

Effect of genetic explanations of type 2 diabetes on attitudes to treatment efficacy

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Article points

1. The aim of this study was to investigate whether perceiving the cause of type 2 diabetes as either “genetic” or “environmental” has any effect on the attitudes towards treatment efficacy.
2. The authors hypothesised that participants who perceived genetic causation would be less likely to believe that treatment is effective than those who perceived environmental causation.
3. The results showed that perceived aetiology had a significant effect on participants’ attitude to treatment, but only in those with a family history of type 2 diabetes.

Key words

- Aetiology
- Genetics
- Treatment efficacy
- Type 2 diabetes

Authors’ details can be found at the end of this article.

Current thinking suggests that type 2 diabetes is caused by a complex interplay of genetic and lifestyle factors. However, the impact of explaining disease aetiology as either genetic or environmental is relatively unexplored for conditions that are considered to be multifactorial. Using a between-participants experimental survey design, the present authors investigated the effect of explaining the aetiology of type 2 diabetes as either genetic or environmental on participants’ attitudes towards treatment efficacy. A total of 200 participants aged ≥ 40 years were recruited from a GP surgery. There was a significant interaction effect between perceived aetiology and family history of type 2 diabetes on attitude to treatment, indicating that only participants with a family history perceived treatment as less effective ($P < 0.05$). Being aware of the impact of genetic attributions in the communication of aetiology is essential if healthcare professionals are to encourage adherence to treatment and advice.

The fundamental ambition of all healthcare professionals working with people who have diabetes is to achieve meticulous blood glucose control (Department of Health [DH], 2001). Indeed, careful regulation of blood glucose is known to improve health outcomes in people with type 2 diabetes, guarding against the macrovascular and microvascular complications associated with the condition (UK Prospective Diabetes Study Group, 1998). However, monitoring and regulating daily blood glucose levels requires considerable effort on the part of individuals and healthcare professionals

involved in their care. For individuals newly diagnosed with type 2 diabetes, many of whom are overweight, initial management will often involve weight loss and increased physical activity, followed by the addition of medication as appropriate. Consequently, individuals with type 2 diabetes are often required to adhere to a range of medical and behavioural treatments.

Type 2 diabetes has traditionally been referred to as a “lifestyle disease” because it is associated with lifestyle “choices” that are considered detrimental to physical health (Koenigsberg et al, 2004). This label may be

misleading given recent advances within the field of genomic medicine. Current thinking now indicates that complex interactions between variations in multiple genes and the environment are more likely to be responsible for the onset of this disease (Scheuner et al, 2008). Mirroring this professionally changing view of type 2 diabetes aetiology, Valdez et al (2010) reported that within lay communities the conceptual idea that diabetes “tends to run in families” exists, and this is a tacit acknowledgement that heredity may play an important role in the onset and progression of the condition (Valdez et al, 2010).

The importance of perceived family history as a factor in decisions about health behaviours is particularly relevant here because knowledge about the health experiences of family members can result in speculation about whether individuals will follow the same health trajectory (Hunt et al, 2000). Family history is a risk factor for many chronic diseases, including cancer, cardiovascular disease and diabetes. Indeed, family members resemble each other in risk for disease not only because they share their genes but also because family members may have shared environments and lifestyle behaviours that put them at higher risk for certain diseases (Valdez et al, 2010).

It is important to attempt to understand how lay people make sense of diseases that have multifactorial aetiology. Type 2 diabetes clearly illustrates this because patients are expected to grasp the complicated message that medical outcomes associated with the condition are influenced by a combination of lifestyle and genetic factors. Thinking critically about how genetic information is received by patients is therefore fundamental to improving their adherence to medical advice (Tarn et al, 2006; Lin and Ciechanowski, 2008). The limited, and often speculative, evidence to date indicates that providing people with a genetic profile of their risk for common chronic diseases will negatively impact on their perceived controllability of the disease, which is an important determinant of what action they take or fail to take to improve risk-reducing behaviours (Senior et al, 1999).

There is a paucity of sound empirical evidence about how people deal with beliefs and information about inherited disposition to type 2 diabetes. Several studies in the field of health psychology have explored the concept of “fatalism” with respect to genetic susceptibility and health screening for specific conditions (Straughan and Seow, 1998; Senior et al, 1999; Hunt et al, 2000; Frosch et al, 2005; Pijl et al, 2009). For example, Senior et al (1999) have indicated that an increased risk of heart disease was perceived to be less preventable when genetic risk information was presented than when risk information of an unspecified nature was presented. In support of this, Straughan and Seow (1998) argue that fatalism, defined by them as a “belief that some health issues are beyond human control,” is particularly relevant now that many diseases are thought to have a genetic aetiology. Their study demonstrated that fatalism negatively influenced perceived self-efficacy, a construct recognised as crucial for effective behavioural change, adherence to treatment regimens or both (Bandura, 1997). Fatalistic perspectives deterred the women in their study from adopting regular health screening.

