

Young people and sun safety: the role of attitudes, norms and control factors

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Skin cancer is the most prevalent form of cancer in Australia.¹ For Australians, this translates into approximately 380,000 cases of skin cancer annually,² with at least one in every two Australians being diagnosed with skin cancer.³ Melanoma is the fourth most common potentially fatal cancer behind prostate, colorectal and lung cancer for men and the third most common behind breast and colon cancer for women.²

The cumulative effects of sun exposure over extended periods of time have been linked to the development of non-melanoma skin cancer types,^{4,5} whereas episodic, intermittent, high-intensity exposure to large amounts of sun has been linked to the development of melanoma-type skin cancers.^{4,6} Thus, the effects of exposure to ultraviolet radiation are an important concern for Australians, particularly in Queensland, which has the highest incidence rates of skin cancer in the world^{7,8} and the highest mortality rates for malignant melanoma in the world.⁹ Current aetiological evidence has established exposure of the skin to the sun as the most consistently implicated factor causing

skin cancer, and it remains the most dangerous risk factor associated with melanoma in Australia.⁹⁻¹¹ High sun exposure is especially of concern for people aged 20 years and younger, given that young people in general spend more time outdoors in the sun and perform fewer sun-protective behaviours and that skin damage in the first 20 years of life is linked to the risk of skin cancer development in later life.¹²⁻¹⁴

The sun-protection attitudes of young people are particularly important as they can be more resistant to adult advice on what to wear and how to behave in the sun. Research also shows that there is a decline in sun-protective behaviour during adolescence as the onus of responsibility for sun protection passes from parents and caregivers to the individual.¹⁰ Although young people's attitudes are fairly positive about performing some sun-protection behaviours,¹⁵ these positive factors do not necessarily translate into attitude-consistent behaviour. This attitude-behaviour inconsistency may occur due to the likelihood that many of the factors determining sun-protection

Abstract

Issue addressed: Differences in the behavioural, normative and control beliefs of young Australian sun-protectors and non sun-protectors are analysed using a theory of planned behaviour belief-based framework.

Methods: A questionnaire assessed the sun-safety-related beliefs and perceptions of a Queensland sample (n=858) of young people aged between 12 and 20 years. Two weeks later, participants reported their sun-protective behaviour for the previous fortnight.

Results: The study found that clear differences emerged between sun-protectors and non-protectors on underlying normative and control beliefs related to sun-safety behaviours (but not behavioural beliefs). Specifically, sun-protectors were more likely to believe that their friends and family think they should perform sun-protective behaviours. Sun-protectors were also more likely to perceive that a range of motivating factors would encourage them to perform sun-safety behaviours. Finally, non-protectors were more likely to report forgetfulness and laziness as barriers preventing them from performing sun-protection behaviours than sun-protectors.

Conclusions: Findings indicate that future interventions should target young people's normative and control beliefs related to sun safety.

Key words: sun safety, theory of planned behaviour, beliefs, young people

Health Promotion Journal of Australia 2008;**19**:45-51

So what?

Targeting the normative and control beliefs of young people in relation to sun protection is important to encourage an increase in sun-safety behaviours in these high-risk populations.

behaviour are complex and psychologically based. One well-known model, the theory of planned behaviour,¹⁶ has been used to explain the attitude-behaviour relationship and accounts for the complexity of decision-making by consideration of barriers (or facilitating factors) related to behavioural performance, as well as important social influences.

The theory of planned behaviour maintains that the forces that shape intention to perform a specified behaviour are the attitudes, normative and control factors related to that behaviour. Intentions encompass the motivational factors that affect behaviour and are the most proximal determinant of behaviour. Intentions are determined by attitude (positive or negative evaluation of performing a behaviour), subjective norm (perceived social pressure to perform or not perform a behaviour) and perceived behavioural control (perceived ease or difficulty of performing a behaviour). As one of the most commonly used models of attitude-behaviour relations, the theory of planned behaviour has been used successfully by many researchers to understand the motivations underlying a variety of behaviours,¹⁷ including sun protection.^{18,19}

One important feature of the theory of planned behaviour is its belief basis underlying attitude, subjective norm and perceived behavioural control. According to the theory of planned behaviour, individuals' attitudes are seen as being influenced by their beliefs concerning the consequences of the behaviour (behavioural beliefs). Subjective norm is said to be determined by the perceived expectations of specific individuals and groups (normative beliefs). In addition, Ajzen¹⁶ proposed that judgements of perceived behavioural control are a function of people's beliefs concerning the likelihood that different factors, referred to as control factors, may interfere with (barriers) or facilitate (motivators) performance of the behaviour.

