



Maintenance of a gluten free diet in coeliac disease: The roles of self-regulation, habit, psychological resources, motivation, support, and goal priority

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ABSTRACT

Introduction: A strict lifelong gluten free diet (GFD) is the only treatment for coeliac disease (CD). Theory-based research has focused predominantly on initiation, rational, and motivational processes in predicting adherence. The aim of this study was to evaluate an expanded collection of theoretical constructs specifically relevant to the maintenance of behaviour change, in the understanding and prediction of GFD adherence.

Methods: Respondents with CD (N = 5573) completed measures of GFD adherence, psychological distress, intentions, self-efficacy, and the maintenance-relevant constructs of self-regulation, habit, temptation and intentional and unintentional lapses (cognitive and behavioural consequences of lowered or fluctuating psychological resources and self-control), motivation, social and environmental support, and goal priority, conflict, and facilitation. Correlations and multiple regression were used to determine their influence on adherence, over and above intention and self-efficacy, and how relationships changed in the presence of distress.

Results: Better adherence was associated with greater self-regulation, habit, self-efficacy, priority, facilitation, and support; and lower psychological distress, conflict, and fewer self-control lapses (e.g., when busy/stressed). Autonomous and wellbeing-based, but not controlled motivations, were related to adherence. In the presence of distress, the influence of self-regulation and intentional lapses on adherence were increased, while temptation and unintentional lapses were decreased.

Discussion: The findings point to the importance of considering intentional, volitional, automatic, and emotional processes in the understanding and prediction of GFD adherence. Behaviour change interventions and psychological support are now needed so that theoretical knowledge can be translated into evidence-based care, including a role for psychologists within the multi-disciplinary treatment team.

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1. Introduction

The sole treatment for coeliac disease (CD) is lifelong adherence to a strict gluten free diet (GFD; Hardy & Tye-Din, 2016). Failure to achieve this, even due to trace amounts of gluten, can result in the

persistence of gastrointestinal symptoms and place individuals at risk of long-term health complications such as cancer, infertility, and osteoporosis (Green & Jabri, 2003). There is an assumption within the medical and dietetic fields that giving a patient information about their condition and the associated risks, and providing information about its treatment, will be sufficient to prompt good adherence (e.g., Ciacci et al., 2015). The reality of behaviour change is, however, far more complex than the provision of knowledge and instruction alone (Hornik, 1989; Sainsbury,

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Mullan, & Sharpe, 2013b), and many patients with CD struggle to meet the strict but necessary standards for adherence (Hall, Rubin, & Charnock, 2009).

GFD adherence is the outcome of a series of complex patient behaviours, including the reading of food labels and ingredient lists, ensuring safe food preparation at home, telling the people who are responsible for preparing food about your CD and need for a GFD, and asking questions about food preparation and the risk of contamination when eating away from home, among others. Understanding the modifiable determinants of poor adherence is essential for the design of evidence-based strategies to improve dietary adherence and health. We and others have shown that a range of patient factors including food label-reading skills, degree of symptomatology to gluten exposure (Halmos et al., 2017), and depressive symptoms (Sainsbury & Marques, 2018), are associated with, and likely to influence, both behaviour and dietary adherence, but ultimately patient behaviour is the most important and modifiable determinant. One means to the development of interventions is the use of health behaviour change theory (e.g., Craig et al., 2008). The successful application of theory to a behavioural problem, such as GFD adherence, provides a blueprint or logic model for intervention efforts by suggesting the mechanisms via which changes in behaviour may be achieved (Bartholomew Eldredge et al., 2016; Glanz & Bishop, 2010; Michie & Prestwich, 2010). Theory-based behaviour change interventions are potentially more effective than those without a theoretical basis, and have the advantage of giving insight into why an intervention does or does not work (Glanz & Bishop, 2010; Michie, Johnston, Francis, Hardeman, & Eccles, 2008; Webb, Joseph, Yardley, & Michie, 2010).

Few studies have applied theory to the understanding and prediction of GFD adherence in CD, and only one intervention designed specifically to improve adherence has been published (Sainsbury, Mullan, & Sharpe, 2015b; Sainsbury et al., 2013b). Using the theory of planned behaviour (TPB), attitudes and perceived behavioural control (PBC) predicted significant variance in both the intention to follow a strict GFD and GFD adherence (Sainsbury & Mullan, 2011; Sainsbury, Mullan, & Sharpe, 2013a). The presence of an intention-behaviour gap, however, suggested that additional factors are needed to explain why some individuals struggle to remain gluten free despite having strong intentions (Sainsbury et al., 2013a). Extending the TPB, it was found that the interaction between intention, habit, and PBC predicted GFD adherence, such that individuals with both low habit and low PBC had the worst adherence, regardless of their level of intention; whereas for people with high habit and low PBC, adherence did increase as a function of intention (Kothe, Sainsbury, Smith, & Mullan, 2015). It was acknowledged that habit may be a better predictor if applied to the separate behaviours that comprise adherence, as differences in the likelihood and desirability of automaticity for these may differ.

