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Review Article

The importance of health belief models in determining self-care behaviour in diabetes

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Abstract

Patients' self-care behaviours have a major role in diabetes management. Diabetes education provides the required knowledge, but despite this, self-care is often suboptimal. The degree to which patients follow advice as regards the various self-care behaviours is determined by their health beliefs (Illness Representations or Personal Models) of diabetes. Psychometric studies have tried to categorize and measure the beliefs about illness that influence patients to adhere to treatment recommendations in diabetes. Various models have been proposed to explain the relationship between beliefs and behaviour. Leventhal's Self-Regulatory Model, which takes account of the emotional as well as the objective rational response to illness, currently seems to offer the best system for identifying the determinants of patient self-care behaviour. A review of interventions indicates those based on psychological theory offer professionals the best chance of maximizing their patients' contribution to diabetes self-management and achieving improved outcomes, both glycaemic and psychosocial. Studies designed specifically to modify illness representations are now being undertaken. This brief review aims to summarize developments in this area of psychological theory over the last 20 years and the implications for promoting better self-care behaviour in diabetes.

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Keywords diabetes, illness cognitions, patient education, psychosocial

Abbreviations CBT, cognitive behavioural therapy; HBM, Health Belief Model; IPQ, Illness Perception Questionnaire; IR, illness representation; PM, Personal Model; PMDI, Personal Models of Diabetes Interview; QoL, quality of life; SF36, Short-Form 36 questionnaire; SMBG, self-monitoring of blood glucose; SRM, Self-regulatory Model; T1DM, T2DM, Type 1 and Type 2 diabetes, respectively; TRA, Theory of Reasoned Action

Introduction

Healthcare professionals ask patients with diabetes to carry out many self-care behaviours. These include dietary change, exercise, regular self-medication, insulin injection, self-monitoring of blood glucose (SMBG), insulin dose adjustment, regular attendance at clinic and for screening programmes. These behaviours are often not achieved, despite their value being understood by both patient and professional. Much has been made of the importance of education in diabetes. 'Education, education, education' has become a mantra. Lack of knowledge seems the most easily remediable reason for failure to achieve good self-care. The provision of information may go beyond the bare facts of what should be done and, depending on the way in which it is delivered, may alter the patient's attitude to treatment and improve their satisfaction with it. However, in a meta-analysis of 30 studies of patient education in chronic disease, Mazucca found that improving patient knowledge alone is rarely sufficient to improve adherence to treatment regime [1]. As regards taking medication, a review of over 20 studies found no good evidence of a link between knowledge and adherence [2]. Some patients with a good level of knowledge are poor adherers [3]. In another group, individualized education improved adherence to drug regime but was independent of knowledge [4]. Thus, education and knowledge alone are insufficient. We need to go further.

After optimization of medication, self-care behaviours largely determine HbA_{1c}. Valid measures of self-management behaviour should yield associations between behaviour and glycaemic control. Although some studies have shown such a relationship [5–8], others were unable to do so [9–16]. The

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discrepancies may be due to methodological differences. Many studies have asked patients to rate their adherence to their own recommended diabetic regimen. However, asking patients to report their behaviours on scales measured in absolute terms (e.g. 'How many blood glucose measurements do you do each week?') is likely to be a better measure than asking people to rate what they do against their recollection of what they may (or may not) have been advised years previously. Self-care behaviour may be influenced by cognitive function, which can show premature decline in diabetes [17], or by depression, which is more common in diabetes than in the general population [18]. These are important issues in clinical practice, but beyond the scope of the present review.

Patients' motivation to undertake the required activities is not in the main the direct result of symptoms, since diabetes, at least prior to the development of advanced complications, is mostly a symptomless condition. Patients are motivated by other perceptions of their diabetes over both the short and long term. This includes their views on the likelihood that adverse events will occur, the perceived impact on their everyday life, perceived personal control and perceptions of the effectiveness of preventative strategies. These overall views are termed their health beliefs, illness representations (IRs) or personal models.

