COVER SHEET

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Behavioral, Normative and Control Beliefs Underlying Low-Fat Dietary and Regular Physical Activity Behaviors for Adults Diagnosed with Type 2 Diabetes and/or Cardiovascular Disease.

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This study was conducted as part of a grant to the second author from Queensland Health, Diabetes Australia – Queensland and The Heart Foundation – Queensland.

Abstract

Promoting healthy lifestyle behaviors is an important aspect of interventions designed to improve the management of chronic diseases such as Type 2 diabetes and cardiovascular disease. The present study used Ajzen's (1991) theory of planned behavior as a framework to examine beliefs amongst adults diagnosed with these conditions who do and do not engage in low-fat dietary and regular physical activity behaviors. Participants (N = 192) completed a questionnaire assessing their behavioral, normative and control beliefs in relation to regular, moderate physical activity and eating foods low in saturated fats. Measures of self-reported behavior were also examined. The findings revealed that, in general, it is the underlying behavioral beliefs that are important determinants for both physical activity and low-fat food consumption with some evidence to suggest that pressure from significant others is an important consideration for low-fat food consumption. Laziness, as a barrier to engaging in physical activity, also emerged as an important factor. To encourage a healthy lifestyle amongst this population, interventions should address the perceived costs associated with behavioral performance and encourage people to maintain healthy behaviors in light of these costs.

Keywords: Physical activity, low-fat food consumption, diabetes, cardiovascular disease, theory of planned behaviour, beliefs

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Chronic diseases such as diabetes and cardiovascular disease (CVD) have risen substantially in developed countries in the last decade. In Australia, CVD is now the leading cause of death. In 2001, approximately 17% of the population was diagnosed with this disease, placing enormous costs on the health care system (Australian Institute of Health and Welfare, 2002). Type 2 Diabetes, as well as being an independent risk factor for CVD, shares similar risk factors to CVD. Many individuals suffer from symptoms of both diseases. It is estimated that 1 in 4 individuals now have diabetes or are at a high risk of developing the disease within the next 5 – 10 years (Diabetes Australia, 2002). Both diet and activity levels have been implicated as risk factors in the onset and progression of diabetes and CVD and there is considerable agreement that improved physical activity and dietary modification are central to the prevention and optimal management of these diseases (Vessby, 2000).

Research in this domain has mostly focused on the identification of the underlying factors that contribute to people's adherence to recommended guidelines for dietary and activity behaviors (e.g., Agurs-Collins, Kumanyika, Ten Have, & Adams, 1997). Both predictive (e.g., Paisley, Lloyd, & Mela, 1993) and intervention-style approaches (e.g., Anderson, Cox, McKellar, Lean, & Mela, 1998) have been used to examine the determinants of healthy dietary and physical activity behaviors, and to identify the key factors involved in behavior change processes.

One of the most commonly utilized models to predict health behavior is the theory of reasoned action (TRA; Fishbein & Ajzen 1975) and its extension, the theory of planned behavior (TPB; Ajzen 1991). According to the TPB, the immediate antecedent of behavior is a person's intention to perform it. Intentions, in turn, are proposed to be a function of three independent determinants; attitude (evaluation associated with performing the behavior), subjective norm (perceived social pressure to perform or not perform the behavior), and perceived behavioral control (the extent to which the behavior is perceived to be under their volitional control, also believed to be a direct predictor of behavior; see Ajzen, 1991). According to meta-analyses, there is established support for the predictive validity of the TPB model across a variety of behavioral domains (e.g., Armitage & Conner, 2001) including physical activity and healthy eating choices (see e.g., Godin & Kok, 1996). It should be noted, however, that there is weaker evidence to support the theory's utility for the development and evaluation of health-based interventions (Hardeman, Johnston, Johnston, Bonetti, Wareham, & Kimmonth, 2002).

