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Predictors of intentions to perform six cancer-related behaviours: Roles for injunctive and descriptive norms

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This study reports an application of the integrative model to the prediction of intentions to engage in three cancer screening behaviours (mammogram, colonoscopy and PSA test) and three healthy lifestyle behaviours (exercising, eating fruits and vegetables, and controlling ones diet to lose weight). We examined the roles of attitudes, perceived behavioural control, injunctive norms (what important others think one should do), and descriptive norms (perceptions of what others do) as predictors of participant's intentions to engage in each behaviour. Results indicated that injunctive norms were the strongest predictors of prostate and colon cancer screening intentions and contributed significantly to the prediction of intentions to get a mammogram. In contrast, injunctive norms contributed relatively little to the prediction of lifestyle behaviours, but were strongly predictive of intentions to eat fruits and vegetables. Implications for designing behaviour-specific communications and interventions are discussed.

Keywords: cancer; theory of planned behaviour; integrative model; injunctive norm; descriptive norm

Introduction

The theory of reasoned action (TRA; Fishbein & Ajzen, 1975) provides a framework for predicting and understanding behaviour, and for identifying factors that can be targeted to elicit behaviour change. Specifically, TRA maintains that intentions to perform (or not perform) a behaviour is a precondition for engaging in the behaviour. Behavioural intentions, in turn, are a function of a person's attitude towards performing the behaviour, and the subjective norm to perform or not perform the behaviour. The theory of planned behaviour (TPB; Ajzen, 1988, 1991) extended the TRA model to include perceived control over performing a behaviour as an additional predictor of intentions as well as a moderator of the intention–behaviour relationship. According to these theories, attitudes toward the behaviour refer to the degree to which one is in favor of or opposed to personally performing the behaviour; is my performance of the behaviour good or bad? Is it harmful or beneficial, pleasant or unpleasant? Subjective norms refer to a person's perception of the degree to which important others think he or she should or should not perform the behaviour. The perceived behavioural control component measures a person's

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belief that they do or do not have the ability to perform a particular behaviour; that performing the behaviour is, or is not, under the person's control.

The theories of reasoned action and planned behaviour have been effectively applied to understanding and modifying a wide range of health behaviours, and explain, on average, approximately 40% of the variance in health-related behavioural intentions (Rutter & Quine, 2002). Although attitudes, subjective norms, and perceived behavioural control explain a considerable amount of variance in intentions and behaviour, the relative importance of each component to the prediction of intentions varies by behaviour. For example, attitudes have been found to be the strongest predictors of dieting (Nejad, Wertheim, & Greenwood, 2004) and healthy eating (Payne, Jones, & Harris, 2004). Other studies have found that perceived behavioural control is the strongest predictor of intentions to exercise regularly (e.g. Culos-Reed, Shields, & Brawley, 2005) and quit smoking (Norman, Conner, & Bell, 1999). Similarly, subjective norms have been found to be the primary predictors of wearing a bicycle helmet (Lajunen & Räsänen, 2004; Quine, Rutter, & Arnold, 2001), having teeth cleaned regularly, and washing hands after using the bathroom (Johnston, White, & Norman, 2004). However, one of the criticisms of the TRA/TPB is that although the normative component of the model is usually correlated fairly highly with intentions ($rs \approx 0.40$), it often accounts for little or no unique variance in intentions (e.g. Hagger, Chatzisarantis, & Biddle, 2002; Norman & Hoyle, 2004). In their meta-analytic review of 185 TRA and TPB studies across several behavioural domains, Armitage and Conner (2001) concluded that the 'subjective norm was the TPB component most weakly related to intention' (p. 488). Some researchers have concluded that the normative component of TPB is inadequate for predicting intentions and have removed it from their analyses (e.g. Sparks, Shepherd, Wieringa, & Zimmermans, 1995).

Although the contribution of subjective norms to the prediction of intentions and behaviours appears to vary by behaviour, there appear to be relatively few behaviours for which subjective norms are the primary predictors of intentions to perform the behaviour. One goal of the current research is to address the question of why it is that subjective norms tend to have the lowest correlations with, and often explain little unique variance in BIs. A second goal is to examine the relative contributions of attitudes, norms, and perceived control in the prediction of different cancer-related behaviours.