A variety of psychologically based interventions to promote better diabetes self-care have been studied. Reviews of those used in adolescence and in adults have indicated the need for a better theoretical basis for those interventions to be trialled [19,20]. The present brief review aims to summarize the current status of health belief models developed to explain patient behaviour and implications for the behavioural management of diabetic patients and design of future interventional studies.

Development of health belief models

Various health belief theories have been proposed. The validity of such models, meaning the ability of measured beliefs to predict measured behaviour successfully, can be tested in psychometric studies. Early studies of health-related behaviour focused upon demographic and social characteristics of patients or biomedical factors that might influence behaviour: disease complexity, duration, and adverse effects of treatment. The results indicated these factors were poor predictors. Also, they were generally not amenable to change, so that the findings would not aid clinical practice or intervention. It became recognized that subjective psychological processes involved in health protective behaviour and illness-related behaviour were likely to be of major importance [21].

The Health Belief Model (HBM) identified five basic dimensions as a basis for behaviour: perceived severity of the condition, perceived susceptibility or vulnerability to the disease process, perceived benefits (belief in efficacy), costs/barriers, and cues to action, which may be internal (symptoms) or external (health education, illness of family or friend) [22,23]. Two major meta-analyses have been published [24,25]. Janz and Becker found perceived barriers to self-care to be powerful. Perceptions of susceptibility were influential for preventative self-care behaviours. Perceived benefits (equivalent to treatment efficacy) and perceptions of severity contributed to sick-role behaviour (i.e. after diagnosis) [24]. However, Harrison *et al.* concluded that although the principle dimensions of the model significantly influenced behaviour, the amount of variance in measured behaviour accounted for by the main HBM domains (perceived susceptibility, severity, benefits and costs) was small (< 10%) [25]. In diabetes, inconsistent results have been obtained. Perceived benefits (minus costs) correlate with adherence to diabetic regimen in adolescence [26]. In adults, benefits and vulnerability were related to diabetes regimen adherence [27], whereas, consistent with other work [28,29], younger subjects were influenced predominantly by the costs or barriers of the diabetes management regime. Some found the HBM dimension of 'severity' was associated with regimen adherence [30,31], but others did not [27]. The emotional response to illness may influence this relationship, in that perceived severity can lead to better adherence or to denial, but the HBM does not directly include emotional response.

According to the Theory of Reasoned Action (TRA)/Theory of Planned Behaviour [32], behavioural intention is a function of:
(i) the individual's attitude to the behaviour and evaluation of performing it. This attitude refers to expectations and evaluation of outcome.
(ii) The individual's perception of social pressure to perform the action (the subjective norm) and whether he/she is motivated to comply with this pressure (wanting the approval of significant others: spouse, family, doctor).

Thus, the TRA places the individual within their social context. However, intention does not always result in action, which may be influenced by other factors. The TRA has been used to explain regimen compliance with variable success [33,34]. In diabetic patients, DeWeerdt *et al.* found a relation between intention and behaviour, with some influence of social norm [6]. The Theory of Planned Behaviour (an extension of TRA) predicted self-monitoring behaviour in adults with Type 1 diabetes (T1DM) [35].

Protection Motivation Theory grew out of fear communication theories [36]. 'Fear appeal' studies are important to health professionals, who must impart information about the value of health protective behaviour and risks of non-compliance. An early model, the Drive Model, suggested health protective behaviour was dependent on the amount of drive (fear) created. The model recognized that high levels of fear would lead to avoidance/denial, but proposed that low to moderate fear levels would motivate patients to comply. The model has not been well supported by research findings [37].

Recent approaches have focused on the ideas and beliefs that individuals have about illness. Leventhal suggested individuals respond to avoid danger but also to avoid the emotion of fear [21,38,39]. His Self-regulatory Model of illness (SRM, also known as the Illness Representation Model, Common Sense Model or Personal Model of illness) suggests that cognitive processes and emotional processes operate independently: for