In addition to direct determinants of intentions and behavior, the TPB model identifies the beliefs underlying attitudes, subjective norm, and perceived behavioral control (Ajzen, 1991). Individuals' attitudes are proposed to be a function of their beliefs that outcomes associated with their behavior will occur (behavioral beliefs) weighted by evaluations of each of the outcomes (i.e., how good or bad they are; outcome evaluations). Subjective norm is proposed to be a function of the extent to which other people would want the person to perform the behavior (normative beliefs) weighted by his or her motivation to comply with each of these referents (motivation to comply). Perceived behavioral control is proposed to be a function of the beliefs concerning whether resources and opportunities are available to perform the behavior (control beliefs) weighted by the expected impact these factors would have if they were to occur/be present (perceived power).

Assessing belief based determinants of the TPB allows identification of the underlying beliefs that distinguish between individuals who perform (or intend to perform) and individuals who do not perform (or do not intend to perform) the behavior(s) under

investigation (Fishbein & Stasson, 1990). A number of studies have utilized this type of belief-based analysis to increase our understanding of health behaviors (e.g., Johnston & White, 2003). More specifically, Conn, Tripp-Reimer and Mass (2003)'s TPB based study found that, in a community-dwelling sample of older women, a number of specific control beliefs (e.g., "Exercise is difficult because I am too tired") and a behavioral belief ("Exercise is good for my health") were related to exercise, with regression analyses of combined belief sets supporting the results. Armitage and Conner (1999) distinguished between intenders and non-intenders in relation to eating a low-fat diet and found a significant difference in both behavioral (e.g., "Eating a low-fat diet makes me feel healthier") and control (e.g., "Eating a low-fat diet costs too much money") beliefs. Although providing an important belief-based analysis of the predictors of adherence to a low-fat diet, their study was limited by its focus on a non-clinical sample of primarily young adults.

The present study builds on these previous studies by examining a range of different beliefs amongst adults diagnosed with Type 2 diabetes and/or CVD, distinguishing between those who do and do not (a) engage in regular, moderate physical activity, and (b) eat foods low in saturated fats[1]. As part of a larger program of research examining the utility of the TPB within the context of eating and activity behaviors, the present study assessed the behavioral (costs and benefits), normative and control beliefs related to engaging in the two behaviors. Additionally, the study examined the relative importance of the underlying beliefs for influencing healthy lifestyle behavior in the population investigated. Such belief-based analyses allow a distinction between sub samples that can assist in informing health education and intervention programs.

Method

Participants and Procedure

Ethical clearance was obtained for the study from relevant university and hospital ethics committees. A self-report questionnaire was used to measure participants' behavioral, normative and control beliefs and behavior over the past month in relation to the two target behaviors. Participants agreeing to take part in the study provided written informed consent. A total of 192 adults (over 18 years of age) diagnosed with Type 2 diabetes and/or CVD were recruited by local health care professionals from seven community health center sites in Queensland, Australia. The sample comprised 114 (59%) females and 76 (40%) males (two participants did not report their sex). The mean age of participants was 60.98 years (*SD* = 8.55; range = 30 – 84 years). Most participants were Caucasian (*n* = 183, 95%), married (*n* = 146, 76%), and retired (*n* = 61, 32%). Two-thirds of the participants (*n* = 128, 66.7%) had been diagnosed with diabetes only, with 6.7% of the participants (*n* = 13) diagnosed as having CVD only. A further 25% of participants (*n* = 48) reported having both Type 2 diabetes and CVD.

Elicitation Study

Using content analysis, an elicitation study established the modal behavioral, normative and control belief items for the target behaviors to include in the main questionnaire. The sample was comprised of 46 participants (24 females, 22 males; mean age = 59.11 years) diagnosed with Type 2 diabetes and/or CVD who were broadly representative of participants in the main study. Using procedures outlined by Ajzen and Fishbein (1980), respondents generated the advantages and disadvantages for the two target behaviors of (a) regular, moderate physical activity, and (b) eating foods low in saturated fats. The three most frequently reported advantages and three most frequently reported disadvantages were used to assess behavioral beliefs in the main questionnaire for each target behavior. For normative beliefs, respondents then listed the important people or groups of people who would either

approve or disapprove of them performing the two behaviors. The same referents were the most frequently listed for both behaviors. For control beliefs, participants were asked to list any factors or circumstances that might encourage or discourage them from engaging in the two target behaviors with the four most frequently reported barriers for each behavior used to assess control beliefs in the main questionnaire (see Tables 1 and 2).

