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Melinda Williams

University of Wollongong, mw483@uow.edu.au

Sandra C. Jones

University of Wollongong, sandraj@uow.edu.au

Peter Caputi

University of Wollongong, pcaputi@uow.edu.au

Donald Iverson

University of Wollongong, iverson@uow.edu.au

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Australian adolescents' compliance with sun protection behaviours during summer: the importance of the school context

Abstract

Adolescents exhibit significantly lower sun protection behaviours than adults in Australia. While many studies have assessed the sun protection behaviours of adolescents during summer, few studies have explored the differences in sun protection behaviours of adolescents across key contexts relevant to adolescents during summer—notably school time, weekends and school holidays. Greater understanding of differences in behaviours across these contexts provides more detailed explanations of the nature of adolescent ultraviolet exposure and thereby facilitates improved targeting of interventions for this segment whose behaviour is considered hard to change. In this study, we explore the differences in self-reported, habitual, sun protection behaviours of adolescents across key contexts during summer. A sample of 692 adolescents aged between 12 and 18 completed a self-report survey concerning habitual sun-related behaviours across four key contexts. Comparisons were made between contexts in seven key sun protection behaviours. The results show that there are significant differences in habitual sun protection behaviours of adolescents between contexts and notably increased compliance with sun protection behaviours in the school context. These findings suggest that some sun protection behaviours are not transferred between key contexts relevant to adolescents and highlight an opportunity for public health programmes to focus more specifically on facilitating the transfer of positive sun protection behaviours between contexts.

Keywords

summer, context, during, australian, behaviours, protection, adolescents, school, sun, importance, compliance

Disciplines

Arts and Humanities | Life Sciences | Medicine and Health Sciences | Social and Behavioral Sciences

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Australian adolescents' compliance with sun protection behaviours during summer: the importance of the school context

MELINDA WILLIAMS^{1*}, SANDRA C. JONES¹, PETER CAPUTI²
and DON IVERSON³

¹Centre for Health Initiatives, University of Wollongong, Northfields Ave., Room G04, Building 41, Wollongong, NSW 2522, Australia, ²School of Psychology and Centre for Health Initiatives, University of Wollongong, Northfields Ave., Wollongong, NSW 2522, Australia and ³Illawarra Health and Medical Research Institute and Centre for Health Initiatives, University of Wollongong, Northfields Ave., Wollongong, NSW 2522, Australia

*Corresponding author. E-mail: mw483@uow.edu.au

SUMMARY

Adolescents exhibit significantly lower sun protection behaviours than adults in Australia. While many studies have assessed the sun protection behaviours of adolescents during summer, few studies have explored the differences in sun protection behaviours of adolescents across key contexts relevant to adolescents during summer—notably school time, weekends and school holidays. Greater understanding of differences in behaviours across these contexts provides more detailed explanations of the nature of adolescent ultraviolet exposure and thereby facilitates improved targeting of interventions for this segment whose behaviour is considered hard to change. In this study, we explore the differences in self-reported, habitual, sun protection behaviours of adolescents across key

contexts during summer. A sample of 692 adolescents aged between 12 and 18 completed a self-report survey concerning habitual sun-related behaviours across four key contexts. Comparisons were made between contexts in seven key sun protection behaviours. The results show that there are significant differences in habitual sun protection behaviours of adolescents between contexts and notably increased compliance with sun protection behaviours in the school context. These findings suggest that some sun protection behaviours are not transferred between key contexts relevant to adolescents and highlight an opportunity for public health programmes to focus more specifically on facilitating the transfer of positive sun protection behaviours between contexts.

