THE THEORY OF PLANNED BEHAVIOUR AND HEALTHY EATING: EXAMINING ADDITIVE AND MODERATING EFFECTS OF SOCIAL INFLUENCE VARIABLES

RACHEL POVEY¹, MARK CONNER¹*, PAUL SPARKS², RHIANNON JAMES² and RICHARD SHEPHERD²

¹School of Psychology, University of Leeds, Leeds LS2 9JT, UK
²Institute of Food Research, Earley Gate, Reading RG6 6BZ, UK

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This paper examines the additive and moderating effects of social influence variables (injunctive norms, descriptive norms, perceived social support) within the Theory of Planned Behaviour (TPB). The target behaviour is the decision to eat healthily. Questionnaire responses on components of the TPB, descriptive norms, perceived social support, and subsequent healthy eating were obtained from a prospective sample of 235 members of the general public. Good predictions of intentions (42% of variance explained) and behaviour (15% of variance explained) were found using the Theory of Planned Behaviour. Neither descriptive norms nor perceived social support added to these predictions of intentions over and above the TPB variables. However, perceived social support was found to act as a moderator variable on the relationship between perceived behavioural control and intention, and the relationship between attitude and intention. Implications for exploring the role of social influence variables on decisions concerning health behaviours are discussed.

KEY WORDS: Theory of planned behaviour, injunctive norms, descriptive norms, perceived social support.

INTRODUCTION

This paper examines the additive and moderating effects of social influence variables (injunctive norms, descriptive norms, perceived social support) within the Theory of Planned Behaviour (TPB). The target behaviour is eating healthily. Over the past few years, there has been increasing evidence to suggest a link between diet and life-threatening diseases such as heart disease (Ulbricht and Southgate, 1991) and cancer (Doll and Peto, 1981). This has resulted in the publication of a number of dietary recommendations (e.g., COMA, 1991) and the development of campaigns with the aim of encouraging the public to eat more healthily. The success of such campaigns is influenced to some extent by people's understanding of the terms "healthy" and "unhealthy" eating (Povey, Conner, Sparks, James and Shepherd, 1998) but also by social cognitive factors such as people's attitudes, beliefs and intentions towards eating a healthy diet. The role of social cognitive factors has been of particular interest to psychologists, partly because they have been shown to affect behaviour (Conner and Norman, 1996, 1998) and partly because they are influences which are potentially modifiable. Although several approaches have been used

* Corresponding author. Fax: +44 113 233 5749. E-mail: mc@psychology.leeds.ac.uk.
(e.g., Bennett et al., 1994), one of the models most frequently employed by psychologists, which attempts to examine such influences on behaviour, is the Theory of Planned Behaviour (TPB) (Ajzen, 1991). This paper describes a study in which the TPB is used as a theoretical framework to examine the influence of different social cognitive factors on people's intentions to eat a healthy diet and the extent to which these factors predict subsequent healthy eating behaviour.

The TPB has developed out of the earlier Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975), and proposes that behaviour is determined by a combination of an individual's intentions to engage in that behaviour and their perceptions of control over the behaviour. Intentions, in turn, are held to be predicted by attitudes, subjective norm (perceived social pressure) and perceived behavioural control (the degree to which the behaviour is perceived to be under the control of the individual). The TPB has been used to examine a wide variety of different behaviours (see Conner and Sparks, 1996; Godin and Kok, 1996 for reviews), several of which are food-related. The food-related behaviours which have been studied include reduction in fat intake (Paisley, Lloyd, Sparks, and Mela, 1995; Paisley and Sparks, 1998); skimmed milk consumption (Raats, Shepherd and Sparks, 1995); organic vegetable consumption (Sparks and Shepherd, 1992); chip consumption (Towler and Shepherd, 1991/2); biscuit and wholemeal bread consumption (Sparks, Hedderley and Shepherd, 1992); health-related eating behaviours (Ajzen and Timko, 1986); and healthy eating (Conner, Povey, Bell and Norman, 1994). However, the majority of these studies have examined people's intentions rather than behaviour (see Godin and Kok, 1996), and the few which have actually examined behaviour tend to be cross-sectional, rather than prospective in design (e.g., Ajzen and Timko, 1986; Towler and Shepherd, 1991/2). The few studies which have employed prospective designs to predict eating behaviour have tended to report weak predictions. For example, Conner et al. (1994) used the TPB to predict intentions to eat a healthier diet on a sample of 241 respondents, and found that attitudes, subjective norms and PBC were predictive of intentions \( R^2 = 0.41 \), although intentions and PBC were relatively poor at predicting actual behaviour \( R^2 = 0.05 \).