Main Questionnaire

Belief measures. Behavioral, normative and control beliefs (obtained from the elicitation study) were examined for each of the target behaviors of (a) engaging in moderate physical activity on a regular basis, and (b) eating foods low in saturated fats (e.g., low-fat dairy products, fat-trimmed meat and mono- and polyunsaturated oils) during the next month. Although traditionally assessed by a multiplicative combination of belief (i.e., behavioral, normative, and control beliefs) and evaluative items (i.e., outcome evaluations, motivation to comply, and perceived power), due to space constraints, the current study assessed the belief items only. In support of this focus, it has been argued that the evaluative items are not essential for belief measurement (Ajzen, 1991). To assess behavioral beliefs, participants rated how likely it would be that six consequences would occur if they performed the two target behaviors. For normative beliefs, participants rated how likely the four referents would think that they should engage in the two target behaviors. Control beliefs were assessed by asking participants to rate how likely it was that four barriers would prevent them from engaging in the two target behaviors. For each set of beliefs, participants responded on a 7-point Likert scale from (1) *extremely unlikely* to (7) *extremely likely.*

Self-report behavior. The target behaviors comprised a self-report assessment of physical activity and consumption of low saturated fat in the previous month. For physical activity, participants reported how many days in the past month that they engaged in at least 30 minutes of moderate-intensity physical activity [(1) *not once* to (7) *every day*] and responded to the item: "During the past month to what extent did you engage in physical activity on a regular basis?" [(1) *a small extent* to (7) *a large extent*]. These two items (r = .59, $p < .001$) were averaged to create a physical activity score for each participant.

To assess low fat food consumption, they were asked to identify what type of foods (with low-fat options) they had (usually) consumed in the previous month. Participants were provided with a list of low- to high-fat options within a number of food categories. Within the food categories, participants were provided with seven low-fat food options (e.g., low-fat milk). Each participant received a score of 1 for each of the low-fat products listed that they had consumed or if they did not consume the food category. Reponses to the consumption of the seven low-fat foods were then summed to provide a low-fat food score with possible scores ranging from 0 to 7. Higher scores reflected a greater level of low-fat dietary consumption.

Results

Overview of Data Analysis

There was approximately 5% of missing data for the measures related to physical activity (5.7 %) and eating foods low in saturated fats (4.7 %). The average level of physical activity for participants on the 7-point scale was 4.18 (SD = 1.6), reflecting a moderate level of activity during the previous 1-month time-period. For low fat food consumption, the results showed that participants were eating about one half of the seven low-fat food products assessed (M = 4.47, SD = 1.4). For each targeted behavior, three one-way multivariate analyses of variance (MANOVAs) were performed[2]. Belief-based measures (i.e., behavioral, normative, and control beliefs) were used as dependent variables. The MANOVAS used (a)

physical activity (high-active versus low-active), and (b) eating saturated fats (high adherents versus low adherents) as the independent variables. For physical activity, participants who rated at or above the midpoint ('4') on the physical activity measure were classed as 'high-active' whereas those who rated their behavior below 4 were classed as 'low-active'. Participants who rated at or above the midpoint ('4') on the fat food consumption measure were classed as 'high adherents' and those who rated their behavior below 4 were classed as 'low adherents'. In addition to the MANOVAS, a multiple regression analysis was conducted to examine the relative importance of the behavioral, normative, and control beliefs in the prediction of each target behavior.

MANOVA Results: Physical Activity

Using Wilk's criterion, there was a significant multivariate effect of behavioral beliefs for physical activity, F (6,131) = 3.481, p =.003. As shown in Table 1, univariate tests indicated that high-active participants were more likely than low-active participants to consider feeling healthy as a probable outcome of their performing the behavior. High-active participants were also less likely than low-active participants to think that they would feel sore if they carried out regular exercise.