Key words: skin cancer prevention; adolescents; settings approach

INTRODUCTION

Australia continues to have one of the highest incidences of skin cancer in the world, with new cases estimated to outnumber other forms of cancer by a ratio of 4:1 (AIHW, 2008). Exposure to ultraviolet (UV) radiation from the sun is the primary preventable risk factor for developing both melanoma and non-melanoma

skin cancers, with adolescence a period of significant risk (Weinstock *et al.*, 1989; Whiteman *et al.*, 2001). The adolescent group demonstrates the highest level of risk behaviours in terms of low compliance with recommended sun protection behaviours (Dobbinson *et al.*, 2008), long periods of exposure to UV radiation and has a high incidence of sunburns (NSW Skin Cancer Prevention Working Group, 2007).

Australia has a long history of population-wide programmes promoting sun protection (Montague *et al.*, 2001), and recently, fear-based adolescent-targeted programmes such as the NSW Cancer Institute's 'Darker Side of Tanning'. Despite these efforts, national surveys of adolescent sun protection behaviours, conducted every 3 years since 1984, have shown consistently low compliance of adolescents with recommended guidelines for sun protection (Livingston *et al.*, 2003). Among adolescent males, routine compliance with three sun protection behaviours, wearing a hat, wearing protective clothing and using sunscreen, has ranged between 9 and 13% in the period between 1993 and 2002, and 6 and 10% compliance among adolescent females in that same period (Livingston *et al.*, 2003).

Measurement of sun protection behaviours most often involves self-report of habitual sun protection practices (Creech and Mayer, 1997; Glanz and Mayer, 2005). The Australian School Students' Alcohol and Drug Survey has provided repeated population-based data on the sun protection behaviours of Australian adolescents (Livingston *et al.*, 2003), with data collected in the context of habitual behaviours 'during summer'. The recently proposed standardized measures of adolescent behaviours (Glanz *et al.*, 2008) are also assessed in the context of 'during summer'. Measures of habitual behaviours are useful to allow generalizations across a population and to monitor change over time. The inherent generalization in the measures of habitual behaviour during summer, however, ignores potential differences in sun protection behaviours between key contexts such as at school, on weekends and during holidays.

Knowledge of how behaviours vary between contexts can provide health promotion planners with greater opportunities to influence behaviour change through improved targeting of programmes to specific contexts. The influence of the school context in sun protection has been highlighted in previous research findings, for example, that a sun protection school policy, such as compulsory hat use when outside, was related to increased sun protection among adolescents (Lower *et al.*, 1998a,b). Overall, however, the limited success of programmes to date in improving the sun protection behaviours of adolescents (Saraiya *et al.*, 2004) highlights the need to better understand the nature of

adolescent sun protection behaviours. Identifying and understanding differences in sun protection behaviours between contexts may provide the information needed to better target programmes to this challenging group in terms of stimulating behaviour change. Despite high levels of knowledge about the need for sun protection (Arthey and Clarke, 1995), adolescents have not translated this awareness into positive sun protection behaviours (Livingston *et al.*, 2003).

The present study is, to the best of our knowledge, the first attempt at quantifying the differences in self-reported habitual sun-related behaviours between key contexts relevant to adolescents. The purpose of this study was to determine whether, and to what extent, self-reported habitual sun protection behaviours among adolescents varied between specific contexts during summer.

METHODS

Participants

A sample of 692 adolescents aged between 12 and 18 participated in this study. The gender distribution of the sample was 36% male and 64% female, which under-represents the male population with the actual distribution of secondary school students in New South Wales (NSW) in 2009 of 51% male and 49% female (Australian Bureau of Statistics, 2010). Age characteristics were generally consistent with those from the state data set with 66% aged 12–15 and 34% aged 16 plus compared with an actual distribution of secondary school students in NSW in 2009 of 68% aged 12–15 and 32% aged >16 (Australian Bureau of Statistics, 2010).

Sample selection

The study adopted a convenience sampling strategy of adolescents aged 12–18. Three methods of recruitment were used: schools, online and via a regional Australian university's promotional events. Schools were selected based on their geographic location. All schools were located within a single local government area of a coastal community in Eastern Australia. Eligible schools were required to be located within 10 km of the beach reflecting a

similar coastal lifestyle and be either non-government or independent secondary schools. Ethics approval was sought from the representing education office for each school. Following ethics approval, school principals were approached to seek participation. All schools meeting the eligibility criteria were invited to participate in the study (a total of six independent and Catholic secondary schools). Each school was offered a \$200 incentive for its participation; no individual student incentives were offered. Two schools agreed to participate in the study, one independent school and one Catholic school.