**Additional Variables**

Recent research has shown a number of attempts to improve the predictive power of the model by including other additional predictors such as self-identity (Sparks and Shepherd, 1992); perceived need to change (Paisley and Sparks, 1998); moral norms (Parker, Manstead and Stradling, 1995; Sparks, 1994) and habit or past behaviour (Bagozzi and Kimmel, 1995; Frederick and Dossett, 1983) with varying success (for a review see Conner and Armitage, 1998). Other ways in which the role of additional variables in the model have been assessed is by an examination of their moderating effect on intentions and/or behaviour (e.g., Terry and Hogg, 1996). A moderator variable has been described as a "qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable" (Baron and Kenny, 1986, p. 1174): that is, the relationship varies at different levels of the moderator variable. This study examines the effect of two additional measures of social influence within the context of the TPB as both additional and as moderator variables. These two components are perceived social support and descriptive norms.
Additive Effects

Normative influences are widely held to have an important impact on behaviours such as food choices. However, studies using TPB frequently report that subjective norms (the component of the model held to encapsulate normative influences) have only a weak relationship with intentions (see Godin and Kok, 1996). One reason for this disparity may be the narrowness of this conception of normative influences employed in the TPB (Conner, Martin, Silverdale and Grogan, 1996). Normative influences may vary in several ways. Cialdini, Reno and Kallgren (1990) distinguish between injunctive and descriptive norms. Injunctive norms concern perceptions of social approval or disapproval of a behaviour. These are the form of norms employed in the TPB in relation to perceived social pressure from people in general (subjective norms) or from specific groups or individuals (normative beliefs). In contrast, descriptive norms refer to perceptions of others' performance of the behaviour. Several studies have found that descriptive norms contribute to the prediction of intentions independently of injunctive norms (e.g., Conner et al., 1996; DeVries, Backbier, Kok and Dijkstra, 1995; Grube, Morgan and McGree, 1986). Fishbein (1993) notes that both may be employed as indicators of the same construct – perceived social pressure. Thus the issue of which is more predictive of intentions becomes an empirical issue. However this empirical question may have important implications for interventions to change behaviour, particularly when the different norms are conflicting. Terry and colleagues (Terry and Hogg, 1996; White, Terry and Hogg, 1994) suggest that examining group norms may be one way to broaden the individualised view of social influence variables taken in most applications of the TPB.1

Another component of social influence commonly employed in health psychology research is perceived social support. There exists a wealth of literature concerning the health protective qualities of social support (for a review see Rutter, Quine and Chesham, 1993), though there appears to be no consensus on a single definition, which has resulted in difficulties with its measurement (Heitzmann and Kaplan, 1988). One definition of social support which has been adopted by a number of researchers (e.g., Courneya and McAuley, 1995a; Kelsey et al., 1996) is that by Wallston, Alagna, DeVellis and DeVellis (1983) who state that it “describes the comfort, assistance, and/or information one receives through formal and informal contacts with individuals or groups” (p. 369). Thus social support is the help and assistance one receives when trying to perform or not perform a behaviour, subjective norm is the perceived pressure one receives from others, and descriptive norm is the extent to which others are perceived to perform the behaviour or not.

Whilst these definitions make clear the relatedness of the three constructs, the three can usefully be distinguished. For example, significant others might be perceived as not performing a particular health behaviour themselves (descriptive norms), but as believing that you should perform the behaviour (subjective norms), and being supportive or helpful (perceived social support) to one’s attempts to perform the behaviour. To the extent that these different influences are consistent and positive we might expect stronger intentions to perform the behaviour. Thus we might expect these three components of social norms to combine additively in their influence on intentions. Alternatively, one of these measures may be a dominant influence on intentions. Consideration of these different social influence

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1 Cialdini et al. (1990) distinguish a third form of social influence, moral or personal norms. These are not further considered here, but see Conner and Armitage (1998) for a review of their role in the TPB.

2 We are grateful to an anonymous reviewer for bringing this point to our attention.
variables might elucidate which are the key influences on health behaviour decision making.