Norms and intentions

One possible reason that the normative component of the TRA/TPB models might not account for much unique variance in BIs and behaviours is that the way in which subjective norms are defined and measured under the TRA/TPB framework does not capture important social-psychological facets of social influence (Conner & Armitage, 1998; Sheeran & Orbell, 1999; Terry, Hogg, & White, 1999). According to TRA subjective norms are measured in terms of the respondent's beliefs that their most important others think they should or should not perform the behaviour in question. According to Cialdini, Reno, and Kallgren (1990) this conceptualisation of normative pressure is more specifically termed an injunctive norm. Descriptive norms represent another type of norm that has substantial impact on behaviour. Descriptive norms refer to perceptions of what others are doing. Although behaviours that are prescribed are often those that are performed, injunctive and descriptive norms are conceptually distinct and, although they will often exert similar influences on behaviour, in some cases they may be in conflict. As an example, consider an adolescent whose mother and close friends do not want her to smoke, yet she sees her mother, a teacher, several classmates, and an admired celebrity

smoking. If we measured only injunctive norms and this adolescent stated an intention to smoke or started smoking, we might incorrectly conclude that her smoking intention and behaviour were not normatively influenced.

In his integrative model of behavioural prediction (IM) Fishbein (2000) included all of the TPB constructs and expanded the model in several important ways. Most germane to the present research is the recognition that the normative component of the model includes 'both perceptions of what others think one should do as well as perceptions of what others are doing' (p. 275). That is, both injunctive and descriptive norms are identified as indicants of normative pressure. Several researchers have investigated the roles of both descriptive and injunctive norms within the TRA/TPB/IM framework. In their meta-analysis of 21 studies that measured both injunctive and descriptive norms across several behavioural domains, Rivis and Sheeran (2003) found that in addition to attitudes ($\beta = 0.40$), perceived control ($\beta = 0.11$), and injunctive norms ($\beta = 0.16$), descriptive norms also uniquely contributed to the prediction of intentions ($\beta = 0.24$) and significantly increased the model R^2 from 0.39 to 0.44. All coefficients were significant at $p < 0.001$. McMillan and Conner (2003) found that, among college students, in addition to attitudes, perceived control, and injunctive norms, descriptive norms also contributed significantly to the prediction of intentions to use of several illicit drugs.

Although the normative component of TRA/TPB has traditionally only measured injunctive norms the construct is intended to assess the perceived social pressure that one feels with respect to performing or not performing a particular behaviour (see Fishbein, 2000). Research has shown that in addition to the influence of what most others think one should do, perceptions of what others are doing may also have a substantial impact on intentions to perform or not perform a variety of behaviours. Moreover, some evidence suggests that combining injunctive and descriptive norms into a single measure of normative pressure may increase the contribution of the normative component of TRA/TPB/IM to the prediction of BIs (e.g. Albarracín, Fishbein, & Middlestadt, 1998; Rhodes & Courneya 2003; Sayeed, Fishbein, Hornik, Cappella, & Ahern, 2005).

Roles for attitudes, norms, and control

A second goal of this research was to understand the relative importance of attitudes, injunctive norms, descriptive norms, and perceived behavioural control in the prediction of intentions to engage in several cancer-relevant behaviours. From a theoretical perspective, understanding the relative importance of each of the TRA/TPB/IM components to predicting intentions is critical to the development of effective interventions and communications. If a certain construct emerges as a particularly strong predictor of an intention to perform a certain behaviour it signifies that intenders and non-intenders (or those with higher and lower intentions) differ primarily on that dimension. As such, an intervention targeting that behaviour should pay particular attention to understanding and modifying the beliefs that underlie that construct.

The present research

The present research examined the roles of the IM components (attitudes, perceived behavioural control, injunctive norms and descriptive norms) across six different cancer-related behaviours. Specifically, we examine the extent to which the roles of injunctive and descriptive norms vary across behaviours as well as examine the possibility that measuring descriptive norms in addition to injunctive norms will better capture the role of normative

pressure on behaviour and thus increase the prediction of intentions to engage in several cancer detection and prevention behaviours.