An advertisement for the survey was placed on the social networking site, Facebook. A chance to win a \$50 incentive was available to participants who completed the survey online. The advertisement was promoted to individuals with a Facebook account who were between 12 and 18 years of age. To avoid individuals from the school sample completing the survey online, the online promotion was limited to individuals whose location, as defined by Facebook, was within a 25 km radius of the city of Sydney in eastern Australia, ~80 km north of the regional city. Participants were also recruited at information evenings held by the regional university for year 12 students. Attendees were offered a \$5 voucher for completing the survey and screened to ensure that they had not already completed the survey at school or online.

All participants, irrespective of the method of recruitment, were made aware prior to providing their consent that the survey related to sun protection. Participation was voluntary, with participants advised prior to the commencement of the survey of their option to withdraw at any time. The study protocol was approved by the University's Human Research Ethics Committee.

Measures

Habitual sun protection behaviour items used in the survey were based on the recently recommended standardized US measures of adolescents' habitual sun exposure and protection during summer (Glanz *et al.*, 2008) but adapted to include specific contexts relevant to adolescents during summer. The three specific contexts of 'when at school during summer', 'on the weekend during summer' and 'during the

summer holidays' were used as well as the more general context of 'during summer in general'. The specific contexts were conceptualized as key opportunities relevant to adolescent UVR exposure during the summer months. In Australia, school holidays comprise approximately half of the summer months (December–January). Participants were asked to report their usual sun protecting behaviour in each of the contexts with these items all prefaced with 'When you are outside on a warm sunny day (context), how often do you usually do the following...'.

Seven sun protection behaviours were assessed for each context: wearing sunscreen, wearing a hat, staying in the shade, wearing a shirt with sleeves that covers your shoulders, wearing pants/skirt to at least your knees, wearing sunglasses and spending most of the time inside during peak UV hours in the middle of the day. Five of these items are consistent with current guidelines for sun protection in eastern Australia and are also similar to the recently standardized US measures of sun protection behaviours (Glanz *et al.*, 2008). The additional items, a measure of lower body protective clothing and avoidance of peak UV hours, were included to increase the specificity of the assessment. Participants rated each question on a 5-point Likert-type scale ranging from 'never' (1) to 'always' (5).

A preliminary version of the survey instrument was developed for pilot testing with adolescents to guide the final selection of measures. Think-aloud sessions, a form of cognitive interviewing used to ensure survey questions work as intended (Foddy, 1994), were undertaken with 24 adolescents to test the understanding, interpretation and cognitive processes used when answering the questions. Cognitive interviewing is a technique used to increase the reliability and validity of measures and was recently used by Glanz *et al.* (Glanz *et al.*, 2008) in the development of items for behavioural research in sun protection. The preliminary survey was also reviewed for content validity with seven skin cancer prevention experts from three Australian State Cancer Councils (West Australia, Victoria and New South Wales) to ensure the survey captured the range of behaviours performed by adolescents. Adjustments were made to question wording and response options based on the results of pilot testing the survey.

Statistical analysis

Data were analysed using SPSS version 17.0. Differences in sun protection behaviours across the key contexts were analysed using a multivariate repeated-measures analysis of variance. Follow-up *post hoc* comparisons were then carried out on significant findings.