The influence of social support has been found to be important for different types of behaviour change, such as exercise participation (Courneya and McAuley, 1995a), smoking cessation (Lennox and Taylor, 1994; McMahon, Jason and Salina, 1994; Terborg, Hibbard and Glasgow, 1995) and successful treatment for alcoholism (Gordon and Zull, 1991; McKay and Maisto, 1993). There is also some limited evidence for a relationship between social support and dietary change such as reduction in fat consumption (Paisley, 1994; Zimmerman and Connor, 1989). For example, Paisley (1994) studied 45 participants who significantly reduced their fat intake during a 20 week intervention study and found that participants who were more successful at reducing their fat intake reported receiving greater family support than those who were less successful (see also Kelsey et al., 1996; Terborg et al., 1995).

There have been few studies which have examined the role of perceived social support in the contextual framework of the TPB. Two such studies are those by Horne (1994) and by Wankel, Mummery, Stephens and Craig (1994) both of which reported perceived social support to be a significant predictor of intentions to engage in physical activity. However, in both cases perceived social support was actually measured as an alternative to subjective norm, and not as an independent predictor of intention. Other authors (e.g., Courneya and McAuley, 1995a) have argued that subjective norm and social support are distinct social constructs, "each appears to be tapping a different aspect of social influence...and should not be considered interchangeable with each other" (p. 333). Courneya and McAuley (1995a) present strong evidence to support the discriminant validity of these two constructs. As discussed earlier, we agree with this distinction and believe it may be useful to distinguish between three forms of social influence: social support, injunctive norms and descriptive norms. The present study tests whether measures of descriptive norms and social support add to predictions of intentions to eat healthily over and above the components of the TPB (including subjective norms as a measure of injunctive norms).

**Moderating Effects**

In addition to additive effects, we anticipated that the different social influence measures might also have moderating effects on the relationship between variables in the TPB. Such moderation effects are of interest because they may reflect the operation of different social processes which help us further understand the relationship between variables in models such as the TPB. Whilst wishing to explore all possible moderation effects, we anticipated that our normative variables might specifically moderate the effects of one variable in the TPB. We expected attitudes to be more predictive of intentions when the social environment is supportive of the behaviour. This is the contingent-consistency hypothesis (Acock and DeFleur, 1972) which has received some attention in the literature. Such an interaction would suggest that social influences operate to determine the impact that attitudes have on intentions. Several studies have found support for this interaction effect (Grube and Morgan, 1990; Grube et al., 1986; Rabow, Neuman and Hernandez, 1987; Newcomb, Rabow and Hernandez, 1992). In the TPB, one might expect an interaction between subjective norms and attitudes in predicting intentions. However, the present study provided the opportunity to examine which of the three normative components might moderate the impact of attitudes on intentions. Elucidation of which social influence variable produces a moderation effect might give insight into the social processes by which attitudes influence intentions.
Study Focus

This study examines the extent to which the TPB is useful as a model to predict intentions to eat a healthy diet in addition to its ability to predict actual dietary behaviour. In addition, it examines whether the additional variables of descriptive norms and perceived social support improve the predictive value of the model, and whether they moderate the relationship between the different components of the model. In this study we employ a measure of subjective norms in order to tap injunctive norms.

METHOD

Participants

Two hundred and sixty-nine people responded to an advertisement placed in a local newspaper to recruit volunteers for a food study. The results in this study are based on the 235 people (87%) who completed both study questionnaires (female 70%; male 30%; median age = 38 years). Fifty-one per cent of the sample were married or living as married; 33% were single; 11% were divorced or separated; and 5% were widows or widowers. Twenty-nine per cent were highly educated with a degree or higher degree; 31% had post-16 qualifications; 21% had school qualifications; and 18% had no qualifications. Sixteen per cent of the sample were non-earners, or on state benefits, and 13% were housewives.

Materials

This paper reports data from two questionnaires which were developed for the purpose of this study. The first questionnaire included an initial eight questions to obtain demographic information, followed by questions which had been specifically designed to assess components of the TPB, and questions measuring descriptive norms and perceived social support. Questions based on the TPB included questions measuring the participant’s intentions, perceived behavioural control, subjective norm and attitudes towards eating a healthy diet. The second questionnaire measured dietary behaviour by means of a 63-item food frequency questionnaire adapted from the Leeds Food and Nutrition Survey (Margetts, Cade and Osmond, 1989). In accordance with the principle of compatibility (Ajzen, 1988), all questions were matched in terms of target and action.

Intentions (INT). Intentions to eat a healthy diet were measured by two statements: “I intend to eat a healthy diet in the future” and “I want to eat a healthy diet in the future”. The responses were measured on 7-point fully anchored scales running from “strongly agree” (+3) to “strongly disagree” (−3). Cronbach’s alpha for the two questions was 0.89, and an overall measure of intention was calculated by taking a mean score of the two items.