In the present study, the authors explored the impact that genetic attributions have on attitudes to treatment effectiveness for type 2 diabetes. Attitudes are important in predicting whether people will adhere to medical advice and treatment (Armitage and Conner, 2001). Previous research in various chronic conditions has demonstrated that when genetic factors are attributed even in part to the cause of a condition, people may believe that outcomes are not wholly within their control (Straughan and Seow, 1998). For example, this perceived loss of control has been found to influence people’s beliefs about the responsiveness of a condition to therapeutic interventions for schizophrenia (Bennett et al, 2008).

Aim and method

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4. The aim of this study was to investigate whether perceiving the cause of type 2 diabetes as either “genetic” or “environmental” has any effect on the attitudes towards treatment efficacy.

The study used a between-participants experimental survey design. Participants were men and women attending a GP surgery in South Wales. There were 200 participants, none of whom had a diagnosis of diabetes.

All participants were asked to read a description (vignette) of an individual with type 2 diabetes that described their symptoms and indicated why they may have developed the condition. Participants were alternately allocated genetic or environmental vignettes (in which a genetic or environmental aetiology, respectively, was implied). The process continued until a total sample of 200 participants was achieved; thus the genetic and environmental groups each consisted of 100 individuals. The vignettes were developed in consultation with the charitable body Diabetes UK Cymru.

Having read the vignette, all participants completed a questionnaire on attitude to treatment efficacy that measured how effective they believed that treatment would be for the person described. The questionnaire was designed specifically for this study. It consisted of 15 statements. A five-point Likert scale was employed to measure the attitudinal responses of participants. Approximately half the statements were positively worded and the other half were worded in a negative direction to avoid acquiescent response. The following scoring system was applied for responses to statements worded in a positive direction:

- Strongly disagree=1.
- Disagree=2.
- Don't know=3.
- Agree=4.
- Strongly agree=5.

This scoring system was reversed for responses to statements that were worded in a negative direction. The mid-point score for this attitude scale was 33. Scores above 33 indicated a positive attitude and scores below this mid-point indicated a negative attitude to treatment efficacy.

The internal reliability and face validity of the attitude scale was established prior to the main study. The study received ethical approval from the relevant NHS Research and Development Department and NHS Research Ethics Committee.

It was hypothesised that participants who read the “genetic causation” vignette would be less likely to believe that treatment is effective than those who read the “environmental causation” vignette.

Results

Study participants

The age range of participants was 40–89 years, with a mean age of 59.2 years (standard deviation 12.5 years). The age

demographics for the genetic and environmental groups were similar ($P>0.05$). Of the 200 participants in the study, 122 (61%) were female and 78 (39%) were male. The proportion of males and females between the two experimental groups was not significantly different ($P>0.05$). The majority of participants reported not having a family member with type 2 diabetes ($n=139$; 69.5%) and only four individuals (2%) did not know their family status relating to this condition. Consequently, the remaining 57 individuals (28.5%) reported a family history of type 2 diabetes, and they were equally distributed between the two experimental groups ($P>0.05$).