Assessing the belief-based determinants of attitude, subjective norm and perceived behavioural control components of the theory of planned behaviour is an advantage for researchers in that they can establish the beliefs that distinguish those that perform or do not perform the given behaviour.²⁰ Knowledge of these beliefs has been used to improve our understanding of behaviours such as safe sex²¹ and ecstasy use.²² Thus, belief-based analyses allow a distinction between subsamples that can assist in informing health promotion programs.

This study examined a range of beliefs that differentiated young people who performed sun-protective behaviours from those who did not. Specifically, an assessment of beliefs relating to both sun-protection behaviour costs and benefits, beliefs about the controllability of sun-protective behaviours, and beliefs about how others influence the decision to perform sun-protective behaviours, was undertaken. Additionally, the study examined the relative importance of the underlying beliefs for influencing sun-safety behaviour in the target population.

There are a limited number of studies examining the efficacy of the theory of planned behaviour interventions for sun-protective behaviours. Thus, an analysis of these underlying behavioural, normative and control beliefs was thought to allow for a greater understanding of the factors that distinguished between young people who performed sun-protective behaviours and those who did not. Importantly, the theory of planned behaviour model lends itself to recommendations to engender attitudinal and behaviour change for the target behaviours under investigation.¹⁷⁻²³ By adopting a theory of planned behaviour paradigm, the belief-based determinants (such as perceived benefits or costs) of behavioural performance can be targeted in resultant education and social marketing campaigns. Therefore, the approach adopted in the current research will allow for the formulation of strategies to encourage sun-safe behaviours for young people.

Method

Participants and procedure

To examine young people's beliefs about sun safety in a high-risk area, we aimed to recruit a convenience sample of young Queensland students and employees. There were 858 participants in the study who responded at both data collection time points. The sample comprised young employees ($n=16$) and school ($n=671$), university ($n=155$) and TAFE ($n=16$) students in Queensland, Australia. Most of the participants were female (54.2%) but, due to a clerical error, 14.4% of the participants' gender is unknown. Participants were aged between 12 and 20 years with a mean age of 14.6 years ($SD=2.3$ years). Most participants were Caucasian (86.5%) and the most common skin colour reported was fair/very fair (57.5%) followed by brown/olive (38.4%). More participants were from a metropolitan area (66.9%) and slightly more of the school student participants were from State schools (53.2%) than independent schools (46.6%).

The current study used a prospective design to avoid any issues of common method variance associated with cross-sectional surveys. Before conducting the study, ethical clearance was applied for and granted from the Queensland University of Technology's Human Research Ethics Committee (QUT reference number 3925H), Education Queensland and Catholic Education. During the period from March to May, 2006, questionnaires were distributed to individual schools (via teaching staff during school time), university and TAFE (technical college) students (via a female researcher), and workplaces (via respective employers). Seventeen schools and three workplaces were invited to participate in the study. To avoid homogeneity in the sample, schools were identified in accordance with their geographical location, their status as a public or private school and their status as an all-boy, all-girl

or co-educational school. Full-time employees at workplaces were approached to obtain at least some participants who were not full-time students. Suitable workplaces were identified according to the high proportion of employees in the target age group. Six of the schools and two of the workplaces approached declined to participate due to either other research study or time commitments.