Footnote:

1 The measures did not specify a context or time frame. Nevertheless the current predictions of intentions and behaviour do not appear to be appreciably lower than for studies which have matched all measures on all 4 elements suggested by the principle of compatibility. This may be taken as support for Fishbein and Ajzen’s (1975) suggestion that matching target and action are of primary importance in ensuring strong relationships amongst components of the model. We are grateful to an anonymous reviewer for drawing our attention to this issue.
Attitudes (ATT). Attitudes towards eating a healthy diet were measured by six 7-point semantic differential scales in response to the statement "overall, I think that eating a healthy diet is...". The scales ran from "enjoyable" to "unenjoyable", "good" to "bad", "foolish" to "wise", "harmful" to "beneficial", "pleasant" to "unpleasant" and "favourable" to "unfavourable". Each scale was anchored only at its end-points and scored -3 to +3 (positive scores were given to desirable characteristics). It was decided that two of the items would be discounted from the final scale (viz. foolish-wise, beneficial-harmful), since they were heavily skewed in the positive direction. Cronbach’s alpha for the four remaining items was computed (0.85) and an overall measure of attitude was created for each person by calculating the mean score of the four items.

Perceived behavioural control (PBC). PBC was measured by four questions using 7-point response formats which were fully anchored. The first question was: "how confident are you that you could eat a healthy diet if you wanted to?" and scored from "not at all confident" (+1) to "extremely confident" (+7). The second question was: "how much control do you feel you would have over eating a healthy diet?" and scored from "no control" (+1) to "complete control" (+7). The third question was "to what extent is it up to you whether you eat a healthy diet?" and scored from "not at all" (+1) to "to an extremely great extent" (+7). The final question asked "how easy or difficult do you think it would be for you to eat a healthy diet?" and scored from "very easy" (+7) to "very difficult" (+1). Cronbach’s alpha for the four questions was found to be 0.79, and an overall measure of perceived behavioural control was calculated for each person by taking the mean score of the four items.

Subjective norm (SN). SN was measured by two items. The first item consisted of responses to the statement "people who are important to me think I should eat a healthy diet". Responses were given on a fully anchored 7-point scale, scored from "strongly agree" (+3) to "strongly disagree" (-3). The second measured the group attitude by responses to the statement "people I know well think eating a healthy diet is...", responses were on a 7-point scale, anchored only at its end points, these being "a very good idea" (+3) and "a very bad idea" (-3). Cronbach’s alpha for these two questions was only 0.48, so the first item alone was used as a measure of subjective norm.4

Perceived social support (PSS). This was measured by responses to the question, "to what extent do you think the following groups would be supportive/helpful to you if you tried to eat a healthy diet?". The groups were people who are important to me, my partner, my children, my friends, my colleagues, health experts, and my general practitioner. Responses were measured on a 5-point fully anchored scale, running from "not at all" (+1) to "to a very great extent" (+5). Cronbach’s alpha for the seven questions was 0.82, and an overall measure of perceived social support was calculated for each person by taking the mean score.

4 In this study, we did not weight our subjective norm measure by motivation to comply. Several authors (e.g., Conner and Sparks, 1996) have recommended this approach to tapping subjective norms. The second item used to assess subjective norm here is similar to the “group attitude” measure employed by White et al. (1994). It is interesting to note that the lack of scale reliability found here can be interpreted as support for the discriminant validity of subjective norm and group attitudes.
Descriptive Norms (DN). This was measured by responses to the question “to what extent do you think the following groups eat a healthy diet?”. The groups were the same as for the PSS measure. Responses were measured on a 5-point fully anchored scale, running from “not at all” (+1) to “to a very great extent” (+5). Cronbach’s alpha for the seven questions was 0.80, and an overall measure of descriptive norms was calculated for each person by taking the mean score.

Behaviour (Beh). A measure of behaviour was obtained from the second questionnaire which was a 63-item food frequency measure. Responses were combined with standard portion size data (using different values for the male and female respondents) and food composition data to derive measures of daily macro-nutrient intake, percentage food energy from fat, fibre intake (grams per day) and fruit and vegetable intake (portions per day). A “healthy eating” index was then derived by calculating the standardised scores for fibre (grams), fruit and vegetable (portions) and fat intake (percentage energy) measures, and then subtracting the standardised fat intake score from the other two.

