

Health locus of control theory in diabetes: a worthwhile approach in managing diabetic foot ulcers?

The current global epidemic of type two diabetes mellitus has led to an accompanying increase in both foot ulceration and amputations, which pose significant health problems to populations worldwide. If improved treatment options are to be offered, then we clearly need a better understanding of all aspects of this disease. To date the major focus of diabetes research has been on physical factors, which are undeniably important, but there has been little acknowledgement of the significant psychological effects that can influence health and delay wound healing. The 'health locus of control' (HLC) theory, a psychological theory concerning patients' perceptions of how much control they have over life events (both positive and negative) may well be of use in this patient group. It has been suggested that concordance with treatment is improved when patients have a high 'internal' HLC (as measured by a questionnaire), which aligns with the belief that they have greater control over their health. It has further been suggested that through the implementation of 'group-care' education programmes, patients' attitudes can change, with a shift towards higher 'internal' HLC values. Thus a new approach in patient management might be to implement such education programmes, in the hope of improving adherence to treatment regimens and, hence, patient outcomes. To date there has been little conclusive evidence of the application of this theory, and although various studies have been performed in diabetic populations, only one study has been conducted specifically regarding diabetic foot ulcers. Clearly more research is needed.

health locus of control; diabetic foot ulcers; psychological factors; self-efficacy

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Type 2 diabetes mellitus is a global problem. Its worldwide incidence is currently on the rise, with estimates of nearly 366 million diagnoses by the year 2030.¹ The more we understand about this disease and the entirety of its effects, the better equipped we will be to treat these patients successfully. Type 2 diabetes causes a vast number of complications, including foot ulceration, which may have reached a lifetime incidence of as much as 25% in these patients.² Diabetic foot ulcers (DFUs) result from the interplay of countless factors (including poor vascularity, hyperglycaemia, peripheral neuropathy, poor nutritional status, susceptibility to infection), which make healing a slow and difficult process.^{3,4} These ulcers can have significant psychological effects on patients, especially when they fail to heal.^{5,6} Some studies have suggested that patients with diabetes are twice as likely to have depression when compared with those without diabetes.^{7,8} Furthermore, various studies have found links between depression, stress, anxiety and decreased healing.^{9,10,11}

While physical treatment of the ulcer is imperative, the physician should also acknowledge psychological components of the underlying disease,⁵ as focusing solely on physical treatment modalities appears to be insufficient.¹² This is illustrated by the fact that at least 85% of non-traumatic amputations

are related to DFUs.¹³ One investigator has proposed that physicians provide little emotional support for their patients, following a qualitative analysis of 20 medical encounters in which the nine physicians assessed responded empathetically only 10% of the time.¹⁴ A greater awareness of the psychological factors that play a role in therapy could be the missing link in drastically improving outcomes of DFUs.

Helping physicians to better understand and address the psychological aspects of their patients' behaviour could significantly improve health care. Many psychological theories and models have been put forward to explain patients' health behaviour, including the health locus of control (HLC) theory, which can be applied to patients with DFUs. Understanding and applying this theory may be critical in the development of effective educational and interventional medical programmes for increasing concordance with treatment regimens and, in effect, improving health and healing.¹⁵

Health locus of control theory

In 1966, Rotter proposed the health locus of control theory, as well as the first internal-external locus scale (I-E scale). He examined subjects' beliefs concerning whether or not they had any control over reinforcements that they received (positive or negative events or goals) or if they considered them to be

due to pure luck or chance. He proposed that people could be divided into two groups, depending on the degree to which they accepted personal responsibility for what happened to them.¹⁶

The results led to the development of the health locus of control theory and provided the first definitions of internal versus external locus of control. Internal locus of control was defined as the belief that positive/negative life events are a consequence of one's own actions, whereas external locus of control was defined as the belief that positive/negative life events are unrelated to one's own behaviour and so are beyond one's control.¹⁷ After being mildly expanded to encompass not only reinforcement, but also other aspects of behaviour, these definitions still are a central part of HLC theory today.¹⁸⁻²⁰

Wallston et al.²¹ developed the first HLC scale applied to health and tested it in two experiments. The first,²¹ using 88 college students as subjects, assessed health values and attitudes towards locus of control, administering the HLC scale and Rotter's I-E scale. Individuals with high health values and high internal HLCs were found to request more information about a disease condition, as measured

by their choice to receive a greater number of pamphlets about hypertension than any of the other groups in the study (low health value internal/external HLCs and high health value external HLCs).