University, TAFE and employee participants were recruited via noticeboards at the respective institutions or workplaces. Incentives for participation were offered to university (course credit or the chance to win an MP3 player valued at \$99), TAFE (chance to win an MP3 player) and non-student participants (\$30). School students were offered no incentive to complete the questionnaire. While it is difficult to determine the full impact that a difference in incentives offered may have had on participation in the survey, the experience of completing the questionnaire was sufficiently similar for all participants. Items in the main questionnaire assessed the belief-based components of the theory of planned behaviour (i.e. behavioural, normative and control beliefs) in relation to performing sun-safety behaviours in the next fortnight. Two weeks later, participants were contacted to complete a follow-up questionnaire reporting on their sun-safety behaviour, consisting of a measure assessing sun safety in the previous fortnight. Questionnaires completed at each time point were matched via a code identifier.

Measures

Target behaviour

The target behaviour was defined as using SPF30+ sunscreen, wearing protective clothing such as a hat, long-sleeved shirt and sunglasses, or seeking shade during peak hours of the day (between 10 am and 3 pm). The target behaviour was framed in terms of the target, action, time and context, as stipulated by Fishbein and Ajzen²⁴ (e.g. "Performing sun-protective behaviours every time I go in the sun for more than 10 minutes during the next 2 weeks").

Elicitation study

An elicitation study was conducted with 145 adolescents and

young adults to identify the salient behavioural, normative, and control beliefs for sun-protection-related behaviours.²⁵ The elicitation study comprised a series of focus groups to elicit the most commonly occurring behavioural, normative and control beliefs. Participants were asked to report the advantages and disadvantages of performing sun-protection behaviour, the individuals or groups of people who would approve or disapprove of sun-protection behaviour, and the factors that would prevent/discourage or motivate/encourage performance of sun-protection behaviour. The most commonly reported items formed the belief-based items in the main questionnaire.¹⁶ Sample characteristics were largely representative of those from the main study.

Main questionnaire

All belief-based items were measured on seven-point Likert scales ranging from 1 = 'extremely unlikely' to 7 = 'extremely likely'. At Time 1, behavioural beliefs, normative beliefs and control beliefs were assessed (without their corresponding value assessments due to space constraints in the questionnaire and as it has been argued that the conventional evaluative items are not essential for belief measurement¹⁶). To assess behavioural beliefs, respondents indicated the likelihood that six different outcomes would be consequences of performing sun-protection behaviour. The outcomes comprised both costs (such as looking unfashionable) and benefits (such as decreasing the risk of skin cancer) of performing sun-protection behaviour. Normative beliefs were assessed by asking respondents to report the likelihood that salient others (the relevant referents, including close friends) would think that they should perform sun-protection behaviours. Participants were able to indicate if one of the listed referents did not apply to them.

To assess the motivators comprising control beliefs, respondents indicated the likelihood that a number of motivators (including cheaper sun-protection products) would help them to perform sun-protection behaviours. To assess the barriers comprising control beliefs, respondents indicated the likelihood that a number of barriers (including forgetting) would prevent them from performing sun-protection behaviours. Participants were able to indicate if one of the listed control factors did not apply

Table 1: Mean differences in behavioural beliefs for sun-protectors and non-sun-protectors.

| Behavioural belief | Non-sun-protectors n=434 | Sun-protectors n=378 | Univariate <i>F</i> | <i>p</i> | Partial η^2 |
|----------------------------------------------------|-----------------------------|-------------------------|---------------------|----------|---------------------|
| Looking unfashionable | 4.01 | 3.84 | 2.14 | 0.144 | 0.00 |
| Decreasing the risk of skin cancer | 5.90 | 5.91 | 0.04 | 0.837 | 0.00 |
| Being less affected by glare | 5.17 | 5.22 | 0.18 | 0.673 | 0.00 |
| Being uncomfortable (e.g. too hot, sweaty, greasy) | 4.80 | 4.45 | 9.15 | 0.003 | 0.01 |
| Decreasing the risk of sunburn | 5.72 | 5.80 | 0.52 | 0.471 | 0.00 |
| Being less likely to tan | 5.23 | 5.21 | 0.05 | 0.825 | 0.00 |

Significance cut-off level = $p < 0.001$.

to them. Note that one of the motivators (others reminding you to sun protect) and two of the barriers (cold or overcast weather and advertisements in general) were added to those most commonly reported control factors obtained from the elicitation study due to theoretical interest of the researchers. Demographic characteristics were also assessed; participants' age, gender and location (metropolitan versus regional) were obtained.