Procedure

Respondents were asked to complete and return the first questionnaire on the receipt of which they were sent the second questionnaire. The average time interval between receipt of the two questionnaires was 2 weeks. On the return of the second completed questionnaire each respondent was paid £4 for their participation. The data obtained from the questionnaires were analysed using SPSS for Windows (Norusis, 1993).

RESULTS

First, a correlation matrix was computed to examine the relationship between the different components of the TPB, and the additional variables of descriptive norms and perceived social support (Table 1).

<table>
<thead>
<tr>
<th></th>
<th>Behaviour</th>
<th>Intentions</th>
<th>Perceived behaviour control</th>
<th>Attitude</th>
<th>Subjective norms</th>
<th>Descriptive norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentions</td>
<td>0.293***</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>0.357***</td>
<td>0.464***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>0.356***</td>
<td>0.636***</td>
<td>0.496***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective Norms</td>
<td>-0.009</td>
<td>0.261***</td>
<td>0.108</td>
<td>0.192**</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Descriptive Norms</td>
<td>0.056</td>
<td>0.207**</td>
<td>0.227***</td>
<td>0.306***</td>
<td>0.418***</td>
<td></td>
</tr>
<tr>
<td>Perceived Social Support</td>
<td>0.010</td>
<td>0.262***</td>
<td>0.281***</td>
<td>0.323***</td>
<td>0.471***</td>
<td>0.611***</td>
</tr>
</tbody>
</table>

*p < 0.05; **p < 0.01; ***p < 0.001
N = 242 for all components apart from actual diet where N = 234

In regressions with intentions and PBC we found similar results when using the overall healthy eating index or any one of the three components of this index (fat, fibre or fruit and vegetable intake).
The results in Table 1 show that each of attitude, subjective norm and PBC are positively and significantly correlated with intentions to eat a healthy diet. Also, they were found to be significantly positively correlated with actual behaviour. Descriptive norms and perceived social support on the other hand were found to be significantly positively correlated with intentions but not behaviour. From Table 1 it is apparent that our three measures of social influence are moderately strongly correlated with one-another. This is not surprising, since although they are considered to be conceptually distinct (Courneya and McAuley, 1995a), they are each concerned with different aspects of social influence. However, in no case were the correlations sufficient to indicate problems with discriminant validity amongst the constructs.

Predicting Intentions

A hierarchical multiple regression analysis was then carried out in three stages using intention to eat a healthy diet as the dependent variable. All variables were mean-centred to reduce the effects of multi-collinearity (Aiken and West, 1991). The independent variables were the three TPB variables of attitude (ATT), subjective norm (SN) and perceived behavioural control (PBC); the additional variables of descriptive norms (DN) and perceived social support (PSS); and the interaction terms of ATT, SN, PBC, descriptive norms and perceived social support. The interaction terms were calculated by multiplying each pair of variables. There were thus a total of ten interaction terms considered.

The variables were entered in three stages. First, the three TPB variables were entered together in one block; then the additional variables of descriptive norms and perceived social support were entered in a second block; and finally the interaction terms were entered together in a third block (Table 2). In the first two blocks variables were forced into the equation. However, the analysis of the interaction terms was exploratory and therefore we used a stepwise procedure at the third step.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Multiple regression analyses of intentions to eat a healthy diet onto TPB variables (Block 1); descriptive norms and perceived social support (Block 2); and interaction variables (Block 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Beta*</td>
</tr>
<tr>
<td>Block 1</td>
<td></td>
</tr>
<tr>
<td>Attitude (ATT)</td>
<td>0.456***</td>
</tr>
<tr>
<td>Perceived behaviour control (PBC)</td>
<td>0.220***</td>
</tr>
<tr>
<td>Subjective norm (SN)</td>
<td>0.120*</td>
</tr>
<tr>
<td>Block 2</td>
<td></td>
</tr>
<tr>
<td>Descriptive Norms (DN)</td>
<td>-0.094</td>
</tr>
<tr>
<td>Perceived social support (PSS)</td>
<td>0.029</td>
</tr>
<tr>
<td>Block 3</td>
<td></td>
</tr>
<tr>
<td>PSS × PBC</td>
<td>-0.186**</td>
</tr>
<tr>
<td>PSS × ATT</td>
<td>0.132*</td>
</tr>
</tbody>
</table>

*p < 0.05; **p < 0.01; ***p < 0.001

*The beta values reported are those at entry. Variables in blocks 1 and 2 were forced into the equation. Variables in block 3 were selected on statistical criteria ("stepwise" regression).