RESULTS

The mean response for compliance with sun protection behaviours in each context is shown in Figure 1. Sun protection behaviours among adolescents were generally poor in each of the contexts assessed. The mean compliance with sun protection behaviours reported in any context ranged from 1.69 to 4.34 (possible range 1 'never' to 5 'always'). Only one of the reported behaviours achieved a mean compliance >4.0 : wearing a shirt with sleeves that covers your shoulders at school. Using sunscreen at school had the lowest mean compliance ($M = 1.69$) for any behaviour in any context assessed. When combined, the average compliance of the seven sun protection behaviours in each context was similar: at school ($M = 2.87$), on weekends ($M = 2.82$), summer holidays ($M = 2.88$) and summer in general ($M = 2.87$).

In relation to compliance with individual sun protection behaviours in each context, the highest mean compliance with the sun protection behaviours performed at school were for wearing a shirt with sleeves that cover your shoulders ($M = 4.34$), wearing pants that cover at least to the knees ($M = 3.51$) and seeking

shade ($M = 3.30$). The lowest mean compliances with sun protection behaviours performed at school were: using sunscreen ($M = 1.69$), wearing sunglasses ($M = 1.79$), wearing a hat ($M = 2.49$) and avoiding peak UV hours ($M = 2.95$).

With regard to the sun protection behaviours performed on weekends, compliance with seeking shade ($M = 3.04$) and wearing a shirt with sleeves that cover your shoulders ($M = 3.33$) had the highest mean compliance compared with other sun protection behaviours on weekends. The mean compliance for the five remaining behaviours performed on weekends ranged from 2.15 to 2.90. During the summer holidays, the highest mean compliance for sun protection behaviours were using sunscreen ($M = 3.33$) and wearing a shirt with sleeves ($M = 3.18$). The lowest mean compliances were for wearing a hat ($M = 2.40$) and wearing pants to cover at least to the knees ($M = 2.54$). During summer in general, the sun protection behaviours most frequently complied with were wearing a shirt with sleeves ($M = 3.22$) and use of sunscreen ($M = 3.11$). The lowest mean compliances were for wearing a hat ($M = 2.37$) and wearing pants to cover at least to the knees ($M = 2.56$).

Multivariate analysis

To determine if there were differences in compliance with behaviours between contexts, a multivariate repeated-measure analysis of variance was performed. Significant multivariate effects were detected for behaviours [Wilks'

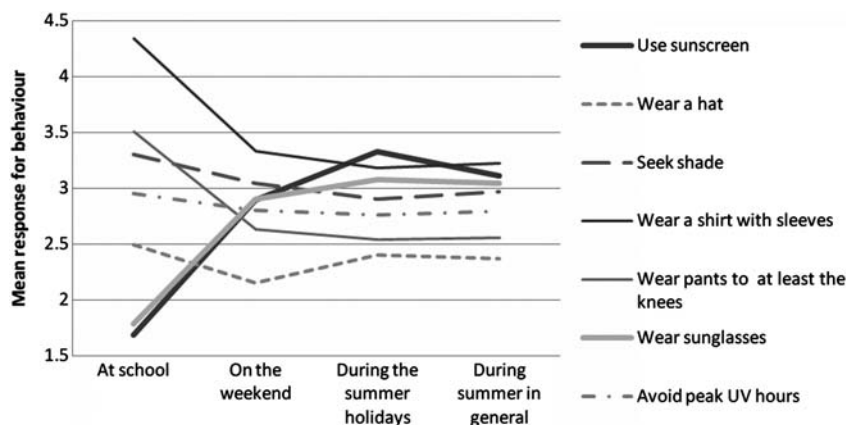


Fig. 1: Mean response for each sun protection behaviour within each context.

$\lambda = 0.503$, $F(6,575) = 94.51$, $P = 0.000$], contexts [Wilks' $\lambda = 0.934$, $F(3,578) = 13.71$, $P = 0.000$] and the interaction between behaviours and contexts [Wilks' $\lambda = 0.246$, $F(18,563) = 95.78$, $P = 0.000$]. *Post hoc* analyses were conducted to further examine the interaction effect. The mean difference and standard errors of self-reported compliance with behaviours performed in each context are reported in Table 1. The mean differences in compliance between contexts are first referenced to the context of 'during summer in general', then 'during holidays' and finally 'on weekends', until the mean differences in compliance for each behaviour are compared between each context. The findings from the *post hoc* analyses are presented under subheadings for each context.