Method

Participants and demographics

Participants were 1753 individuals (874 males, 879 females) ranging in age from 40 to 70 years old, with an average age of 52.77 (SD = 8.42). The sample was selected from a nationally representative panel of adult participants in the US compiled by Knowledge Networks, an independent survey research company. Panel members were recruited using random digit dialing procedures. If a panel member did not have internet access the survey company provided internet access for them. Once the sample was selected from the panel, data were collected using online questionnaires. With respect to the ethnicity of our sample, 76.3% were White, Non-Hispanic, 11.1% were Black, non-Hispanic, 7.1% were Hispanic, 3.0% identified as more than two races, and 2.6% indicated 'other' .

Each participant responded to six questions that measured the IM components (i.e. intentions, attitudes, perceived behavioural control, injunctive norms, and descriptive norms) for each of the six behaviours of interest; getting a mammogram, a colonoscopy, and a PSA test, as well as exercising regularly, eating fruits and vegetables, and controlling one's diet to lose weight.

Specifically, all participants responded to questions regarding getting a colonoscopy in the next year (or when it is next recommended), eating five or more servings of fruits and vegetables most days in the next year, dieting to control weight, and exercising at least three times in most weeks over the next year. Male participants also responded to questions regarding getting a prostate specific antigen (PSA) test in the next year (or when it is next recommended), and female participants responded to additional questions about getting a mammogram in the next year (or when it is next recommended). These items were imbedded in a larger survey examining cancer-related information seeking and scanning (see, Niederdeppe et al., 2007) that took place between October 2005 and June 2006. The median time to complete the survey was 23.37 minutes.

Measures

For all six behaviours behavioural intentions (BI) were measured using a single item. Measures of intentions to engage in the healthy lifestyle behaviours were as follows: 'How likely is it that you will control your diet to lose weight in the next year?', 'How likely is it that you will have five or more servings of fruits and vegetables most days in the next year?' and, 'How likely is it that you will exercise at least three times in most weeks over the next year?' Intentions to engage in cancer screening behaviours were measured using one of two items. Those who indicated they had previously had the particular screening were asked, for example, 'How likely is it that you will have a colonoscopy when it is next recommended?' Those who had never had a particular screening, or had not had one within the past 10 years were asked 'How likely is it that you will have a colonoscopy in the next year?' All BI items were scored 1 = very unlikely, to 5 = very likely. Perceived behavioural control/self-efficacy (PBC/SE) was also assessed using a single item, which read, for example 'If you wanted to, how sure are you that you can get a colonoscopy [in the next year/when it is next recommended]?' For the lifestyle behaviours PBC/SE items read 'If you wanted to, how sure are you that you can exercise at least three times in most weeks over the next year?' Items assessing PBC/SE were scored 1 = very unsure, to

5 = very sure. To measure injunctive norms (IN) participants responded to a question such as 'Do most people who are important to you think you should or should not get a colonoscopy [in the next year/when it is next recommended]?' and 'Do most people who are important to you think you should or should not exercise at least three times in most weeks over the next year?' Injunctive norm items were scored 1 = definitely should not, to 5 = definitely should.

The item assessing descriptive norms (DN) for lifestyle behaviours (eating fruits and vegetables, exercise, and dieting to control weight) read, for example, 'How many of the people most important to you ate five or more servings of fruits and vegetables most days in the past year'. However, what important others do may not be relevant for gender-specific screening behaviours. For example, husbands (an important other) do not get mammograms and assessing DNs by asking what 'important others' do, may be misleading. Therefore, with regards to the cancer screening behaviours (colonoscopy, mammogram, and PSA test) participants responded to a somewhat different item assessing DNs that read, for example, 'How many of the people who are most similar to you got a mammogram in the past year?' Both items were scored from 1 = none or very few to 4 = all or almost all. Consistent with the IM, a measure of normative pressure (NP) was computed by averaging the descriptive and injunctive norm concerning each behaviour. Finally, attitudes (ATT) towards each of the behaviours were assessed by averaging responses to two semantic differential scales; for example, 'My getting a mammogram [in the next year/when it is next recommended] is extremely bad – extremely good; extremely unpleasant – extremely pleasant. Both items were scored −3 to +3. Descriptive statistics and correlations among all items relevant to each behaviour appear in Tables 1 and 2.