It can be seen from Table 2 that a significant proportion of the variability in intentions was explained by attitudes, subjective norm and PBC when they were entered into the first block (R²=0.422). Attitudes were found to be the strongest predictor of intentions,
although subjective norm and PBC were also found to be positively and significantly related to intentions. This would suggest that respondents with a more positive attitude, who believed that people important to them think they should eat a healthy diet and had higher perceived control would be more likely to intend to eat a healthy diet than the others.

In the next block, descriptive norms and perceived social support were entered. This did not significantly increase the amount of variance explained ($R^2$ change = 0.005). In the final block, the interaction terms were added to the equation. Using a stepwise procedure, two interaction terms were added to the equation. First, the interaction between perceived social support and PBC was entered and found to significantly increase the amount of variance explained ($R^2$ change = 0.012; $F(1,216)=4.74, p<0.05$). Secondly, the interaction between perceived social support and attitude was entered and found to significantly increase the amount of variance explained ($R^2$ change = 0.010; $F(1,215)=3.91, p<0.05$). When beta weights for the previously included predictor variables were examined, they were found to have changed very little, with each of the previously significant predictors remaining statistically significant. The significant beta weight for the perceived social support $\times$ PBC interaction was negative ($\beta=-0.186, p<0.01$), while the significant beta weight for the perceived social support $\times$ attitude interaction was positive ($\beta=0.132, p<0.05$).

We probed the nature of the significant interactions using simple slope analyses (Aiken and West, 1991) by examining the regression lines at three levels of the hypothesised moderator, i.e., the mean level and at one standard deviation above and below the mean (Figure 1). For the perceived social support $\times$ attitude interaction, simple slope analyses demonstrated how the relationship between attitude and intention varies as a function of perceived social support (Figure 1, top panel). At all levels of perceived social support, attitudes were significantly positively related to intentions. However, as perceived social support increases from low ($B=0.441, p<0.01$), to neutral ($B=0.595, p<0.001$), to high ($B=0.749, p<0.0001$), attitude became a stronger predictor of intentions. Thus, as social support increases the power of attitudes to predict intentions also increases.

For the perceived social support $\times$ PBC interaction, simple slope analyses demonstrated how the relationship between PBC and intention varies as a function of perceived social support (Figure 1, bottom panel). When perceived social support is high, PBC does not predict intentions ($\beta=0.040$, ns). However, as social support becomes neutral or low, PBC becomes a stronger predictor of intentions ($\beta=0.196, p<0.01$ and $\beta=0.352, p<0.001$ respectively). Thus, for those who perceive themselves as having high levels of social support to eat healthily (above the mean perceived social support score), PBC had no impact on their intentions to eat healthily, while for other respondents, increasing levels of PBC was associated with increasing levels of intentions to eat healthily.

**Predicting Behaviour**

A hierarchical regression was then performed to investigate the extent to which intentions (INT) to eat a healthy diet and perceived behavioural control (PBC) predicted eating behaviour. The variables were all mean-centred and were entered in two stages. The independent variables of INT and PBC were entered in the first block; and the interaction between

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6 Entry of all 3 social influence variables simultaneously after entry of attitude and PBC resulted in a marginally significant increase in variance explained in intentions ($R^2$ change = 0.019; $F(3,217)=2.45, p=0.06$). Examination of the beta weights revealed that only the subjective norm component was significant ($\beta=0.142, p<0.05$).
Figure 1  Simple regression slopes. Top panel shows regression of intentions on attitudes for low perceived social support (mean −1 standard deviation), moderate perceived social support (mean) and high perceived social support (mean +1 standard deviation) participants. Bottom panel shows regression of intentions on PBC for low perceived social support (mean −1 standard deviation), moderate perceived social support (mean) and high perceived social support (mean +1 standard deviation) participants.
INT and PBC was added in the second block. The regression of actual diet onto INT and PBC was found to be significant ($R^2 = 0.149$) as shown in Table 3.

It can be seen from Table 3 that a significant proportion of the variability in healthy eating behaviour was explained by intentions and perceived behavioural control when they were entered into the first block ($R^2 = 0.149$). This would suggest that people with stronger intentions and higher perceived behavioural control are more likely to eat a healthy diet. The interaction term did not significantly increase the variance in behaviour explained ($R^2$ change = 0.003, ns).