Insert table 1 about here

No significant multivariate effect of normative beliefs emerged for physical activity, F (4, 127) = .725, p = .577. There was, however, a significant multivariate effect of control beliefs (using Wilks criterion, F (4,142) = 3.265, p = .015). The univariate results suggest that high-active participants were less likely than low-active participants to perceive that laziness would be a barrier to their engaging in physical activity.

MANOVA Results: Low-Fat Food Consumption

A marginal multivariate effect of behavioral beliefs was found for low-fat food consumption (using Wilks criterion, F(6,163) = 1.903, p = .083). Results of univariate tests indicated that high adherents were more likely than low adherents to think that feeling healthy would be a probable outcome of their following a low-fat diet (see Table 2). High adherents were also less likely than low adherents to consider that they would have to use unfamiliar ingredients to maintain a low-fat diet.

No multivariate effect of normative beliefs for low-fat food consumption was found (F (4,147) = 1.428, p = .228) although a number of univariate tests did emerge as significant. These analyses indicated that high adherents were more likely than low adherents to think that important referents (i.e., family, friends and peers) would approve of their consuming low-fat foods. There was no multivariate effect of control beliefs for low-fat food consumption (using Wilk's criterion, F (4,171) = .789, p = .534).

Insert table 2 about here

Predicting Healthy Lifestyle Behavior

The MANOVA analyses identified how the adherence groups differed in terms of their beliefs. However, these analyses did not allow an assessment of which beliefs are most influential for respondents engaging in a healthy lifestyle. A multiple regression analysis was conducted to assess the relative influence of the behavioral, normative and control beliefs for predicting behavior. Given that the costs and benefits associated with behaviors are often considered as independent (Rempel & Fong, 2005), behavioral beliefs about the likelihood of the benefits (benefit likelihood) and the likelihood of the costs (cost likelihood) were considered separately. Therefore, the regression analyses used four scales as the predictor variables (benefit likelihood, cost likelihood, normative beliefs, and control beliefs). The dependent measure was based on a continuous scale reflecting past behavior (as described in the Method Section). Together, the belief-based measures accounted for a significant, albeit small percent of the variance in behavior (12% and 6% of the variance in behavior for physical activity and low-fat food consumption, respectively; see Table 3). For physical activity, both cost likelihood and control beliefs were significant predictors. The fewer the costs associated with being physically active and the less likely control factors were perceived as able to influence the ability to engage in regular moderate physical activity, the more individuals were physically active. For low-fat food consumption, both costs and benefits were significant predictors of participant behavior. The more likely participants were to perceive benefits to result from eating low-fat foods and the less likely they were to associate costs with low-fat food consumption, the more individuals reported adherence to the low-fat food recommendations.

Insert table 3 about here

Discussion

The present research examined the behavioral, normative and control beliefs underlying the consumption of low-fat dietary and regular physical activity behaviors amongst adults diagnosed with Type 2 diabetes and/or CVD. For physical activity, behavioral and control beliefs distinguished high- from low-activity participants whereas behavioral and normative beliefs differentiated those engaging in greater rather than less low-fat food consumption. Additionally, the analyses examining the relative importance of these belief sets in predicting the target behaviors showed a similar pattern of results.

For physical activity, the results suggest that campaigns designed to encourage physical activity should emphasize positive health-related feelings associated with excercising, reinforcing that soreness is not necessarily an outcome. Also, our results showed that participants who engaged in regular, moderate physical activity over the previous month were less likely than those who had not, to consider that laziness would be a barrier to their performance, suggesting that behavior change programs should aim to engender feelings of motivation to be physically active. Interventions incorporating elements that target self-discipline and goal setting activities may prove beneficial. For physical activity, to combat feelings of laziness, it may be useful to implement reward-based systems to increase motivation to engage in moderate exercise. Underlying beliefs relating to social influences from important referents, however, did not appear to be an avenue to target, since both high- and low-activity respondents perceived similar levels of approval by others. These results are broadly consistent with results obtained by previous TPB belief-based studies examining physical activity. In a similar vein to Conn et al.'s (2003) study of exercise beliefs amongst older women, behavioral and control beliefs emerged as the important factors distinguishing

between the more and less active groups; however, a greater number of control beliefs emerged as important in Conn et al.'s study.