Table 1. Means, standard deviations and correlations for cancer-screening behaviours.

Behaviour and variable	*M*	SD	BI	ATT	PBC	IN	DN
Colonoscopy ($n = 1452$)							
Behavioural intention (BI)	3.01	1.62	1.00				
Attitude (ATT)	−0.22	1.66	0.522	1.00			
Perceived behavioural control (PBC)	4.14	1.23	0.424	0.296	1.00		
Injunctive norm (IN)	3.01	0.94	0.660	0.506	0.357	1.00	
Descriptive norm (DN)	1.97	0.94	0.464	0.352	0.258	0.523	1.00
Perceived normative pressure (PNP)	2.49	0.82	0.644	0.491	0.352	0.872	0.873
Mammogram ($n = 849$)							
BI	4.04	1.40	1.00				
ATT	0.93	1.46	.478	1.00			
PBC	4.57	1.01	.538	0.282	1.00		
IN	3.53	0.69	0.516	0.436	0.317	1.00	
DN	2.88	0.94	0.405	0.339	0.266	0.507	1.00
PNP	3.21	0.71	0.519	0.436	0.330	0.820	0.909
PSA exam ($n = 603$)							
BI	3.56	1.43	1.00				
ATT	1.12	1.40	0.522	1.00			
PBC	4.42	1.02	0.474	0.362	1.00		
IN	3.26	0.73	0.649	0.494	0.423	1.00	
DN	2.01	0.88	0.445	0.335	0.270	0.461	1.00
PNP	2.64	0.69	0.628	0.475	0.397	0.825	0.882

Note: All correlations are significant at $p < 0.001$, two-tailed. NP was calculated as the mean of the IN and DN measures.

Table 2. Means, standard deviations and correlations for lifestyle behaviours.

Variable	*M*	SD	BI	ATT	PBC	IN	DN
Eating fruits and vegetables ($n = 1719$)							
Behavioural intention (BI)	3.27	1.29	1.00				
Attitude (ATT)	1.65	1.34	0.527	1.00			
Perceived behavioural control (PBC)	3.90	1.15	0.520	0.471	1.00		
Injunctive norm (IN)	3.27	0.57	0.412	0.390	0.386	1.00	
Descriptive norm (DN)	2.14	0.84	0.487	0.364	0.363	0.435	1.00
Perceived normative pressure (PNP)	2.71	0.60	0.536	0.439	0.437	0.779	0.904
Exercise ($n = 1692$)							
BI	3.60	1.24	1.00				
ATT	1.34	1.50	0.614	1.00			
PBC	3.97	1.14	0.660	0.539	1.00		
IN	3.36	0.61	0.327	0.372	0.388	1.00	
DN	2.06	0.79	0.287	0.245	0.253	0.265	1.00
PNP	2.71	0.56	0.381	0.376	0.390	0.732	0.851
Dieting ($n = 1689$)							
BI	3.39	1.25	1.00				
ATT	0.82	1.57	0.612	1.00			
PBC	3.80	1.14	0.587	0.461	1.00		
IN	3.02	0.88	0.553	0.486	0.337	1.00	
DN	2.02	0.76	0.273	0.250	0.234	0.234	1.00
PNP	2.52	0.65	0.538	0.479	0.368	0.821	0.747

Note: All correlations are significant at $p < 0.001$, two-tailed. NP was calculated as the mean of the IN and DN measures.

Statistical analyses

Correlations

Pearson correlations were computed to examine the linear relations between intentions and the other IM variables. Of particular interest are correlations between the IN and DN items and intentions.

Regressions

To further examine the relationships between norms and intentions to perform cancer-related behaviours we conducted a series of regression analyses predicting intentions from the model components. Our analytic strategy was the same for each behaviour; in step 1 of a hierarchical regression we entered ATT, PBC and IN. In step 2 we added DN to the model and examined the change in model R^2. Following the procedures described in Cohen and Cohen (1983, pp. 479–480) we tested the differences between each pair of the standardised regression coefficients within each model (e.g. the difference between the coefficients for PBC and ATT within the model predicting colonoscopy intentions).

