.078$)	Principles of self-monitoring

Table 1 (*Continued*)

Investigators	Population	Intervention	Findings	Theory
Hughes *et al.* (1991)[61]	$n = 95$ 6–16 years old	Home and ambulatory sessions 3-month clinic visits, education and home visits Facilitator: research nurse Parents involved	Decreased school absenteeism ($P = 0.04$) and better small airway function after 1 year Better metered aerosol technique ($P = 0.0005$) Decreased number of hospitalisations ($P = 0.02$) After 1 year, increased child asthma management ($P = 0.006$)	Principles of self-monitoring
School settings				
Evans *et al.* (1987)[63]	$n = 239$ 3rd–5th graders Hispanic and African-American	Open Airways at School Six 60-minute sessions over 2–3 weeks Group size: 8–12 children Facilitator: health educator Parents received some materials	Higher scores on an index of asthma self-management ($P < 0.05$) Decreased symptom scores ($P = 0.02$) Greater self-efficacy are asthma management skills ($P < 0.05$) Significant better grades in school ($P = 0.05$)	Social cognitive theory
Shah *et al.* (2001)[66]	$n = 251$ High school students	Triple A (Adolescent Asthma Action) Peer education model: peer leader receive three 90-minute workshops and then conduct three 45-minute health lessons for lower grades Group size: class size Facilitator: initial training of leaders conducted by adults, then student delivery	Improved quality of life (>0.5 units) in 25% of intervention group vs. 12% in control ($P = 0.01$) Improvement in quality of life activities (41% vs. 28%) and in emotions (39% vs. 19%) domains for males Decreased in the school absences (8 vs. 5 days in 10th grade students, $P < 0.05$)	Social support and networks
Toelle *et al.* (1993)[65]	$n = 65$ 8–11 years old	Two 60-minute sessions over 2 weeks Group size: 8–12 children Parents invited	Improved FEV_1 ($P < 0.05$) at follow-up Improved asthma knowledge ($P < 0.001$) Slightly fewer unscheduled doctor and ED ($P = 0.05$)	Self-efficacy construct

ED, emergency department; FEV1, forced expiratory volume in 1 second.

baseline scores for self-regulation predicted health-related outcomes 18 months later. Baseline self-efficacy was significantly associated with fewer subsequent emergency department visits and doctor's office visits following an asthma episode. Higher baseline observation scores predicted higher subsequent quality of life. Higher baseline scores for judgement predicted fewer subsequent physician follow-up visits for asthma.

IMPROVEMENTS IN ASTHMA CONTROL ASSOCIATED WITH THEORY-BASED INTERVENTIONS

A large number of asthma interventions for children have been designed, assessed and reported in the literature.[44] These have generally combined strategies for preventing and managing an asthma episode and managing the social and behavioural factors associated with the disease. Although not all articles describing asthma programmes provide adequate information about the specific theories and theoretical principles employed, most outline activities related to symptom or peak flow monitoring, the use of action plans and efforts to build patients' sense of efficacy and problem-solving skills. These aspects of asthma management are consistent with the theoretical principles of learning and change receiving greatest currency among behavioural scientists (see above).

Table 1 provides examples of programmes in three venues (clinics, homes and schools) that have employed principles from behavioural theory in which reasonable evaluation methods have been employed (e.g. randomised-controlled trials) and in which outcomes important to asthma control have been assessed. Evaluation of these programmes and a number of others has noted significant change.

Interventions based in clinical settings seem to have been effective in improving management practices,[45–48] a child's school performance[49] and symptom status[50,51] and in reducing daily disruptions from asthma,[52,53] emergency department use and hospitalisations.[49,54–59] Theoretical bases of programmes have included social cognitive theory, principles of self-monitoring and the locus of control and self-efficacy constructs.

A small number of programmes has been designed for use in both clinics and patients' homes. These studies have observed improvements in such factors as symptom status,[60,61] school attendance[61] and environmental precipitants in the house.[62] They have employed approaches from social cognitive theory.

Successful school-based programmes focused on asthma management and the child's level of confidence in managing well. Significant changes have been noted in symptom status,[63] asthma knowledge,[64,65] school grades,[63] and attendance.[66] Theories and principles used have included social cognitive theory, self-efficacy, social support and social networks.

CONCLUSION

Controlling paediatric respiratory disease requires a significant change in the behaviour of all stakeholders: patient, family, clinician, community and health system. Left to their own devices, patients will engage in some aspects of behaviour (for example, setting appropriate goals, using effective strategies and reaching for productive end-points) with which clinicians agree but this will not always occur. Asthma interventions can help patients to improve their self-regulation and achieve better health status, quality of life and personal goals. We have argued[67] that many asthma interventions do not achieve change because they fail to teach patients how to observe, make judgements and react appropriately to their change efforts. In other words, they fail to operationalise sound behavioural theory. Good theory can explain how to bring about change.

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