Attitudes to treatment efficacy

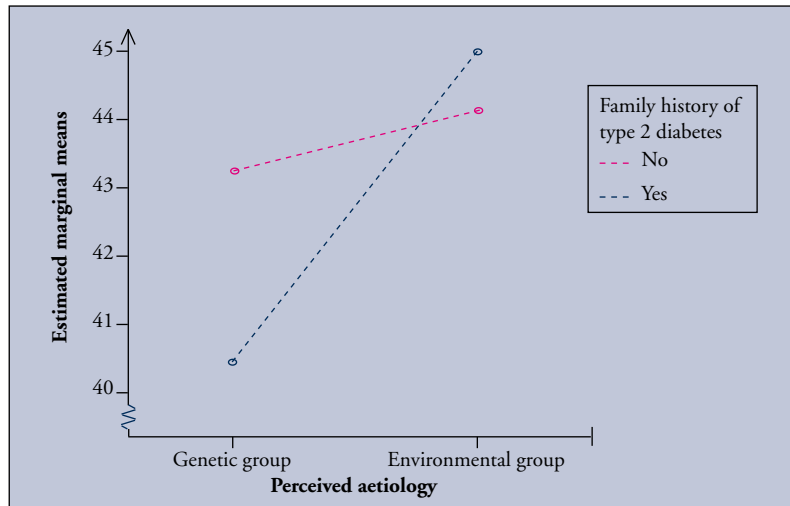
Generally, all participants – regardless of which description they read – had mean scores on the attitude scale above the mid-point of the scale (33), which indicates that they were generally positive about the efficacy of treatments for type 2 diabetes. However, there was a significant effect of perceived aetiology on attitudes to treatment in those with a family history of type 2 diabetes. This is illustrated in *Figure 1*, where it can be seen that people who had a family history of diabetes and read a genetic vignette had much less positive attitudes to treatment efficacy than people with a family history who read the environmental vignette. Looking at the main effects that underlie the interaction, a significant main effect of perceived aetiology was found on participants' attitude to treatment – $F(1, 193)=11.54$ ($P=0.001$). However, the results showed no significant main effect of family history on attitude to treatment – $F(1, 193)=1.91$ ($P=0.168$). These results confirm that it is perceived aetiology that is having the effect, but only in those with a family history of type 2 diabetes.

Discussion

It is important to highlight at the outset that generally positive attitudes to treatment efficacy were demonstrated in both the groups reading the environmental and the genetic vignette. However, the results show that attitudes to treatment were significantly less positive in those people with a family history of type 2 diabetes who read the genetic aetiology vignette.

Appropriate management of type 2 diabetes requires patients to adopt and adhere to prescribed treatment and behavioural change activities in order to prevent or manage the complications associated with this condition (DH and Diabetes UK, 2005). The results of this study indicate that a subtle implication of genetic aetiology can reduce perceptions of treatment efficacy and therefore may compromise adherence to recommended treatment regimens. Previous research acknowledges that beliefs about the controllability

Figure 1. Estimated marginal means of attitude to treatment.



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1. Currently, a gap appears to exist in our understanding of how and why participants who are grouped according to their family history status for type 2 diabetes are affected differently by genetic and environmental explanations of disease aetiology.
2. The findings from this study indicate that healthcare professionals should be aware of the possibility that a genetic explanation of type 2 diabetes could negatively influence patients' beliefs about the effectiveness of treatments, making adherence less likely.

of a condition can be negatively influenced when the cause of that condition is attributed to genetic factors (Bennett et al, 2008). The results of the present study confirm these findings, but only in individuals who had a family history of type 2 diabetes.

Currently, a gap appears to exist in our understanding of how and why participants who are grouped according to their family history status for type 2 diabetes are affected differently by genetic and environmental explanations of disease aetiology. However, Leventhal et al's (1980) Self-Regulation Model of illness perception – which states that how people think about a disease is determined by the labels they give to it – may offer valuable insight into these observed differences. The principal construct within this model is the idea of illness representations or “lay” beliefs about illness. Hale et al (2007) argue that as people with a chronic illness gather information about their condition (from personal experience as well as the opinions of significant others, including family members and healthcare professionals) and evaluate their ability to control or cope with its effects, new representations are formed based on these experiences. As such, illness representations are both cumulative and dynamic, whereby people adopt, replace and adapt their beliefs according to new information and personal experience (Hale et al, 2007).

These illness representations may explain why people with a family history of type 2 diabetes have less positive attitudes towards treatment: their experiential understanding of the condition is different to those people who do not have a close family member with diabetes. For example, they are more likely to have witnessed failure of treatment or to have observed the progression of disease despite treatment. It is therefore plausible that having a family history of diabetes, where there is an implied genetic basis for the condition, could influence attitudes towards its perceived controllability. Further investigation of the impact of perceived aetiology in individuals at risk of developing type 2 diabetes is clearly warranted.

Perhaps what is most striking about the overall findings of this study is that a subtle change of implied aetiology can significantly influence individuals' beliefs about treatment efficacy. Although there are currently no established guidelines to inform current practice in the communication of disease aetiology for “at-risk” individuals, the findings of this study do have implications for healthcare professionals in terms of how information about the aetiology of type 2 diabetes is best presented to patients. The findings indicate that healthcare professionals should be aware of the possibility that a genetic explanation of type 2 diabetes could negatively influence patients' beliefs about the effectiveness of treatments, making adherence less likely. Consequently, genetic information about disease aetiology should be communicated in a balanced manner to ensure that patients, particularly those with a positive family history of diabetes, fully understand the multifactorial causes of this condition.