Follow-up questionnaire

After a two-week interval, participants completed a brief follow-up questionnaire that assessed sun-protective behaviour since the administration of the initial questionnaire. To measure behaviour, participants were asked to respond to a single item indicating the extent to which they had engaged in sun-protection behaviours during the previous two-week period. Participants rated how often (on a seven-point scale from 1 = never to 7 = always) they had performed sun-protection behaviour in the previous two weeks. In addition, participants ($n=624$ responding to this item) completed a self-description task of the types of sun-safety behaviours performed during the previous fortnight, which served as a memory prompt to increase the reliability of the measure of sun-safety behaviour.

Results

Descriptive analyses of behaviour

At Time 2 follow-up, the average number of hours participants reported spending per week in the sun in the previous two weeks was 9.9 ($SD=10.4$; range=0-40 hours). On average, participants reported having engaged in sun-protective behaviour only some of the time (mean=3.4; $SD=1.8$). The specific sun-protection behaviours reported by participants in the self-description task that were performed most often were wearing a hat (72.8%) followed by using sunscreen (62.2%). Other sun-protection behaviours performed by participants were wearing sunglasses (35.1%), seeking shade (31.1%) and wearing a form of sun-protective clothing (such as a long-

sleeved shirt) (17.5%). Note that percentages do not add up to 100% across all behaviours as participants reported performing multiple sun-protective behaviours.

Belief-based analyses

To distinguish between participants who had engaged in sun-protection behaviour and those who had not engaged in sun-protection behaviour, a dichotomous independent variable was created. Participants were classified as either sun-protectors or non-sun-protectors based on their responses to the Time 2 follow-up questionnaire. The sun-protective behaviour measure was dichotomised at the midpoint of the scale. Sun-protectors were defined as participants who scored 4 or above on the Time 2 behaviour measure whereas non-sun-protectors scored below 4 on the Time 2 behaviour measure. The dependent variables (i.e. behavioural beliefs, normative beliefs and control beliefs) were examined to identify those beliefs differentiating between young people who had used sun protection and those who had not.

Four one-way multivariate analyses of variance (MANOVAs) were conducted with sun-protection behaviour as the independent variable and belief-based measures as the dependent variables. The first MANOVA was conducted on the underlying behavioural beliefs stating the advantages and disadvantages of performing sun-protection behaviours. The second MANOVA was conducted on the underlying normative beliefs that comprised the important referents in relation to performing sun-safety behaviours. The third MANOVA was conducted on the underlying control barriers related to performing sun-protection behaviours, while the fourth MANOVA examined the underlying motivating factors. Given the study's sample size, only effects significant at the $p<0.001$ level are reported. Wilk's Lambdas were significant for three of the analyses, indicating that there were differences on normative beliefs, $F(8, 639)=4.95$, $p<0.001$, and both sets of control beliefs, $F(10, 702)=5.36$, $p<0.001$ (barriers), $F(8, 736)=6.92$, $p<0.001$ (motivators) but not for behavioural beliefs, $F(6, 805)=1.96$, $p=0.07$. To further explore the

Table 2: Mean differences in normative beliefs for sun-protectors and non-sun-protectors.

| Normative belief | Non-sun-protectors $n=340$ | Sun-protectors $n=308$ | Univariate F | p | Partial η^2 |
|--------------------------------------------|-------------------------------|---------------------------|----------------|-------|---------------------|
| Mum | 5.64 | 6.13 | 16.47 | 0.000 | 0.03 |
| Dad | 5.26 | 5.70 | 11.91 | 0.001 | 0.02 |
| Other family members | 4.70 | 5.28 | 20.88 | 0.000 | 0.03 |
| Close friends | 4.02 | 4.66 | 28.40 | 0.000 | 0.04 |
| Other friends | 3.74 | 4.30 | 23.45 | 0.000 | 0.04 |
| Teachers or work supervisor | 5.15 | 5.38 | 3.11 | 0.078 | 0.01 |
| Health care professionals or organisations | 6.04 | 6.21 | 2.26 | 0.134 | 0.00 |
| Sports mates or coaches | 5.37 | 5.73 | 8.89 | 0.003 | 0.01 |

Significance cut-off level = $p<0.001$.

identified differences between the groups, normative and control beliefs were examined at the univariate level (see Tables 1 to 3).