Results

Correlations

As the correlation matrices in Tables 1 and 2 illustrate, both IN and DN were significantly correlated with intentions for each of the six behaviours. Specifically, IN-BI correlations

ranged from $r = 0.52$ to $r = 0.66$ for the screening behaviours, and from $r = 0.33$, to $r = 0.55$ for the lifestyle behaviours. Similarly, the DN-BI correlations ranged from $r = 0.41$ to $r = 0.46$ for the screening behaviours and from $r = 0.27$ to $r = 0.54$, for the lifestyle behaviours. For 5 of the 6 behaviours IN were more highly correlated with BI than were DN. Across all of the behaviours, IN and DN were correlated with each other between $r = 0.23$ to $r = 0.52$, with a mean of $r = 0.39$ after weighting for sample size.

Regression analyses

As is seen in Table 3, in step 1 of the regression, all three components (i.e. ATT, IN and PBC) were significant predictors of all three cancer screening behaviours, with IN emerging as the strongest predictor of intentions to get a colonoscopy, $\beta = 0.43$, $p < 0.001$ and to get a PSA test, $\beta = 0.40$, $p < 0.001$. Tests of the differences between the coefficients confirmed that the IN coefficients were larger than any other coefficients in those models, p's < 0.001. PBC was the strongest predictor of the intention to get a mammogram, $\beta = 0.37$, and its coefficient was significantly larger than the coefficients for the other predictors, yet the IN was also strongly associated with, and contributed significantly to the prediction of intentions to get a mammogram, $\beta = 0.29$, $p < 0.001$. Adding DN in step 2 led to a very small but (because of the large sample size a) statistically significant increase in the predictions of intentions to get a mammogram (0.8% increase in variance explained, F_{change} (1, 844) = 12.60, $p < 0.001$), intentions to get a colonoscopy, (1% increase, F_{change} (1, 1447) = 31.47, $p < 0.001$), and intentions to get a PSA test, (1.5% increase, F_{change} (1, 598) = 18.21, $p < 0.001$).

With respect to the three lifestyle behaviours – exercise, eating fruits and vegetables, and dieting – in step 1 ATT and PBC were significant predictors of all three behaviours with PBC emerging as the strongest predictor of exercise, $\beta = 0.46$, $p < 0.001$, and dieting intentions, $\beta = 0.35$, $p < 0.001$. Tests of the coefficients showed that the PBC coefficient was significantly larger than the coefficient for IN, but not larger than the coefficient for ATT. For intentions to eat fruits and vegetables the coefficient for ATT was the largest $\beta = 0.28$, $p < 0.001$, but it was not significantly larger than the coefficients for PBC

Table 3. Standardised regression coefficients predicting intentions.

	Step 1	Step 2					
Behaviour	R^2	ATT	PBC	IN	DN	R^2	ΔR^2
Mammogram	0.469	0.232	0.367[a]	0.246	0.104	0.477	0.008
Colonoscopy	0.513	0.211	0.178	0.427[a]	0.121	0.523	0.010
PSA test	0.507	0.208	0.191	0.402[a]	0.138	0.522	0.015
Exercise	0.529	0.350	0.448[a]	0.000 ns	0.088	0.536	0.007
Eating fruits and veggies	0.397	0.275[b]	0.263	0.095	0.250	0.443	0.046
Dieting	0.552	0.308	0.339[c]	0.276	0.052[d]	0.554	0.002[d]

Note: ATT, attitudes; PBC, perceived behavioural control; IN, injunctive norms; DN, descriptive norms. All coefficients and changes in R^2 are significant at $p < 0.001$, except where noted. All coefficients that are statistically significant in step 2 were also significant in step 1.

[a]The coefficient is significantly larger than all of the other coefficients in the model.

[b]The coefficient is significantly larger than the smallest coefficient in the model.

[c]The coefficient is larger than the coefficients for IN and DN, but no different from ATT.

[d]The coefficient and the change in R^2 are statistically significant at $p = 0.002$.