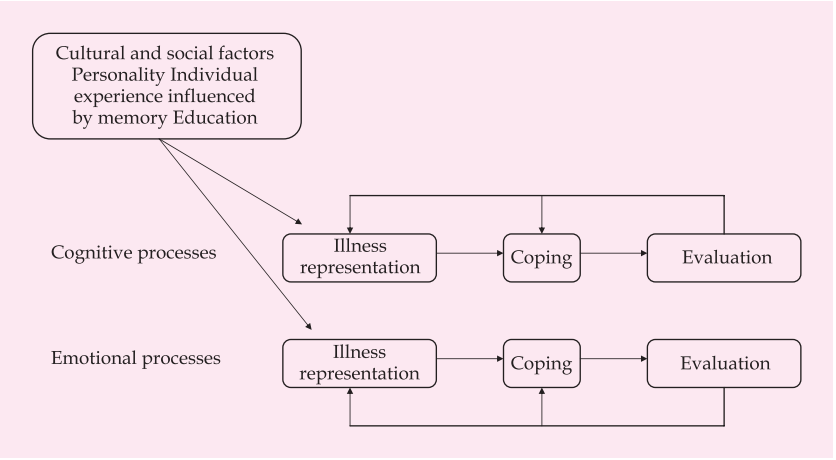

FIGURE 1 Schematic representation of Leventhal's Self-Regulation Model of Health and Illness.

regulation of danger (danger control) and regulation of emotion (emotional control).The two are handled in parallel [40]. Leventhal described IRs or illness cognitions as patients' personal implicit common sense beliefs about their illness. Self-regulatory models see the patient as an active problem-solver whose behaviour reflects attempts to close the perceived gap between his/her current status and a goal or ideal state [21]. Thus, patients take in and interpret information and cope with the presenting problem [38]. The model proposes that three stages regulate behaviour (Fig. 1):

(i) The cognitive representation of the health threat [the IR or Personal Model (PM)].

(ii) The action plan or coping stage.

(iii) The appraisal stage, in which coping and progress are assessed, leading to modification of the representation and/or coping behaviours.

Important features of this model are dynamic interaction between the three stages (representation, coping and appraisal) and parallel processing: cognitive and emotional processes may operate independently, although they generally interact [21].

The components of illness representations

Fundamental to the SRM is patients' representation (or PM) of their condition. Using interviews with patients suffering from various chronic conditions, Leventhal and colleagues studied the ways in which patients conceptualize or represent illness threats [39,41–43]. The representations structured around four components:

Identity: Beliefs concerning the illness label and associated symptoms.

Cause: Beliefs regarding possible causes of the illness: heredity, environmental factors, lifestyle.

Time line or course: Beliefs regarding duration of the illness: acute, cyclic (symptoms may subside, then recur) or chronic. This domain includes views on the variability and predictability of the condition.

Consequences: Beliefs regarding the perceived physical, psychological or financial consequences of the illness.

Working with patients with acute illness, Lau and Hartman [44] added a fifth component:

Curability or controllability: To what extent the condition can be cured or controlled by the individual or treatment. Central here are beliefs about the effectiveness of treatment, referring to the management regime in its widest sense, including whether the clinical advice is helpful, attending clinic is worthwhile, etc. Perceived control includes perceptions of personal control (confidence in self-management) and treatment effectiveness.

PMs have been associated with many health behaviours and adaptive outcome across different illness groups [45]. PMs, particularly perceptions of treatment effectiveness, are better predictors of regimen adherence than perceived barriers [46]. PMs appear to be stronger and more consistent predictors of outcome (eating patterns, physical functioning, HbA_{1c}) than measures of depression [47].

The SRM differs from previous health belief models in that it takes account of patients' current and past experience. This model is favoured by Health Psychologists because it sees patients taking an active role in managing their own condition. PMs are patient rather than interviewer generated, and identify the issues patients themselves think are important. The model recognizes the importance of the emotional response to illness. The SRM implies that patients' PMs can be influenced to achieve a more adaptive (constructive) understanding of their condition and to evaluate the effects of acting on this understanding. The assessment of Personal Models of Diabetes using Leventhal's SRM provides a theoretical basis for understanding and predicting patients' self-care activities. When investigators have used instruments that did not directly adhere to Leventhal's theoretically derived dimensions, factor analysis of the individual items usually resulted in similar domains [48,49], supporting the validity of the SRM.