### DISCUSSION

The results from the multiple regression of intention showed that the TPB variables of attitude, subjective norm and perceived behavioural control were all significant predictors, with attitudes being the strongest, such that stronger intentions were related to more positive attitudes towards eating a healthy diet. The level of prediction ($R^2 = 0.422$) was comparable to that reported in other applications of the TPB (Godin and Kok, 1996). In addition, the present study indicates that intentions and PBC predict healthy eating behaviour ($R^2 = 0.152$) in a prospective sample. This is one of the first studies of the TPB to include a prospective measure of behaviour in the food area. The results would appear to indicate that the findings for this healthy behaviour are comparable (although slightly lower) with those reported for other health behaviours (Godin and Kok, 1996).

### Table 3  Multiple regression analyses of healthy eating behaviour onto intentions and perceived behavioural control (Block 1); and the intention x PBC interaction (Block 2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Beta*</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$R^2$ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention (INT)</td>
<td>0.179**</td>
<td>0.386</td>
<td>0.149***</td>
<td>0.149</td>
</tr>
<tr>
<td>Perceived behavioural control (PBC)</td>
<td>0.268***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT x PBC</td>
<td>0.054</td>
<td>0.390</td>
<td>0.152***</td>
<td>0.003</td>
</tr>
</tbody>
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*p < 0.05; **p < 0.01; ***p < 0.001
*The beta values reported are those at entry

### Additional Variables

A particular focus of the present study was examination of three different forms of normative influence: subjective norms, descriptive norms and perceived social support. The present data (Table 1) would suggest that these constructs are related, but empirically and conceptually distinguishable. Each was significantly positively correlated with intentions at similar levels, none were significantly correlated with behaviour (Table 1). However, when entered into a regression equation as predictors of intentions, only subjective norms

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7 Entry of the 3 social influence variables did not significantly increase the variance in behaviour explained ($R^2$ change = 0.025; $F(4, 203) = 1.53$). Examination of the interactions between social influence variables and the TPB variables revealed none to have a significant impact on behaviour after taking account of the TPB variables.
were significant. Thus in the present context (healthy eating) it is subjective norms which are the dominant social influence on intention formation. However, the moderation analyses indicate that perceived social support can also influence relationships in the TPB (see below). Future theoretical development might usefully consider when the different sources of normative influence might be expected to impact upon intentions to act. For example, the degree of group identification might play an important role in determining the injunctive influence of that group (Terry and Hogg, 1996). The extent to which these three aspects of social influence might usefully be represented as a single higher order social influence construct in particular contexts remains to be investigated.

Moderation Effects

Two moderation effects were found in the current data. Similarly to other researchers (e.g., Grube and Morgan, 1990) we found support for an attitude × norm interaction (the contingent-consistency hypothesis), although not of the form reported previously. The “contingent consistency” hypothesis (Acock and DeFleur, 1972; Bagozzi and Schnedlitz, 1985; Grube et al., 1986; Liska, 1984) proposes that “rather than assuming that psychological variables are proximal, independent causes and that social variables are distal, independent causes of intentions or behavior, both classes of variables are posited as interactive determinants” (Bagozzi and Schnedlitz, 1985, p. 366). In the context of the TPB, this has been operationalised as a positive interaction between subjective norm and attitude such that attitudes are stronger predictors of intentions and behaviour when subjective norms are positive (Bagozzi and Schnedlitz, 1985; Grube et al., 1986; Liska, 1984) and has obtained some, although limited support (see Bagozzi and Schnedlitz, 1985). In the present study, the relationship between attitudes and intentions varied as a function of level of perceived social support. As the level of perceived social support increased, the strength of the relationship between attitudes and intentions increased, although it was significantly positive at all levels of perceived social support. However, neither subjective nor descriptive norms moderated the impact of attitudes on intentions. Thus we did not find support for the traditional form of the contingent-consistency hypothesis. This may reflect the greater importance of likely help and support from others (perceived social support) compared to pressure from others (subjective norms) or modelling (descriptive norms) at least in relation to the decision to eat healthily. This interactive effect of perceived social support and attitudes in the TPB might be a useful focus of study with other behaviours where social support is an important determinant of behaviour.