($\beta = 0.26$, $p < 0.001$) or DN ($\beta = 0.25$, $p < 0.001$). The IN was a significant predictor of intentions to diet $\beta = 0.28$, $p < 0.001$, and to eat fruits and vegetables $\beta = 0.17$, $p < 0.001$, but not of intentions to exercise $\beta = 0.02$, $p = 0.413$. When DN was added in step 2, there was an increase in variance accounted for in the prediction of exercise (0.7% increase in R^2; F_{change} (1, 1687) = 25.15, $p < 0.001$) and dieting (0.2%, increase in R^2; F_{change} (1, 1684) = 9.22, $p = 0.002$) that was of statistical significance but of limited practical significance. In contrast, including DN increased the variance explained in predicting intentions to eat fruits and vegetables by 4.6% F_{change} (1, 1714) = 143.60, $p < 0.001$).

To summarise, IN were the strongest predictors of intentions to get a colonoscopy and a PSA test, and were also strongly associated with mammogram and diet intentions. The inclusion of DNs added relatively little to the prediction of the three screening behaviours. However, DNs were strongly associated with intentions to eat fruits and vegetables, and contributed significantly and substantively to the prediction of intentions to perform this behaviour.

Perceived normative pressure

In addition to examining the individual contributions of IN and DN to the prediction of intentions we also explored, as suggested by the IM, the utility of combining IN and DN into a single measure of perceived normative pressure (PNP). A measure of PNP was computed as the mean of the IN and DN. The correlation between this measure of PNP and BIs ranged from $r = 0.38$ to $r = 0.64$, with a mean of $r = 0.53$. In fact, for mammogram, exercise, and eating fruits and vegetables, the composite PNP item correlated more highly with intentions than did the IN or DN individually. When entered into a regression model with ATT and PBC, PNP was significant for all behaviours. Compared to the original TPB model using only the IN, the model with PNP very slightly increased the percent of variance accounted for in intentions to exercise (0.529–0.534) and moderately increased the percent of variance accounted for in intentions to eat fruits and vegetables (0.397–0.441). At the same time, using the combined PNP measure rather than the IN alone slightly decreased the percent of variance accounted for by the model for mammogram intentions (0.469–0.468), colonoscopy intentions (0.513–0.496), intentions to get a PSA test (0.507–0.496), and intentions to diet to control ones weight (0.552–0.537). Note however, that with the exception of the improvement in the prediction of the intention to eat fruits and vegetables, increases or decreases in the percent of variance accounted for was no more than 2%.

Overall, models that included IN and DN as separate predictors explained, on average, 1.3% more variance in intentions than did models using the combined measure of PNP. Analyses comparing the R^2 for these two models revealed that the reductions in R^2 resulting from using the combined PNP construct (see Table 4) were again quite small, but because of the large sample size were statistically significant.[1]

Discussion

The correlations among measures of descriptive and injunctive norms and attitudes and perceived behavioural control ranged from $r = 0.23$ to $r = 0.51$ across the six behaviours. The results of this study indicate that the roles of IN and DNs in predicting BIs vary by behaviour. DNs were only modestly associated with exercise intentions, yet they were quite strongly associated with intentions to eat fruits and vegetables. Injunctive norms

Table 4. Standardised regression coefficients predicting intentions using a combined measure of normative pressure.

Behaviour	ATT	PBC	PNP	R^2	$R^{2\dagger}$	R^2 diff.
Mammography	0.244	0.375	0.289	0.468	0.477	−0.009
Colonoscopy	0.242	0.194	0.452	0.496	0.523	−0.027
PSA test	0.240	0.224	0.422	0.496	0.522	−0.026
Exercise	0.343	0.445	0.079	0.534	0.536	−0.002
Eating fruits and veggies	0.273	0.260	0.303	0.441	0.443	−0.002
Dieting	0.338	0.342	0.245	0.537	0.554	−0.017

Note: ATT, attitudes; PBC, perceived behavioural control; NP, normative pressure. All coefficients are significant at $p < 0.001$.
†The R^2 from step 2 in Table 3.