The second experiment²¹ matched 34 overweight women with either internal or external HLCs to either self-driven or group weight management programmes. The data showed that subjects who had been appropriately matched on this basis (internal HLC to self-driven programmes, external HLC to group programmes) were more satisfied with their weight management programme than subjects who had been mismatched with regard to their HLC.²¹

These two studies confirmed the validity of the HLC scale in determining health-related behaviours, demonstrating the general theme that an internal HLC was associated with improved health conduct. However, both studies used college students or staff members at two private southern schools as experimental subjects, so the results and conclusions cannot be widely applied to any other populations. Rather, these data might be used as a stepping stone for subsequent studies that might investigate a more generalisable group of subjects.

It is important to note that Wallston^{21,22} evaluated subjects' values towards health. In theory, if a subject does not place a high value on his or her own health, then a high internal HLC will make no difference with regard to positive health behaviours. Much of the current research does not assess health values,²² which may be one of the reasons why the research in this field is inconsistent.^{23,24,25}

Levenson²⁶ criticised Rotter's I-E scale, because it did not differentiate between different types of external control variable. He proposed a separation of the 'external locus' category into beliefs in the roles of 'powerful others' and 'chance'.

Years later, Wallston and colleagues^{27,28} expanded their original scale to develop a multidimensional HLC scale, with the sub-categories 'doctors', 'God' and 'other people' in the group 'powerful others'. The HLC scale that is currently used assesses five dimensions: 'internal' HLC, 'powerful others' HLC, 'chance' HLC, 'other people' HLC and 'doctor's' HLC. The scale can be expected to undergo further changes as the beliefs and values of society evolve.

Health locus of control theory in patients with diabetes

Many studies have found that stress impairs the wound healing process.²⁹ Psychological stress has been found to inhibit the inflammatory stage and reduce levels of matrix metalloproteinase-9 in the wound fluid.³⁰ With such knowledge, it seems imperative that we explore these psychological issues.

If psychological factors can be altered or controlled, then it may be possible to enhance healing. This could have an enormous impact on populations such as patients with diabetes, who often struggle with chronic foot ulcers.⁶ The numerous, high-tech physical treatments and vast knowledge that we currently have do not appear to be having as great a positive impact as might be hoped; diabetic foot ulcers are prevalent and amputation rates remain high.¹³ It is worth considering other approaches to help these patients.⁵

Application of the HLC theory to DFU management has not yet been studied directly. However, there has been much research on HLC and diabetes regimen concordance, which is an important factor in both the prevention and healing of DFUs.

Stenström et al.³¹ examined the relationship between HLC and concordance with treatment in patients with type 1 diabetes, in addition to the interaction of internal and external loci, and determined that individuals with high 'internal' and low 'chance' HLC had the best diabetes regimen concordance, as measured by HbA1c levels. However, this study failed to include all five dimensions of HLC as measured by the multidimensional questionnaire. The reliability of these findings is ques-

tionable — only 'internal', 'chance' and 'powerful others' HLC were assessed.

O'Hea has criticised researchers for their inconsistent findings, noting that 'internal' HLC is often the focus and the other four dimensions of HLC assessment are frequently disregarded. In 2005, O'Hea et al.²⁵ conducted a study evaluating the interactions between HLC and diabetes regimen concordance, using all five dimensions of HLC. Their findings suggested that external HLC does play a role in diabetes regimen concordance. However, consistent with the findings of Stenström et al., internal HLC is paramount in calculating health behaviours.²⁵

In 2009, O'Hea et al.³² conducted a study that measured the interaction between locus of control, self-efficacy, outcome expectancy and HbA1c in patients with type 2 diabetes. They found internal HLC to be important regarding diabetes management when interacting with the other two perceived control constructs.³² These findings are in alliance with Wallston's view that HLC cannot predict health behaviours by itself and that other constructs, such as Bandura's self-efficacy construct,³³ must be incorporated.²²

Coates and Boore³⁴ found different results when they examined a population of patients with type 1 diabetes, who were all found to have high internal HLCs. Although these patients believed that they were responsible for their own health, only one subject had maintained blood glucose values within the normal range (3–5mmol/l).

This unexpected finding might be explained by the complex differences between patients with type 1 diabetes and patients with type 2 diabetes. It can be argued that patients with type 1 diabetes assert greater control over their disease with an insulin injection regimen, which reinforces an internal HLC, but this method of treatment results in more variable blood glucose values. Patients must adjust their injected insulin dose depending on their activities, such as eating and exercising, which is typically a practice of trial and error.

Further research has shown there is no relationship between internal HLC and diabetic health outcomes.³⁵⁻³⁷

The limitations of many of the previously discussed studies are numerous. Research conducted using HbA1c as the sole measure of concordance with treatment is flawed as many factors contributing to a person's HbA1c are frequently overlooked in these studies. The data collected from clinical records is misleading as it is only patients who keep their appointments and seek medical care are assessed.³² An entire population of people who do not seek medical attention and/or do not attend medical appointments are not being accounted for. Lastly, a large number of studies target a very spe-

cific group of people. For example, African-American females or white males with type 2 diabetes. These studies cannot be generalised further, which might explain why so many similar studies have been done on different populations.