Protection motivation theory (PMT) was recently applied to GFD adherence, differentiated based on whether gluten consumption was intentional or accidental (Dowd, Jung, Chen, & Beauchamp, 2016). Intentions (or protection motivation) were a direct predictor of intentional but not unintentional gluten consumption. Additional, indirect predictors (via intention) of intentional consumption were greater symptom severity, lower perceptions of the costs of following a GFD (distress, barriers, and stigma), greater self-regulatory efficacy, more frequent planning, and better knowledge. In contrast, self-regulatory efficacy, or having the confidence to regulate one's behaviour to maintain a strict GFD, was the only predictor of less frequent *unintentional* gluten consumption, and this exerted a direct rather than indirect effect (Dowd et al., 2016).

A similar pattern of results was found by Hall, Rubin, and Charnock (2013), whereby the only correlates of unintentional

consumption were related to self-efficacy (perceived difficulty, control, and confidence), whereas intention, attitudes, symptoms (experienced and perceived tolerance), and social support were additionally related to intentional gluten consumption. By definition, unintentional gluten consumption – typically the most common cause of non-adherence (Hall et al., 2013) – happens outside of conscious awareness and is not easily amenable to accurate self-report, as not all individuals with CD are symptomatic upon exposure. Even for those who are symptomatic, the realisation of accidental consumption is a post-hoc one, and although attributed to gluten, other factors (e.g., other intolerances/allergies, stomach bug) may be responsible for the observed reaction. Methodologically, it is therefore not surprising that rational factors, such as those encompassed by most behaviour change theories, are limited in predicting unintentional gluten consumption.

One of the major challenges of behaviour change is the continued maintenance of changes after initial improvements. In a systematic review of over 100 behaviour change theories (Kwasnicka, Dombrowski, White, & Sniehotka, 2016), five maintenance-specific themes were identified. As applied to GFD adherence, maintenance motivation (theme 1) refers to the development of personal reasons to *continue* following a GFD, as once the salience of pre-diagnosis symptoms is reduced, their power as a continued motivator is also likely reduced. GFD adherence is a complex behaviour requiring active self-regulation (theme 2; e.g., reading labels and planning if eating out) for success in both initiation and maintenance phases. With repeated performance over time, these behaviours should become habitual or automatic (theme 3) and require less conscious regulation. Psychological resources (theme 4) refer to internal resources that can be drawn on to prevent lapses in GFD adherence when self-control may be low or fluctuating due to factors such as tiredness, low mood, or stress, or from the effort involved in maintaining adherence itself. Difficulties in assessing such state-based experiences in a cross-sectional design meant that psychological resources were operationalised here as the frequency of cognitive (temptation) and behavioural (intentional and unintentional gluten consumption) consequences of lowered psychological resources and self-control. Social and environmental influences (theme 5) include the supportiveness of the people and environments in which the GFD is being attempted. These constructs received support in a within-person study of adherence to a weight loss maintenance plan (Kwasnicka, Dombrowski, White, & Sniehotka, 2017), but have not been applied together in other behaviours. Finally, previous research has highlighted the importance of three additional constructs for behavioural maintenance: namely, priority level, and the balancing of unrelated goals that may either facilitate or conflict with goal achievement (Conner et al., 2016; Presseau, Sniehotka, Francis, & Gebhardt, 2010) – for example, the goal of maintaining a strict GFD may sometimes conflict with the goal of being social, whereas the goal of healthy eating may facilitate the GFD. Confidence for this task (concurrent self-regulatory efficacy) is correlated with both GFD adherence and quality of life in patients with CD (Dowd & Jung, 2017).

Given the lifelong necessity of the GFD for patients diagnosed with CD, viewing adherence through the lens of maintenance may advance current understanding beyond that determined using theories of motivation and initiation. Previous theory- and non-theory-based research in CD also supports the relevance of several maintenance constructs. For example, the perceived ability to maintain adherence despite changes in mood and stress (similar to psychological resources) was related to GFD adherence (Leffler et al., 2008); and social (e.g., avoiding social eating, not wanting to draw attention to oneself or inconvenience/burden others, perceived social support) and environmental factors (e.g., travelling

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