were also not predictive of intentions to exercise, yet were strongly predictive of intentions to engage in cancer screening behaviours. Given the inconsistent independent contribution of IN to predictions of BI within the literature, the findings that IN strongly contributed to the prediction of BI to engage in cancer screening behaviours were unanticipated, although in retrospect, they are not unprecedented. For example, Berglund, Nilsson, and Nordin (2005) found that subjective (injunctive) norms were significant predictors of patient intentions to take a PSA test when the doctor offered one, and of requesting PSA tests themselves. Others have found that subjective norms about getting a mammogram are highly correlated with mammogram intentions ($r = 0.41$), and are stronger predictors of mammogram intentions than other TRA/TPB variables (e.g. Montaño, Thompson, Taylor, & Mahloch, 1997; Tolma, Reininger, Ureda, & Evans, 2003). However, Rutter (2000) found that although injunctive norms were predictive of intentions to get breasts screened among women aged 50–64 in the UK ($\beta = 0.18$, $p < 0.001$), the strongest predictor of this behaviour was attitude ($\beta = 0.31$, $p < 0.001$), followed by perceived behavioural control ($\beta = 0.24$, $p < 0.001$). One possible explanation for this difference is that the women in Rutter's study were part of a health programme in which all women between the ages of 50 and 64 were invited to take a mammogram every 3 years. As such, it is perhaps not surprising that the relative weights of attitudes, injunctive norms, and perceived behavioural control in predicting mammogram intentions differed between her sample and ours.

Another conclusion of this study is that although the addition of DNs accounted for small but significant portions of additional variance in intentions to perform each of the six behaviours, DNs were only a particularly strong determinant of intentions to eat fruits and vegetables. This finding has important theoretical and practical implications.

From a theoretical perspective, the normative component of the IM is intended to capture the social normative pressures that people experience with regard to performing or not performing a given behaviour. Consistent with other research, we have shown here that the DN can account for statistically significant conceptually meaningful amounts of additional variance in intentions to perform some behaviours, (e.g. eating fruits and vegetables). Evidence also suggests that IN and DN can be modeled together as a single construct, not unlike the experiential and instrumental aspects of the attitude construct and the capability and controllability aspects of perceived behavioural control. For example, in this study the average correlation between IN and DN was $r = 0.39$, with a range of $r = 0.23$ to $r = 0.52$. Correlations between the experiential and instrumental aspects of attitude have ranged from $r = 0.23$ (Rhodes & Blanchard, 2006) to $r = 0.69$ (Courneya, Vallance, Jones, Reiman, 2005), whereas those between the capability and controllability aspects of perceived behavioural control have ranged from $r = .32$

(Norman & Hoyle, 2004) to $r = 0.78$ (Rhodes & Blanchard, 2006). More important, a recent paper by Hagger and Chatzisarantis (2005) not only corroborated the validity of the distinctions between the two aspects of each of the TPB and IM's three major predictors, but the paper also provided support for a hierarchical view of the three components. That is, a model that entered experiential and instrumental attitudes, injunctive and descriptive norms, and capability and controllability as six separate factors performed no better than a model in which these subcomponents were treated as indicators of the higher-order constructs of attitude, perceived social pressure, and perceived behavioural control. Clearly, however, more research is needed to more fully investigate the nature and utility of a normative pressure construct that accounts for both injunctive and descriptive normative pressure across a wide range of behaviours and populations.

The fact that DNs play a meaningful role in predicting intentions to eat fruits and vegetables also has practical significance. To date, we have not been able to identify an intervention targeting healthy eating behaviours that included a DN component. Our findings suggest that interventions and communications targeting healthy eating habits should give special consideration to DNs. It is not difficult to imagine how DNs influence eating habits. Eating is often a collective and social behaviour; we eat with our families, friends, and even strangers. When we eat at home we often eat what others eat because we eat what is prepared. When we eat out we are subject to the sight and smell of foods that others are eating and may say 'that looks and smells great. I'll have that.' In both instances what we eat is influenced by what others eat. Thus, interventions and communications that endeavor to get people to eat more fruits and vegetables should address the descriptive normative beliefs surrounding eating behaviours.