Context of school

Significant differences were seen in the mean compliance with sun protection behaviours performed at school compared with each alternate context for six of the seven behaviours (excluding wearing a hat where there was no difference in compliance at school with compliance during the holidays or during summer in general). Adolescents' compliance with wearing

sunscreen and wearing sunglasses was significantly less frequent at school than in any other context. The use of protective clothing (wearing a shirt with sleeves and pants to at least the knees) and avoidance of peak UV hours were reported significantly more often at school than in any other context. Shade was also more often utilized in the school context than in any other context assessed. Compliance with wearing a hat at school was significantly higher than on weekends.

Context of weekends

The mean compliance with sun protection behaviours on weekends was significantly different to other contexts for six of the seven behaviours assessed (excluding avoidance of peak UV hours where there was no difference in avoidance of peak UV hours between weekends and holidays). Participants reported more often using sunscreen and wearing sunglasses on the weekend than at school; however, these two behaviours were less significantly likely to be engaged in on weekends than during the summer holidays or summer in general. Adolescents reported using shade as well as protective clothing (both upper and lower body

Table 1: Mean difference in sun protection behaviours among adolescents across key contexts during summer

	Summer in general	Holidays [mean difference (SE)]	Weekends [mean difference (SE)]	School [mean difference (SE)]
Sunscreen	Ref	-0.22 (0.03)*	0.23 (0.04)*	1.42 (0.04)*
		Ref	0.45 (0.03)*	1.64 (0.05)*
			Ref	1.19 (0.05)*
Hat	Ref	-0.02 (0.02)	0.23 (0.03)*	-0.12 (0.06)
		Ref	0.25 (0.03)*	-0.09 (0.06)
			Ref	-0.34 (0.06)*
Shade	Ref	0.08 (0.02)*	-0.07 (0.02)*	-0.32 (0.04)*
		Ref	-0.14 (0.03)*	-0.40 (0.04)*
			Ref	-0.26 (0.04)*
Shirt	Ref	0.04 (0.02)	-0.11 (0.03)*	-1.11 (0.05)*
		Ref	-0.15 (0.02)*	-1.15 (0.05)*
			Ref	-1.00 (0.05)*
Pants	Ref	0.02 (0.02)	-0.07 (0.03)*	-0.95 (0.06)*
		Ref	-0.09 (0.02)*	-0.97 (0.06)*
			Ref	-0.88 (0.06)*
Sunglasses	Ref	-0.05 (0.02)	0.13 (0.02)*	1.25 (0.05)*
		Ref	0.18 (0.02)*	1.30 (0.05)*
			Ref	1.12 (0.05)*
Peak Hours	Ref	0.04 (0.02)	-0.00 (0.03)*	-0.16 (0.05)*
		Ref	-0.04 (0.02)	-0.19 (0.05)*
			Ref	-1.5 (0.05)*

Ref, reference category.

* $P < 0.005$.

clothing) more often on weekends than during summer holidays or summer in general, but significantly less often on weekends than when at school. Hats were significantly less often used on weekends than any other context.

Context of holidays

Summer holiday behaviours were most similar to summer in general sun protection behaviours with no significant differences between contexts for five of the seven behaviours assessed (excluding sunscreen, where compliance during the holidays was significantly higher than during the summer in general; and use of shade, where shade was significantly less likely to be sought during the holidays than during summer). Adolescents reported the highest compliance with using sunscreen and wearing sunglasses during the summer holidays compared with any other context, but the lowest use of protective clothing use (both upper and lower body clothing).

Context of summer

Summer sun protection behaviours and summer school holiday behaviours were not significantly different for wearing a hat, wearing a shirt with sleeves that covered shoulders, wearing pants to knees, wearing sunglasses and avoiding peak UV hours.