Throughout the course of this review, only one study was found, conducted by Schlenk and Hart,³⁸ that specifically pertained to a population with DFUs. This study investigated the HLC, health values, concordance and social support in a population of patients with insulin-dependent diabetes, and investigated patient concordance with various aspects of diabetes management (self-monitored blood glucose, exercise, diet, hypoglycaemic management, insulin administration and foot care). Research outcomes demonstrated overall concordance in this population. However, the group was least compliant in the areas of exercise and foot care.³⁸

This preliminary study of HLC and foot care was not promising, although more research is clearly needed before definitive correlations can be made. In accordance with many of the other studies, Schlenk and Hart also found a significant positive correlation between concordance and internal HLC.³⁸ In terms of study limitations, it should be acknowl-

edged that all 30 subjects were taken from a single diabetes outpatient clinic. Therefore, it is not possible to apply the study findings outside of this specific group of participants. Furthermore, the clinic ran a self-care education programme, which may explain why the concordance rates were unusually high (all of the test subjects performed in accordance with 70% of the aspects measured). This separates the study population from other groups with diabetes.

Clinical application

Applying principles of the HLC theory to clinical practice might be a very useful technique for changing patients' attitudes and, in some cases, achieving better health and healing.

Trento et al.³⁹ developed and tested a group-care technique in patients with type 2 diabetes, which consisted of facilitators and a doctor hosting group sessions 3–6 times per year. These sessions involved hands-on activities, group work, problem-solving exercises, discussions, and the sharing of feelings with others. A total of 56 patients with type 2 diabetes who had participated in group care for 5–7 years and 51 patients with type 2 diabetes who had

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received individual medical education were given two questionnaires at the end of their programmes: the Wallston and Wallston questionnaire and the Peyrot and Rubin questionnaire, which were used to cover general situational HLC and diabetes-specific HLC, respectively. Patients involved in group care demonstrated lower 'chance' HLC values, which meant they did not believe their situations were due to chance. The Peyrot and Rubin questionnaire confirmed that group-care patients had higher internal HLCs, although the Wallston and Wallston questionnaire did not find the same results.

This study demonstrates that group-care intervention might increase internal HLC and, therefore, may increase concordance and patients' responsibility for their own health. Due to the extended time period during which this study took place, some patients had to drop out for various reasons. This inevitably changed the group's characteristics and, possibly, the outcomes of the study.

A following study by Trento et al.⁴⁰ was the first to compare the HLC values of patients with both type 1 and type 2 diabetes who attended a group-care programme, versus a control group of age/gender/diabetes duration-matched individuals with type 1 and 2 diabetes. In general, patients with type 1 diabetes were found to have a lower internal HLC, and a greater belief that fate controls life events, than patients with type 2 diabetes. The group-care intervention programme decreased fatalist beliefs in both groups when compared with controls. It also increased internal HLC. However, these results were only found using the Peyrot and Rubin questionnaire and not the Wallston and Wallston questionnaire. Furthermore, in this particular study, Trento et al.⁴⁰ failed to take into account their subjects' values on health, which is imperative when trying to assess a person's internal HLC. Despite these limitations, this study provides further evidence of a possible role of HLC in changing attitudes in this patient population.

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The two previously discussed studies by Trento et al. successfully identified that attitude changes are possible. However, it is imperative that further research be conducted to determine whether or not these attitude changes will also lead to behavioural changes. This is where most of the literature is lacking. Once it has been established that HLC attitudes can, in fact, be modified through clinical therapy or educational intervention, will patients begin to modify their behaviour and become more actively responsible in their health care?

Conclusion

The HLC theory has been found to play a role in health outcomes. Although inconsistencies have plagued its research throughout the decades, it can be argued that this is due to variations in study design, methods, outcome measures and the sample populations used.

In general, most of the research has concluded that subjects with a higher internal HLC have better concordance with medical regimens and, overall, better health outcomes.^{21,31,32} In addition, many researchers have concluded that other HLC variables such as 'chance', 'powerful others', and 'God' may also play a role in health outcomes.^{26–28}

Research conducted within the diabetic population has elicited similar results. Examination of the psychological aspects of this disease has proven valuable,⁶ as preliminary research has demonstrated ways in which HLC might be altered in order to increase concordance with treatment and improve health outcomes.^{39,40}

This concept becomes increasingly important as the diabetic population grows in size, along with the number of foot ulcers and amputations.^{1,2,13} Further research is clearly needed, specifically regarding DFUs and HLC, as there is very limited knowledge available on the subject and extrapolation is not a valid means of examining the research in this area. ■

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