Coping mechanisms

IRs are shaped by information from the external social environment (family, healthcare practitioners, the media) and past experience with illness. The way in which the individual

represents the threat guides the coping responses. The form of coping behaviours, e.g. more self-care (adaptive) or denial (maladaptive), contributes substantially to clinical outcome. Detailed discussion of coping mechanisms is beyond the scope of this review, but they are a central part of the SRM. Coping mechanisms can be considered under the headings: avoidance/denial, cognitive reappraisal, expressing emotion, problem-focused coping and seeking social support. Avoidance/denial or expressing emotion (passive coping mechanisms) represent the emotional response to illness recognized in the SRM. In general, active problem-focused coping, meaning that the patient addresses the problem (e.g. suboptimal glycaemic control by utilizing the clinical advice given), is likely to be associated with improved outcome, whereas emotion-focused coping leads to poorer outcome [50]. In other conditions, passive coping has been associated with worse physical and social functioning, mental health and general vitality [51], whereas active coping is associated with more satisfaction with health [52]. Acceptance correlates positively with mental health [53]. The direction of any causation in these relationships is not proven. To improve medical outcomes in diabetes the goal for professionals is to move patients towards problem-focused coping behaviours, which may include seeking social support with or without cognitive reappraisal.

Several validated instruments are available to measure coping mechanisms [54–56]. The COPE allows analysis of individual coping behaviours rather than a simple distinction between emotion-based and problem-focused coping [55]. Studies showing correlation between measurements of PMs, coping and outcome support the concept of the SRM.

Measuring illness representations

The two standard measures for the comprehensive assessment of PMs based on Leventhal's five core components are the Personal Models of Diabetes Interview (PMDI) [10,57] and the Illness Perceptions Questionnaire (IPQ) [58].

The PMDI consists of four dimensions: symptoms, cause, treatment effectiveness, and seriousness (including time-line, i.e. course and consequences). Amended and shortened versions of the PMDI have been used [46,59]. We amended the PMDI, separating cognitive and emotional response items in line with Leventhal's SRM of parallel cognitive and emotional response systems [60]. Factor analysis identified meaningful subscales and internal reliability was satisfactory. Dimensions included: symptoms, internal cause, course, control divided into (i) short-term control (avoidance of high/low blood glucose) and (ii) treatment effectiveness, fear of long-term complications, worries concerning hypoglycaemia, and consequences, which divided into two separate constructs: (i) threat measuring perceived seriousness and vulnerability to complications and (ii) impact on daily life.

The IPQ is a generic instrument that may be adapted to any medical condition [58]. The measure contains five subscales: symptoms; cause; time-line (perceived duration); consequences; control/cure. An amended version (IPQ-R) subdivides controllability into personal control and treatment control [61]. New subscales include a cyclical time-line (fluctuations in condition over time, unpredictability), illness coherence, and an emotional representation dimension. A brief version of the IPQ is now available [62]. Use of the full or brief versions of these measures will depend on the specific research question, the context in which the measure will be used (research or clinic use), time and resources. Questionnaires to assess other aspects of diabetes have been reviewed by Bradley and co-authors [63].

The same core components of IRs have been demonstrated in various different clinical conditions [48,58]. A meta-analysis by Hagger and Orbell included all identifiable studies using the SRM in various diseases and assessed the impact of PMs on outcomes [48]. Scores for consequences, identity (more symptoms) and time-line (course, unpredictability) showed negative correlation with psychological well-being, role functioning, social functioning and vitality. Consequences and identity were also strongly and negatively related to physical functioning. Thus, perceptions of serious consequences, a chronic time-line and greater symptom reporting are associated with worse physical and psychological outcome. Conversely, perceptions of high cure/control are related to improved psychological well-being, social functioning and vitality. This general applicability across diseases supports the validity of the PM domains as measurable factors to predict outcomes. Their interrelationships and relative importance for predicting disease-related behaviour may differ between conditions.