The belief-based analyses above were also conducted to determine if there were any differences in beliefs according to the demographic characteristics of age (younger participants, aged 12-16 years versus older participants, aged 17-20 years), gender (male versus female) and location (metropolitan versus regional). The results for behavioural beliefs were identical to those reported above. For normative beliefs, the only variation to those results reported above was for older participants whereby sun-protectors were more likely than non-sun-protectors to believe that their friends (rather than family) would think they should perform sun-protective behaviours. For control beliefs, both younger and regional sun-protectors were significantly more likely than non-sun-protectors to report that all of the listed motivating factors would help them to perform sun safety. In addition, older sun-protectors were more likely than non-sun-protectors to rate only one motivating factor (user-friendly sunscreen) as helpful in the performance of sun-safety behaviours. Older sun-protectors rated a range of additional barriers to performing sun safety (including sun protection being unavailable and too expensive) than non-sun-protectors.

Predicting sun-protective behaviour

A regression analysis was conducted to determine the relative

importance of the underlying behavioural, normative, and control beliefs for predicting sun-protective behaviour. The regression analysis used four scales as the predictor variables (behavioural beliefs, normative beliefs, control beliefs [motivators] and control beliefs [barriers]). The dependent measure for sun-protection behaviour was based on a continuous scale (see Method section). Together, the belief-based measures significantly predicted sun-protective behaviour at the two-week follow-up, accounting for 11% of the variance in sun-protective behaviours, $F(4,764)=23.96$, $p<0.001$ (see Table 4). Normative beliefs and both motivator and barrier control beliefs emerged as significant predictors of sun-protective behaviour at the two-week follow-up. However, behavioural beliefs was not a significant predictor of sun-protective behaviour at the two-week follow-up. Therefore, the more young people perceived support from important referents to perform sun safety, the fewer barriers they associated with being sun safe and the more likely that motivators were perceived as able to influence positively sun-safety decisions, the more participants reported engaging in sun-safety behaviours.

Discussion

The current study used a theory of planned behaviour framework to identify the behavioural, normative and control beliefs that differentiate between young people who use sun

Table 3: Mean differences in control beliefs for sun-protectors and non-sun-protectors.

| Control belief – motivators | Non-sun-protectors n=391 | Sun-protectors n=354 | Univariate F | p | Partial η^2 |
|---------------------------------------------------|-----------------------------|-------------------------|--------------|-------|---------------------|
| Meeting skin cancer sufferers | 5.02 | 5.41 | 10.10 | 0.002 | 0.01 |
| User friendly sunscreen (e.g. thickness, smell) | 4.82 | 5.38 | 26.48 | 0.000 | 0.03 |
| More fashionable hats and sun-protective clothing | 4.95 | 5.46 | 20.42 | 0.000 | 0.03 |
| Sunscreen stations at the beach/school/uni/work | 4.53 | 5.29 | 43.59 | 0.000 | 0.06 |
| Cheaper sun protection products | 4.37 | 4.75 | 9.00 | 0.003 | 0.01 |
| Advertisements in general | 4.21 | 4.70 | 20.41 | 0.000 | 0.03 |
| Advertisements that use scare tactics | 4.27 | 4.83 | 21.23 | 0.000 | 0.03 |
| Others reminding you to sun protect | 4.76 | 5.33 | 25.23 | 0.000 | 0.03 |
| Control belief – barriers | Non-sun-protectors n=369 | Sun-protectors n=344 | Univariate F | p | Partial η^2 |
| Forgetting | 5.35 | 4.72 | 23.29 | 0.000 | 0.03 |
| Sun protection unavailable | 3.73 | 3.53 | 2.04 | 0.154 | 0.00 |
| Laziness | 5.01 | 4.40 | 22.68 | 0.000 | 0.03 |
| Too expensive | 3.02 | 2.83 | 2.31 | 0.129 | 0.00 |
| Cold or overcast weather | 4.62 | 4.69 | 0.31 | 0.579 | 0.00 |
| Thinking that I won't be out in the sun | 4.70 | 4.76 | 0.27 | 0.607 | 0.00 |
| Being too busy | 4.67 | 4.44 | 3.57 | 0.059 | 0.01 |
| Advertisements in general | 3.55 | 3.51 | 0.16 | 0.687 | 0.00 |
| Advertisements that use scare tactics | 3.61 | 3.67 | 0.30 | 0.586 | 0.00 |
| Others reminding you to sun protect | 3.70 | 3.91 | 2.80 | 0.095 | 0.00 |