For eating foods low in saturated fats and in a similar vein to the results for physical activity, the findings suggest that interventions should highlight the likelihood of positive health-related feelings. Additionally, the findings suggest that interventions should address the topic of use of unfamiliar ingredients in the process of developing a healthy eating pattern. The MANOVA results also suggested that normative beliefs, specifically the influence of family and peers, were associated with low-fat food consumption. Respondents reporting a high adherence to low-fat food consumption recommendations were more likely than weaker adherents to perceive that a number of important referents (namely spouse or partner, family, friends and peers) would think that they should eat foods low in saturated fats. Consequently, interventions may benefit from emphasizing the involvement of partners and family in assisting their relatives to make positive dietary changes and significant referents could be encouraged to participate in interventions alongside their relatives.

Our results contrast with those of Armitage and Conner (1999). In their study of a younger, non-clinical population, a large number of behavioral beliefs distinguished between intenders and non-intenders, whereas the present study found only a few behavioral beliefs that distinguished between the high and less high adherents. This variation in findings may be attributable to differences in age and medical condition of the samples. Adults diagnosed with Type 2 diabetes and/or CVD should be aware of the underlying costs and benefits of performing the behavior. Armitage and Conner's study found that control factors relating to financial costs and knowledge differentiated between their groups whereas no control beliefs distinguished between the two adherence group sin the present study. For participants in an older sample diagnosed with these conditions, knowledge-related barriers may be less likely to prevent behavioral performance than in a potentially 'healthier' younger sample. Differences in findings amongst previous TPB belief-based studies reinforce the importance of identifying underlying beliefs specific to distinct populations (Ajzen & Fishbein, 1980).

The regression analyses broadly support the MANOVA findings in that behavioral costs appeared to be most important in predicting both physical activity and consumption of foods low in saturated fats. It should be noted that the beliefs only accounted for a small percentage of the variance (about 10%) in the prediction of the two target behaviors. According to a theory of planned behavior approach, beliefs would have a much greater impact on behavioral intentions than actions themselves (with the effects of beliefs on behavior mediated via their impact on intentions; see Ajzen, 1991).

The emphasis on diabetes mellitus, in particular, as a 'nutrition'-related condition may explain the fact that normative beliefs were relevant for the dietary behavior (as evidenced by the MANOVA results), but behavioral (or more personal) beliefs were relevant for physical activity. Given the social nature of eating behaviors, it is not surprising that the views of others are important. Physical activity, on the other hand, can often be a more solitary endeavor and, therefore, decision-making related to behavioral performance may be influenced more by personal factors such as behavioral beliefs.

The present research is important in identifying the beliefs that underlie adherence to two key healthy lifestyle recommendations among people diagnosed with serious medical conditions. The present study also provides further support for the utility of a TRA/TPB approach in the domains of physical activity and dietary behaviors. Given that most of the sample had Type 2 diabetes and only about 30% had CVD, however, the results are not generalizable to other clinical populations. Also, the majority of the sample was Caucasian and married. A major limitation of the present study is that it was cross-sectional in design, making

the direction of causality between beliefs and self-reported behaviors unclear. Another obvious limitation of the study was the reliance on self-report data that may have inflated people's assessment of their healthy eating and activity behaviors. In addition, future research should establish the reliability and validity of the behavior scales. It should be noted that the likelihood of behavior change in any future interventions based on the underlying beliefs identified in the present study is likely to be modest given the relatively small amount of variance explained by beliefs in the target behaviors.

While the results of the study suggest potential beliefs to include in the content of an intervention designed to encourage behavior change, they do not indicate which intervention type would be most effective (e.g., persuasion, information; Conner & Sparks, 2005). Furthermore, due to the lack of research, there is limited evidence for the efficacy of the impact of belief-based changes on behavior change (Hardeman et al., 2002). Finally, operationalizing identified beliefs, within an intervention, may prove challenging given individual differences in beliefs and background characteristics. Tackling modal beliefs, however, is at least more cost effective as a method of promoting behavior change than targeting individual beliefs. Future research should assess the utility of this study's recommendations in intervention programs tailored for adults diagnosed with Type 2 diabetes and CVD where adherence to activity and dietary recommendations are essential if symptoms are to be reduced and premature morbidity avoided.