Illness representations in diabetes

In diabetes, studies have investigated the influence of PM domains on outcomes relevant to diabetes self-management: quality of life (QoL), glycaemic control measured as HbA_{1c}, SMBG, dietary behaviour, exercise, depression and clinic attendance. Component domains of PMs are associated with self-management outcomes both cross-sectionally and prospectively [10,57]. PMs also relate to adolescents' self-management [64,65].

QoL: In Type 2 diabetes (T2DM), social functioning, mental health and overall perception of health measured using the General Health Survey SF20 (originally developed for the Medical Outcomes Study [66]) were each consistently related to perceived seriousness of diabetes [57]. Stress was associated with perceived seriousness and inversely with perceived treatment effectiveness; positive affect was associated with treatment effectiveness and inversely with perceived seriousness [57]. In both T1DM and T2DM, patients who believed diabetes more serious reported poorer physical functioning [47]. Lower beliefs in treatment effectiveness yielded the lowest perceptions of health. In T2DM, Paschalides *et al.* found the IRs of symptom load and anticipated consequences to be associated with physical functioning measured using SF36 [67]. Depression and anxiety scores (measured using the Well Being Questionnaire [68]), control and consequences (measured by IPQ [58]) accounted for 51% of the variance in the SF36 mental function score.

Watkins *et al*. found that increased perceptions of control and understanding of diabetes were associated with less interference with social and personal functioning, fewer negative feelings and more positive attitude in both T1DM and T2DM [69]. Eiser *et al*. found well-being and reduced interference with everyday activities were related to perceived control (confidence in self-management) in T1DM and T2DM [70]. Edgar and Skinner similarly found perceived treatment effectiveness to predict emotional well-being in adolescents with T1DM [71]. In adolescents, social support as well as impact of diabetes predicted well-being measured using the Well-Being Questionnaire [68,65]. The impact of diabetes predicted anxiety in adolescents [8]. Impact on life and perceived seriousness were related to depression and anxiety [64].

Diet: PMs of diabetes are predictive of diet self-management in older people with diabetes [72]. Patients' belief about the seriousness of their condition and in treatment effectiveness has been associated with better dietary self-management in both T1DM and T2DM [10,46,47,73]. Increased perception of control and understanding of diabetes were associated with better adherence to diet [69]. Searle *et al*. found perceived consequences predicted some dietary behaviours in T2DM [74]. In adolescents, better diet self-management was predicted by increased family support. This effect was mediated by the treatment effectiveness PM domain, meaning that family support in these patients is associated with increased perceptions of treatment effectiveness and hence leads to better outcome [8,64]. Also in T1DM, perceptions of treatment effectiveness and health threat were associated with better dietary self-management [73].

Physical activity: Perceptions of treatment effectiveness also predicted physical activity [10,57]. Treatment effectiveness and seriousness predicted exercise self-management in the large mixed cohort studied by Glasgow *et al.* [46] and in T1DM [73].

Self-measurement of blood glucose: This has been more controversial, since PMs did not predict SMBG in some studies in T2DM [57], nor in adolescents with T1DM [65]. However, in other studies SMBG has been related to belief in treatment effectiveness in T2DM [10], in a large mixed patient population [46] and also in adolescents with T1DM, where SMBG was related to perceptions of treatment effectiveness but not perceived threat [73].

Clinic attendance: Our own work studied the PMs of T1DM patients who were long-term non-attenders at diabetic clinic [60], attendance at clinic being one of the key self-management issues and a major parameter of adherence to regimen. Non-attenders had more negative views of controllability, course (timeline) and consequences of their diabetes. Perceived treatment effectiveness was the major predictor of clinic attendance.

Depression: A comparison of three PM domains (seriousness, treatment effectiveness and control) with depression (measured using the Center for Epidemiologic Studies Depression Scale) found that PMs predicted eating patterns, HbA_{1c} and physical functioning (QoL), whereas depression symptoms did not [47].

Overall self-management: Using the IPQ, perceived controllability of diabetes with respect to long-term complications was a strong predictor of a general measure of adherence to regimen [75]. The additional influence of Personality was investigated using structural equation modelling, which indicated that both emotional stability and conscientiousness determine self-care indirectly through PM beliefs [73].