Significance cut-off level = $p<0.001$.

protection and those who do not. The results revealed that normative and control beliefs, rather than behavioural beliefs, differentiated between young people who performed sun-protection behaviour and those who did not. Additionally, the analyses examining the relative importance of these belief sets in predicting sun-safety behaviour showed a similar pattern of results. The results provide information about the key beliefs to target when formulating strategies to increase sun-protection behaviours among young people who do not often sun protect.

No behavioural belief differences emerged between sun-protectors and non-sun-protectors. This finding suggests that it would not be worthwhile to focus on the advantages and disadvantages of sun-protection behaviour as they are perceived similarly by sun-protectors and non-sun-protectors. Despite the lack of significant belief-based differences between sun-protectors and non-sun-protectors, in terms of mean ratings, the findings were generally in the expected direction. Overall, both sun-protectors and non-sun-protectors rated the benefits of engaging in sun-safety behaviours (such as decreasing the risk of skin cancer) as more likely consequences of performing sun protection actions than the associated costs (such as looking unfashionable).

Although sun-protectors and non-sun-protectors did not differ on their behavioural beliefs, the analyses revealed that there were important normative and control belief-based differences between sun-protectors and non-sun-protectors. For normative beliefs, analyses revealed that sun-protectors were more likely to believe that their friends and family think they should perform sun-protective behaviours than non-sun-protectors. This finding suggests that for non-sun-protectors it is important to increase the perceived approval of friends and family for engaging in sun-protection behaviour. Increasing the perceived approval of friends could be achieved by using strategies to promote sun protection as the norm, such as encouraging sun protection checking behaviours among friends before they go out in the sun. Normative messages such as “friends don’t let their friends sunburn” or similar messages communicating the approval of family could be incorporated into social marketing campaigns.

For control beliefs, sun-protectors were more likely to perceive

that all listed motivators (with the exception of meeting skin cancer sufferers and cheaper sun-protection products) would encourage them to perform sun-protection behaviours than non-sun-protectors. Further, analyses demonstrated that non-sun-protectors were more likely to report forgetfulness and laziness as barriers preventing them from performing sun-protection behaviours than sun-protectors. To increase sun-protection behaviour for non-sun-protectors it is important to focus on strategies to reduce the effects of forgetfulness and laziness. Initiatives that act as a reminder to sun protect (e.g. reminder sunscreen bangles, eye-catching labels and reminder messages on sunscreen containers and sun-blocking product wrappers) and that emphasise that performing sun-safety behaviours does not take a lot of effort should be used to highlight the message that it is easy to sun protect.

To reduce the impact of forgetfulness, investigation of implementation intentions may prove useful. Implementation intentions are the formulated plan detailing when, where and how an individual plans to act on their intentions (what they plan to do).²⁶ Specifying the details of how an intention will be acted on increases the likelihood of behavioural performance as the elements of the plan (the when, where and how) act as cues to behavioural performance.^{27,28} Thus, outlining the steps by which young people can develop specific behavioural plans (implementation intentions) to sun protect may act as a cue to engage in sun protection and lead to an increase in performing sun-safety behaviours.