Limitations

This study employed a vignette technique. In terms of its merits, vignettes provided participants with the necessary psychological distance to avoid demand effects because they are exploring issues relating to a third person (Alexander and Becker, 1978). However, a drawback of this technique is that participants may have responded differently if they had

met the person described in the vignette. Furthermore, attitudes towards others are only an indication of attitudes towards oneself and may not accurately reflect the full complexities of personal risk perceptions and decision-making.

Conclusion

Challenges clearly exist for healthcare professionals in their communication of genetic information. Not only is the language of genetics daunting and unfamiliar to a lay population, but evidence also suggests that there is a potential for overly deterministic interpretations of genetic information (Bennett et al, 2008). The results of this study suggest this is particularly relevant for those with a family history of type 2 diabetes. However, because participants in the study did not have diabetes, these findings may not apply to individuals with the condition. Nevertheless, the accurate communication and translation of genetic information by healthcare professionals, particularly in relation to disease aetiology, is vital for ensuring that prevention and treatment strategies are adopted by those most at risk of developing conditions that are perceived as “genetic” in origin. ■

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Alexander CS, Becker HJ (1978) The use of vignettes in survey research. *Public Opin Q* **42**: 93–104

Armitage CJ, Conner M (2001) Efficacy of the Theory of Planned Behaviour: a meta-analytic review. *Br J Soc Psychol* **40**: 471–99

Bandura A (1997) *Self-efficacy: The Exercise of Control*. Worth Publishers, New York

Bennett L, Thirlaway K, Murray AJ (2008) The stigmatising implications of presenting schizophrenia as a genetic disease. *J Genet Couns* **17**: 550–9

Department of Health (2001) *National Service Framework for Diabetes: Standards*. DH, London. Available at: <http://bit.ly/1ABi4B> (accessed 29.03.2012)

Department of Health and Diabetes UK (2005) *Structured Patient Education in Diabetes: Report from the Patient Education Working Group*. DH, London. Available at: <http://bit.ly/d2U9DW> (accessed 29.03.2012)

Frosch DL, Mello P, Lerman C (2005) Behavioral consequences of testing for obesity risk. *Cancer Epidemiol Biomarkers Prev* **14**: 1485–9

Hale ED, Trehan GJ, Kitas GD (2007) The common-sense model of self-regulation of health and illness: how can we use it to understand and respond to our patients' needs? *Rheumatology (Oxford)* **46**: 904–6

Hunt K, Davison C, Emslie C, Ford G (2000) Are perceptions of a family history of heart disease related to health-related attitudes and behaviour? *Health Educ Res* **15**: 131–43

Koenigsberg MR, Bartlett D, Cramer JS (2004) Facilitating treatment adherence with lifestyle changes in diabetes. *Am Fam Physician* **69**: 309–16

Leventhal H, Meyer D, Nerenz DR (1980) The common sense representation of illness danger. In: Rachman S (ed). *Contributions to Medical Psychology*. Pergamon Press, New York: 7–30

Lin EH, Ciechanowski P (2008) Working with patients to enhance medication adherence. *Clin Diabetes* **26**: 17–9

Pijl M, Timmermans DR, Claassen L et al (2009) Impact of communicating familial risk of diabetes on illness perceptions and self-reported behavioral outcomes: a randomized controlled trial. *Diabetes Care* **32**: 597–9

Scheuner MT, Sieverding P, Shekelle PG (2008) Delivery of genomic medicine for common chronic adult diseases: a systematic review. *JAMA* **299**: 1320–34

Senior V, Marteau TM, Peters TJ (1999) Will genetic testing for predisposition for disease result in fatalism? A qualitative study of parents responses to neonatal screening for familial hypercholesterolaemia. *Soc Sci Med* **48**: 1857–60

Straughan PT, Seow A (1998) Fatalism reconceptualised: a concept to predict health screening behaviour. *Journal of Gender, Culture, and Health* **3**: 85–100

Tarn DM, Heritage J, Paterniti DA et al (2006) Physician communication when prescribing new medications. *Arch Intern Med* **166**: 1855–62

UK Prospective Diabetes Study (UKPDS) Group (1998) Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet* **352**: 837–53

Valdez R, Yoon PW, Qureshi N et al (2010) Family history in public health practice: a genomic tool for disease prevention and health promotion. *Annu Rev Public Health* **31**: 69–87

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