Glycaemic control: In T2DM, perceptions of internal cause (meaning attributed to self, self-blame) and treatment effectiveness were the PM dimensions most strongly associated with HbA_{1c} [57]. Greater attribution of self-blame and greater belief in treatment effectiveness were associated with lower HbA_{1c}. There was a stronger belief about personal responsibility for the cause of diabetes and glycaemic control in women than in men. Others did not find a relationship between HbA_{1c} and IPQ dimensions [67]. In a mixed population, HbA_{1c} was lower in patients who felt more in control of their diabetes [47]. Using the IPQ in patients with T1DM, 30% of the variance in HbA_{1c} was explained by diabetes-specific self-efficacy (control), perceptions of seriousness and identity [75].

In summary: (i) perception of treatment effectiveness is consistently related to the above outcome measures including HbA_{1c}. Treatment effectiveness includes belief in the efficacy of the treatment regimen and the value of interaction with diabetes professionals through clinic attendance; (ii) several studies have shown that perceptions of seriousness of diabetes are associated with better outcome, but results regarding this construct have been less consistent. Perceptions of high perceived threat (seriousness and vulnerability to diabetes complications) were associated with non-attendance at diabetes clinic [60] and poorer self-care in adolescents [65]. These findings are consistent with earlier HBM studies, in which the relationship between seriousness and outcome measures (regimen adherence, HbA_{1c}) was in the opposite direction to that proposed by the model, in that high perceived threat was associated with low compliance and poor metabolic control [26,27]. Inconsistent results may reflect different ways of measuring this construct. The PMDI does not include a separate construct of seriousness. These perceptions have been incorporated into the Consequences dimension, which also includes perceptions of impact of diabetes on life. The original PMDI construct of seriousness is a combination of perceptions of consequences and course of diabetes [10,57]. We and others have adapted the PMDI, dividing perceptions of consequences into Threat (seriousness of diabetes and feelings of vulnerability to the development of complications) and Impact on life [60,65]. This may provide more clarity.

The interaction between perceptions of seriousness and treatment effectiveness may be important [65], meaning that the belief that diabetes is serious is a positive motivator if the treatment regime is thought effective, but not necessarily otherwise when the management of emotion, sometimes by avoidance/denial, dominates [76,77]. Fear communication studies identify this form of avoidance behaviour [78]. In a qualitative study of chronic non-attenders, we identified the

adverse consequences of fear on self-care in a subgroup of patients who avoided contact with diabetes services [50].

An alternative explanation for the discrepancy between perceptions of seriousness and self-care may be related to the fact that regression analyses do not confirm direction. Thus, patients who are managing well may perceive less seriousness: behaviour determines beliefs rather than the opposite proposed in the models.

Since PMs are related to QoL and self-management, an important question is: 'At what stage are PMs formed?' In a 2-year prospective longitudinal study, we assessed the influence of personality traits (measured using Goldberg's 'Big 5' [79,80]) and health threat communication (using a scale developed in house) on the development of PMs after diagnosis of diabetes [81,82]. Health threat communication at diagnosis was a much stronger predictor of PMs than personality traits, and this effect was clearly evident 2 years after diagnosis [83].

There are clear differences in health-related behaviour between young and old. Age may result in different symptoms, but also in the representation (interpretation) of these symptoms. IRs in older people are based on longer life experience and different social experience, e.g. disease in their peers. They experience greater feelings of vulnerability (except perhaps in the very old), practise risk aversion and more self-care (except for exercise) [84]. Thus, the elderly tend to show more adaptive (beneficial) coping behaviour.

Socio-cultural factors would be expected to influence patients' IRs. However, in Sackett and Haynes' systematic review, no clear relationship emerged between race, gender, ethnic or cultural background and adherence behaviour [85]. Similar benefits from interventions to enhance patients' sense of empowerment and diabetes management skills were obtained in ethnic minority patients as in other groups [86].

Implications for educational and behavioural intervention

Patients' views of the seriousness of diabetes are very variable and often different from those of professionals. Patients often regard T2DM as less serious [87,88]. Many patients have had no diabetes education since diagnosis many years previously. The information given at that time often fails to deal adequately with seriousness. As regards treatment effectiveness, modern developments in diabetes management have improved the outlook for patients enormously, but this has often not filtered through into patients' perceptions. Individual barriers to better self management can be elicited and in some cases reduced. Thus, there is potential to improve the perceptions identified by psychometric research as related to self-care.