While the research has strengths such as the prospective design and recruitment of a relatively diverse group of participants including students and employees from both metropolitan and regional areas, there are also some limitations requiring consideration. The research relied on self-report data to gauge levels of sun-protection behaviour (although qualitative measures were employed to increase the reliability of the self-report data). Future research could use other measures of sun-protection behaviour, such as reports of participants’ sun-protection behaviour by parents, teachers and friends, to increase the reliability of the data. Recent research comparing self-report (via a sun safety diary) with UV monitors, however, suggests that self-report data are reliable.²⁹ Data collection was conducted during one season only; a comparison with findings conducted throughout other seasons of the year would be useful. Further, future studies would benefit from sampling workplaces that have employees that work both indoors and outdoors.

As there are only a limited number of studies examining the efficacy of the theory of planned behaviour as it relates to sun-protective behaviours, the current study expands the body of knowledge in the sun-safety domain, particularly within an Australian context. The findings of the current study add to

Table 4: Multiple regression analysis predicting sun-protective behaviour.

| Variables | R | R ² | F | df | β |
|------------------------------|------|-------------------|--------------------|--------|--------------------|
| Behavioural beliefs | 0.33 | 0.11 ^a | 23.96 ^a | 4, 764 | -0.02 |
| Normative beliefs | | | | | 0.19 ^a |
| Control beliefs – motivators | | | | | 0.20 ^a |
| Control beliefs – barriers | | | | | -0.15 ^a |

(a) $p < 0.001$.

the existing attitude-behaviour relations literature by providing general support for using the theory of planned behaviour approach to targeting sun-protective behaviour for this at-risk population. The analyses of the underlying behavioural, normative and control beliefs in the current research provide a depiction of the differences in beliefs between young people who engage in sun-protective behaviours and those who do not.

Overall, examination of behavioural, normative and control beliefs differentiating between young people who sun protect and those who do not revealed that only normative (the perceived approval and disapproval of important others) and control (perceived barriers and motivators to behavioural performance) beliefs influenced sun-protection behaviour. Specifically, the research suggests a consideration of the approval of friends and family and barriers such as forgetting and laziness in understanding the sun-safety decision-making process of young people. Increasing the sun-protection behaviour of young Australians who do not sun protect is important to reduce the incidence of future skin cancer and skin damage among this at-risk population.

Acknowledgements

We would like to acknowledge Queensland Health for commissioning and funding this research. We would like to thank Christine Taylor, Sabrina Ostowari and Erin O'Connor, Big W variety store staff, and the principals, deputy principals, teachers and other school staff for their assistance with data collection.