Limitations

One limitation of this research is its ability to generalise across different populations. We restricted our sample to persons over 40 years of age because they are those most at risk for getting breast, colon, and prostate cancer and for whom the various screening tests are recommended. However, our results with reference to eating fruits and vegetables, dieting, and exercising may not generalise to younger populations. It is likely that adolescents for example, hold different behavioural, normative, and control beliefs regarding the lifestyle behaviours than do adults over 40. It is also possible that the relative weights of the model components may differ significantly across different age groups. Nevertheless, it is both interesting and informative to note that conventional wisdom and some empirical evidence (e.g. Parker, Manstead, Stradling, Reason, & Baxter, 1992) suggests that intentions and behaviours of younger cohorts are more subject to normative pressures than are older cohorts, yet our results demonstrate a robust influence of social norms on some intentions of older adults.

Another limitation is that due to the time and space restrictions of the survey, PBC and intentions were each measured using a single item, while ATT and PNP were assessed by two items each. Nevertheless, the results reported here are comparable to those reported in other research in terms of the amount of variance accounted for, and the overall pattern of results. For example, Culos-Reed et al. (2005) and Montaño et al. (1997) each used multiple measures of the TPB constructs and report results that parallel ours. Culos-Reed and colleagues found that TPB constructs accounted for 60% of the variance in exercise intentions and that PBC was the strongest predictor, and Montaño and colleagues accounted for 53% of the variance in mammogram intentions with injunctive norms emerging as the strongest predictor. Also, the correlations seen in Tables 1 and 2 are similar in magnitude to those observed in other studies. Further, using a single item to

measure intentions, PBC and subjective norms is not unprecedented (e.g. Conner & Norman, 1996; Nejad et al., 2004; Payne et al., 2004). In general, we do not believe that the limited number of items used to measure each component undermines the reliability of the results reported here.

Finally, it should be noted that all measurements were taken at the same time, so we are unable to make any causal claims. However, several longitudinal studies involving a wide variety of behaviours have found support for the causal directions specified in the theories of reasoned action, planned behaviour, and the IM (e.g. Rhodes, McDonald, McKay, 2006; Rutter, 2000). Similarly, interventions targeting attitudes, norms, and perceived control have reported subsequent changes in behaviour (e.g. Kinsler, Sneed, Morisky, & Ang, 2004, Quine et al., 2001). Future research should examine the relation between intentions and behaviours and explore the environmental and behavioural barriers that moderate the intention–behaviour relation with respect to these six behaviours.

Implications

There are important practical implications for these findings. According to the American Cancer Society's 2007 cancer facts and figures report, there will be 1.4 million new cancer cases in the US in 2007. According to the report, reducing cancer deaths and increasing survival can be achieved by appropriate screening and detection tests, and by engaging in healthy lifestyle behaviours, such as eating fruits and vegetables, exercising regularly, and controlling ones weight. In fact, according to the report one-third, or 186,550 of the estimated 559,650 cancer deaths in 2007 'will be related to overweight or obesity, physical inactivity, and nutrition and thus could also be prevented' (p. 1). One implication of the findings reported here is that very different messages and interventions will be necessary for increasing cancer screening and healthy lifestyle behaviours. For example, interventions aimed at increasing cancer screening intentions and behaviours should draw particular attention to the injunctive norms surrounding those behaviours. Messages and interventions focusing on DNs may be particularly effective in changing intentions to eat fruits and vegetables, whereas a focus on perceived control and/or attitude would appear to hold the most promise for increasing intentions to exercise and to diet to lose weight. These hypotheses need to be put to an empirical test. In addition, as mentioned above, more research is needed to develop a measure of normative pressure that accounts for the influence of injunctive, descriptive, and perhaps other types of norms (e.g. moral norms; Manstead, 2000). It is our hope that the present paper will stimulate more research on the role of normative pressure as a determinant of intentions and behaviour.

Note

1. For each behaviour we computed a difference in the mean squares between the model that used injunctive and descriptive norms as independent predictors and the model that used the combined normative influence item. The difference was divided by the mean square error for the independent predictor model. Because the models differed by only one variable the df in the numerator was 1, the df in the denominator was the same as the df error term, which did not differ between the models within a behaviour.

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