DISCUSSION

To our knowledge, this study is the first to assess and compare sun protection behaviours across key contexts relevant to adolescents during summer. In the contexts assessed, compliance with recommended sun protection behaviours overall was generally low. However, there were significant differences between the contexts in relation to the specific sun protection behaviours performed, and notably increased compliance with sun protection behaviours in the school context. The behaviours with highest compliance reported in the schools are conceivably a function of the rules enforced in that context (e.g. wearing protective clothing is a function of the school uniform policy) or the structural environment (e.g. provision of shaded areas in playgrounds), thus making sun protection easier for adolescents. At the same

time, those behaviours where compliance was lowest in schools are likely a function of not being required or not enforced in that context (e.g. using sunscreen) or even in all likelihood opposed (e.g. sunglasses are generally not included in the school uniform policy given the potential for students to lose them or have them stolen), highlighting opportunities for new policy development. In this study, discriminating between contexts provided a more complete understanding of sun protection behaviours during summer and thus identified opportunities for new programme interventions.

A substantial improvement in sun protection and reduction in skin damage would likely result if adolescent-targeted programmes were able to increase the transfer of positive behaviours across contexts. When mean scores for each sun protection behaviour are combined within a context, the overall compliance with recommended sun protection behaviours in each context was very similar, demonstrating how a composite score can mask the interaction between contexts and individual behaviours. Five of the seven behaviours assessed were complied with more often at school than in any other context. The major obstacle to maximal adolescent sun protection being achieved at school is the significantly lower use of sunscreen and wearing of sunglasses at school. It follows that these behaviours should be a target of school-based interventions. The SunSmart campaign is one of the longest standing community-wide sun protection programmes, launched in 1988 in the Australian state of Victoria and run by the Cancer Council Victoria with funding by the Victorian Health Promotion Foundation. The programme identifies 'environments' as a main route of influence, with structural change in schools and knowledge dissemination to teachers a major component of the programme design (Montague *et al.*, 2001). The SunSmart programme is consistent with the 'Health Promoting Schools' approach.

The approach of health promoting schools identifies teaching and learning curriculum, the school environment and partnerships and community links as inter-related areas of foci in school health promotion. Sun protection has been previously identified as an essential element of health promoting schools (WHO, 2002). To be recognized as a SunSmart school, schools need to have a written sun protection policy meeting minimum standards relating to

curriculum, behaviour and the environment; they must be working to increase shade and reschedule outdoor activities to lower UV times of the day; and teach children about sun protection (Cancer Council Australia). Combined with the community-wide approach of SunSmart to facilitate partnerships between individuals and organizations (Montague *et al.*, 2001), these strategies match the domains within the Health Promoting Schools framework. However, a review of the first 20 years of the SunSmart programme (Montague *et al.*, 2001) acknowledged that secondary schools are more challenging than primary schools to engage in policy and practice change. Promising findings from a recent cluster randomized controlled trial of adolescents' use of purpose built shade in secondary schools highlight the potential for appropriate strategies to reduce the adolescents UV exposure in the school context (Dobbinson *et al.*, 2009). Despite the acknowledged challenges in secondary schools, our study highlights that further improvements could be achieved with increased use of sunscreen and sunglasses in the school context.

Specific initiatives worthy of further consideration in the health promoting schools framework include increased focus on teachers incorporating the development of sun protection self-efficacy in their lessons in a creative way. Creation of a pro-sun protection environment can be enhanced by modifying school policies to provide sunscreen or requesting students to bring sunscreen to school for use when outdoors in the school environment, as well as incorporating sunglasses within the uniform policy. Providing parents with information regarding their role in supporting their teenage son or daughter through role modelling can also facilitate the transfer of sun protection behaviours to alternate contexts. Schools partnering with local councils and sporting groups in making sun protection products more readily available in the community venues, such as swimming pools for carnivals, can make sun protection easier for adolescents. If adolescents develop a pattern of adhering to sun protection behaviours in the school context, there is an increased likelihood of their use transferring to other contexts. While the strategies themselves may not be new to sun protection policy in schools, the ability to focus on transferring positive behaviours between contexts provides a new opportunity for improving adolescent sun protection.