References

1. Staples M, Marks R, Giles G. Trends in the incidence of non-melanocytic skin cancer (NMSC) treated in Australia 1985-1995: Are primary prevention programs starting to have an effect? *Int J Cancer*. 1998;78:144-8.
2. Australian Institute of Health and Welfare. *Cancer in Australia, 2000*. Canberra (AUST): AIHW; 2003. Cancer Series No.: 23.
3. Staples M. *The 2002 National Non-melanoma Skin Cancer Survey: A Report by the NCCI Non-melanoma Skin Cancer Working Group*. Melbourne (AUST): National Cancer Control Initiative; 2002.
4. Hill D, White V, Marks R, Theobald T, Borland R, Roy C. Melanoma prevention: Behavioral and nonbehavioral factors in sunburn among an Australian urban population. *Prev Med*. 1992;21:654-69.
5. Stenbeck KD, Balanda KP, Williams MJ, Ring IT, MacLennan R, Chick JE, et al. Patterns of treated non-melanoma skin cancer in Queensland – the region with the highest incidence rates in the world. *Med J Aust*. 1990;153:511-15.
6. Broadstock M, Borland R, Hill D. Knowledge attitudes and reported behaviors relevant to sun protection and suntanning in adolescents. *Psychology and Health*. 1996;11:527-39.
7. Balanda KP, Stanton WR, Lowe JB, Purdie J. Predictors of sun protective behaviors among school students. *Behav Med*. 1999;25(1):28-35.
8. Giles GG, Marks R, Foley P. Incidence of non-melanocytic skin cancer treated in Australia. *Br Med J*. 1988;296(13):13-17.
9. Baade PD, Coory M, Ring I. *Cancer in Queensland: Trends in Incidence and Mortality for Selected Cancer Sites 1982 to 1996*. Brisbane (AUST): Health Information Centre: Queensland Health; 2000.
10. Arthey S, Clarke VA. Sun-tanning and sun-protection: A review of the psychological literature. *Soc Sci Med*. 1995;40(2):265-74.
11. National Health and Medical Research Council. *Primary Prevention of Skin Cancer in Australia: Report of the Sun Protection Programs Working Party*. Canberra (AUST): NHMRC; 1996.
12. Cockburn J, Hennrikus D, Scott R, Sanson-Fisher R. Adolescent use of sun-protective measures. *Med J Aust*. 1989;151:136-40.
13. Hill D, Boulter J. Sun protection behaviour – determinants and trends. *Proceedings of the Health Consequences of Ozone Depletion Conference* [meetings and event page on the Internet]; 1996 Sept 9-11 [cited 2004 April]; Hobart, Tasmania. Available from: <http://home.vicnet.net.au/~menzies/hill-txt.htm>
14. Mermelstein RJ, Riesenberg LA. Changing knowledge and attitudes about skin cancer risk factors in adolescents. *Health Psychol*. 1992;11(6):371-6.
15. Baade PD, Balanda KP, Lowe JB. Changes in skin protection behaviors, attitudes, and sunburn: In a population with the highest incidence of skin cancer in the world. *Cancer Detect Prev*. 1996;20(6):566-75.
16. Ajzen I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*. 1991;50:179-211.
17. Armitage CJ, Conner M. Efficacy of the theory of planned behaviour: A meta-analytic review. *Br J Soc Psychol*. 2001;40(4):471-99.
18. Hillhouse JJ, Adler CM, Drinnon J, Turrisi R. Application of Ajzen's theory of planned behaviour to predict sunbathing, tanning salon use, and sunscreen use intentions and behaviours. *J Behav Med*. 1997;20(4):365-78.
19. Terry DJ, Hogg MA. Group norms and the attitude behavior relationship: A role for group identification. *Pers Soc Psychol Bull*. 1996;22(8):776-94.
20. Fishbein M, Stasson M. The role of desires, self-predictions, and perceived control in the prediction of training session attendance. *Journal of Applied Social Psychology*. 1990;20:173-98.
21. White KM, Terry DJ, Hogg MA. Safer sex behavior: The role of attitudes, norms and control factors. *Journal of Applied Social Psychology*. 1994;24(24):2164-2192.
22. Conner M, Sherlock K, Orbell S. Psychosocial determinants of ecstasy use in young people in the UK. *Br J Health Psychol*. 1998;3:295-317.
23. Hardeman W, Johnston M, Johnston DW, Bonetti D, Wareham NJ, Kimmmonth AL. Application of the theory of planned behaviour in behaviour change interventions: A systematic review. *Psychology and Health*. 2002;17:123-158.
24. Fishbein M, Ajzen I. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading (MA): Addison-Wesley; 1975.
25. Robinson NG, White KM, Young R McD, Anderson P, Hyde MK, Greenbank S, et al. *Sun Safety Beliefs and Images: Exploring Young People's Perceptions of Skin Cancer Prevention in a High Risk Area*. Personal communication.
26. Ajzen I. Behavioral Interventions Based on the Theory of Planned Behaviour. Amherst (MA): University of Massachusetts; undated [cited 2006 Sept]. Available from: <http://people.umass.edu/ajzen/pdf/tpb.intervention.pdf>
27. Conner M, Norman P. Predicting health behaviour: A social cognition approach. In: Conner M, Norman P, editors. *Predicting Health Behaviour: Research and Practice with Social Cognition Models*. 2nd ed. New York (NY): Open University Press; 2005. p. 1-27.
28. Sheeran P, Milne S, Webb TL, Gollwitzer PM. Implementation intentions and health behaviours. In: Conner M, Norman P, editors. *Predicting Health Behaviour: Research and Practice with Social Cognition Models*. 2nd ed. New York (NY): Open University Press; 2005. p. 276-323.
29. Yaroch AL, Reynolds KD, Buller DB, Maloy JA, Geno CR. Validity of a sun safety diary using UV monitors in middle school children. *Health Educ Behav*. 2006;33(3):340-51.

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