It is now recommended that psychological management should be incorporated into routine care [89], but this is a relatively recent development. Norris *et al*. reviewed 72 controlled trials of interventions in T2DM undertaken between 1980 and 1999 [90]. Most used primarily didactic education. The authors concluded that educational interventions involving patient collaboration with greater interaction were more effective. In a direct comparison, self-management training lowered HbA_{1c} more over 15 months than didactic education [91]. Education that promotes self-management skills maintains lower HbA_{1c} in the long term [92]. The British Diabetic Association report indicated that approaches based on educational or psychological theory spanning social cognitions to 'patient participation' models were consistently associated with larger effects [20]. Programmes to achieve education, modify perceptions and self-management behaviour change can be successfully delivered to groups [93]. Patient Empowerment improved self-efficacy and HbA_{1c} [94,95]. Thus, greater self-efficacy may contribute to perceptions of better treatment effectiveness.

In a meta-analysis of intervention in T2DM, psychologically based therapies aimed at improving glycaemic control were more successful than control subjects having usual care or education alone [96]. A variety of trials aimed to bring about change in emotional, cognitive and behavioural functioning, including adherence. Twenty-one used cognitive behavioural therapy (CBT)-related approaches. Four used counselling techniques including motivational interviewing. In T1DM, meta-analysis showed a benefit in childhood and adolescence, but not adults [97]. These studies in both T1DM and T2DM did not specifically address IRs. Cognitive analytic therapy benefits HbA_{1c} [98]. CBT has improved depression and associated poor glycaemic control [99]. Zettler *et al*. used a cognitive behavioural group programme to reduce anxiety regarding complications, achieving better acceptance of diabetes but no improvement in glycaemic control [100]. Although HbA_{1c} tends to be the main focus of diabetologists, QoL and psychosocial measures are also important. In a systematic review to examine psychosocial outcomes in both T1DM and T2DM, depression improved following psychological interventions, whereas QoL increased following programmes to improve self-management [101].

Few studies have addressed IRs specifically. Some have used a self-regulatory framework but without attempting to identify negative illness representations at the individual patient level [102]. In T1DM, Snoek *et al*. used a CBT approach aimed at improving dysfunctional beliefs about diabetes [103]. At 6 months HbA_{1c} had reduced by 0.8% with preserved emotional well-being. Following myocardial infarction, Petrie *et al*. assessed patients with the IPQ and tailored their intervention accordingly [104]. The intervention group had less distress, less angina and better functional outcome. The design of studies to test intervention based on the SRM is discussed by McAndrew *et al*. [105]. A protocol has been developed for assessing and changing patients' IRs in hypertension [106]. Work is being undertaken to study the effects of changing IRs in poorly controlled T2DM [107]. According to the SRM (Fig. 1), emotional reaction contributes to coping strategies and outcomes. Various techniques are being trialled to control emotion and thus modulate behaviour [108].

Conclusions

We have moved forward from the provision of didactic education through programmes of patient involvement, focus on self-efficacy and patient empowerment to psychologically based approaches addressing dysfunctional beliefs, modifying emotional responses to diabetes and finally towards intervention based on the individual's IRs. As research has moved closer to theoretical models of behaviour results have improved, but there are still scant data from intervention studies in diabetes. Health Belief models tell us that patients' self-management behaviour (their coping strategies) are critically related to their IRs. Of these, treatment effectiveness and seriousness are most important in diabetes. Leventhal's SRM model indicates the importance of the emotional response to illness. This is particularly significant in dealing with the issue of seriousness, which can be associated with fear and maladaptive coping behaviour. Studies are now assessing the value of measuring the individual patient's IRs and then providing a tailored approach. The design of such studies is a complex issue in itself, but it is hoped that this will provide a basis for intervention to improve patients' self-management, glycaemic and psychosocial outcome.

Competing interests

Nothing to declare.

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