The other moderation effect was not anticipated (but see Courneya and McAuley, 1995b on mediation effects involving these two variables). Perceived social support moderated the impact of PBC on intentions such that at high levels of perceived social support, PBC was unrelated to intentions. We should be cautious in interpreting this unexpected effect before confirmation or refutation in others’ studies as it may represent a statistical artefact. Nevertheless, the current data do suggest an interesting possibility. If one perceives that others are likely to be helpful or supportive in performing a behaviour, one’s perceived level of control will not predict intentions to engage in the behaviour. Hence, interventions to increase PBC with this group are unlikely to be particularly effective in increasing inten-

*Note there was no evidence of perceived social support moderating the PBC-behaviour link.*
Together these two moderation effects would support the usefulness of distinguishing subjective norms from perceived social support. The findings indicate that, in contrast to other behaviours (e.g., Conner et al., 1996; Grube et al., 1986), descriptive norms have no additive or interactive effects on intentions to eat healthily. Whilst subjective norms appear to show additive effects on intentions, perceived social support appears to show interactive effects. Thus increasing subjective norms is likely to directly increase intentions, while increasing perceived social support will only influence intentions indirectly through impacts on attitudes and PBC. The moderating effects of perceived social support suggest different intervention strategies for those low and high in social support. For those low in perceived social support, interventions to increase positive evaluations of the behaviour, subjective norms and perceptions of control are likely to be effective in encouraging intention formation and subsequent behaviour. For those high in perceived social support a focus on attitude and subjective norm, but not PBC, is likely to be effective. The present data would suggest that interventions targeting descriptive norms (for example by making salient referents who perform the behaviour) would be unlikely to impact on intentions or behaviour.

We should acknowledge that the inclusion of descriptive norms and perceived social support is not the only, nor necessarily the most fruitful, way to expand the way social influences are assessed in the TPB. The approach adopted within the present paper focuses upon individual perceptions of social influence variables. Terry and colleagues (Terry and Hogg, 1995; White et al., 1994) have drawn upon social identity theory (e.g., Hogg and Abrams, 1988) to suggest that group membership may be an important mediator of social influence. For example, White et al. (1994) showed separate effects for group norms and subjective norms on intentions to engage in safer sex behaviours. Terry and Hogg (1996) also report effects of group norms on intentions to exercise and engage in sun-protective behaviour. In addition, these effects were particularly strong for those who identified with the social group who were the source of the norm. Future research might usefully address the integration of these different perspectives on social influence to give a broader view of how social influences impact upon health behaviour decision making.

Methodological Issues

In interpreting the findings reported here we should note a number of potential methodological problems with the present study. Firstly, we should note that the normative measures employed were operationalised in relation to different social groups. The subjective norm measure focused on "people who are important to me", while the descriptive norm and perceived social support measure were operationalised in relation to this group plus six others. It is possible that this led to an underestimation of the effect of subjective norms on intentions. However, examination of analyses employing only measures of these three constructs in relation to "people who are important to me" produced no substantive differences to the results. Nevertheless future studies might usefully examine measures of these three constructs taken at the same level of generality. This would also allow one to look for differences in how consistent these different aspects of social norm were for different salient others. In addition, further studies might examine the effects of weighting different social influence variables (e.g., subjective norms by motivation to comply).
Secondly, the measures in this study were all self-report. While this is almost unavoidable for constructs such as attitudes, it would be useful to collect truly objective measures of healthy eating. However, because the behaviour measure does not directly ask for self-reported behaviour but rather asks about the frequency of consumption of various foods this measure mixes self-report and objective elements (for further examination of this issue for measures of food choice see Sapp and Jensen, 1998). These effects would be even more convincing if demonstrated in purely objectively measured behaviour.

Conclusions

In summary, the results from this study suggest that the TPB is generally a useful framework to predict healthy eating intentions and behaviour. Neither descriptive norms nor perceived social support added to predictions of intentions over and above the TPB variables. However, perceived social support was found to act as a moderator variable on the relationship between PBC and intention, as well as that between attitude and intention. Descriptive norms showed no moderation effects. Hence, the present results would support the addition of perceived social support to the TPB, but not the addition of descriptive norms (see Conner et al., 1996 for contrary results). Indeed, even the evidence for perceived social support suggested interactive rather than additive effects of this variable. The present findings suggest important and useful ways in which research on social influence variables impacts upon health behaviour decision making can progress. This adds to work demonstrating the importance of less individualised conceptions of social influence (e.g., Terry and Hogg, 1996; White et al., 1994). They also suggest fruitful ways of combining distinct strands of research in health psychology on the impacts of norms versus social support. Future research might usefully begin to address the factors which make the different social influence variables important determinants of health behaviours.

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