Footnotes

[1] The physical activity target behavior was based on National Physical Activity Guidelines for Australians. Given the study's population of older participants with a chronic condition, a realistic target behavior was stated as engaging in moderate physical activity on a regular basis. *Moderate physical activity* was defined as any movement that causes a slight but noticeable increase in breathing and heart rate and may cause light sweating in some people. A *regular basis* was defined as at least three occasions per week. For low-fat food consumption, the measures were based on recommendations contained in the Dietary Guidelines for Australians and the Australian Guide to Healthy Eating (Commonwealth Department of Health and Ageing, 2001). These recommendations include: (a) substitute margarine composed largely of monounsaturated or polyunsaturated fat for butter, (b) use only low-fat dairy products, (c) use a monounsaturated or polyunsaturated cooking oil and (4) trim all visible fat from meats.

[2]There were no identified sex differences or differences based on type of diagnosis in the study's analyses.

Acknowledgements

For their assistance with this study, the authors would like to thank Kylie Burton, Barbara Sponza, Theresa Collison, Jan Coad, Ruth Dukes, Ann Dyne, Helen Elliott, Claire Hyde, Rene Hinton, Debbie McGrath, Betty Mulder, Susan Mylne, Cheryl Pearson, Gaylene Weir, Cindy Wood and Paul Norman.

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Table 1

Mean Beliefs by Engagement in Moderate Physical Activity

	Behavioral beliefs	
Costs and benefits	Low active (*n* = 78)	High active (*n* = 60)
Feel healthy	5.72	6.25**
Lose weight	5.37	5.25
Feel tired	4.81	4.22
Feel sore	4.55	3.42***
Increase my fitness level	5.71	5.70
Put my health at risk	1.78	1.60
	Normative beliefs	
Referents	Low active (*n* = 73)	High active (*n* = 59)
Spouse or partner	5.36	5.23
Family	5.50	5.05
Friends and peers	5.16	4.80
Doctor	6.34	6.10
	Control beliefs	
Control factors	Low active (*n* = 80)	High active (*n* = 67)
Lack of time	3.60	3.07
Laziness	4.29	3.13***
Not feeling well	3.73	3.21
Weather	4.25	3.96

**$p < .01$, ***$p < .001$

Table 2

Mean Beliefs by Adherence to the Consumption of Foods Low in Saturated Fats

	Behavioral beliefs	
Costs and benefits	Low adherents (*n* = 84)	High adherents (*n* = 86)
Feel healthy	5.86	6.33*
Lose weight	5.23	5.38
Reduce the taste of food	3.76	3.31
Use unfamiliar ingredients	3.60	3.00*
Reduce cholesterol	5.46	5.85
Unfamiliar preparation and cooking methods	3.68	3.27
	Normative beliefs	
Referents	Low adherents (*n* = 85)	High adherents (*n* = 64)
Spouse or partner	5.43	6.05
Family	5.62	6.20*
Friends and peers	5.25	5.84*
Doctor	6.42	6.76
	Control beliefs	
Control factors	Low adherents (*n* = 88)	High adherents (*n* = 88)
Lack of availability	2.33	2.75
Lack of discipline	3.67	3.73
Cost	2.81	3.08
Holiday periods/social occasions	3.56	3.89

*$p < .05$

Table 3

Multiple Regression Analyses Predicting Regular Physical Activity and Consumption of Foods Low in Saturated Fats

Variable	*R*	R^2	F	*df*	β
Regular physical activity	.36	.12	4.797	4,133	
Benefit likelihood					.11
Cost likelihood					-.20*
Normative beliefs					-.09
Control beliefs					-.17*
Consumption of low fat foods	.26	.06	2.962	4,163	
Benefit likelihood					.16*
Cost likelihood					-.16*
Normative beliefs					.10
Control beliefs					.04

*$p < .05$