The contexts assessed (at school, weekends, holidays, summer in general) provide a different picture of adolescents' sun protection behaviours. It appears that 'summer in general' is most similar to self-reported behaviour 'during summer holidays', with no significant differences seen between summer holidays and summer in general for five of the seven behaviours assessed. This suggests that when adolescents recall their usual behaviours 'during summer', they reference their behaviours performed during the school holidays. Adolescents are a group whose behaviour is considered hard to change, and greater understanding of the nature of their UVR exposure may allow interventions to take account of the specific behaviours in specific contexts and thereby potentially result in better outcomes.

A limitation of this study is the reliance on self-report data. In the area of sun protection, it is difficult to identify a gold standard against which measurements from the tool under investigation can be compared (Lower *et al.*, 1998a,b). Various attempts have been made to establish the validity of adolescent self-report measures, including parental report and direct observation, but as Lower *et al.* noted, adolescent self-report of solar protection is valid and has the potential to be utilized with a degree of confidence to assess behaviour (Lower *et al.*, 1998a,b). A further limitation of this study is the inability to stratify the study sample based on specific school policies and curriculum within each school. Stratification would enable determination of the differential impact of specific policies within the school context on sun protection behaviours. A systematic review by Saraiya *et al.* reported insufficient evidence to determine the effectiveness of educational and policy interventions on sun protection behaviours in secondary schools (Saraiya *et al.*, 2004). Given the increased compliance with sun protection behaviours among adolescents in the school context identified in the study, our results highlight the continuing need for research in this area.

CONCLUSION

The study provides in-depth information about adolescent sun protection behaviours. Identifying that differences exist between habitual behaviours in key contexts, particularly the

importance of the school context, provides an opportunity for health promotion programmes to focus on enabling the transfer of positive behaviours to alternate contexts. Targeted activities based on specific behaviours could facilitate halting and potentially reversing the current negative trend in adolescent sun protection. The findings from this study deepen our understanding of adolescent sun exposure. In summary, sun protection behaviours are not transferred between key contexts relevant to adolescents and the results of this study highlight potential areas for more effective interventions in adolescent sun protection.

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REFERENCES

- Arthey, S. and Clarke, V. (1995) Sun tanning and sun protection: a review of the psychological literature. *Social Science and Medicine*, **40**, 265–274.
- Australian Bureau of Statistics. (2010) *Schools Australia 2009, Data Cubes*. www.abs.gov.au (12 January 2011, date last accessed).
- Australian Institute of Health and Welfare. (2008) *Australia's Health 2008*. Cat. No. AUS 99 Australian Institute of Health and Welfare, Canberra.
- Cancer Council Australia. *SunSmart Schools*. <http://www.cancer.org.au/cancersmartlifestyle/SunSmart/SunSmartschools.htm> (8 March 2011, date last accessed).
- Creech, L. and Mayer, J. (1997) Ultraviolet radiation exposure in children: a review of measurement strategies. *Annals of Behavioral Medicine*, **19**, 399–407.
- Dobbinson, S., Wakefield, M., Hill, D., Girgis, A., Aitken, J., Beckmann, K. et al. (2008) Prevalence and determinants of Australian adolescents' and adults' weekend sun protection and sunburn, summer 2003–2004. *Journal of the American Academy of Dermatology*, **59**, 602–614.
- Dobbinson, S., White, V., Wakefield, M., Jansen, K., White, V., Livingston, P. et al. (2009) Adolescents' use of purpose built shade in secondary schools: cluster randomised controlled trial. *British Medical Journal*, **338**, 1–6.
- Foddy, W. (1994) *Constructing Questions for Interviews and Questionnaires: Theory and Practice in Social Research*. Cambridge University Press, Cambridge.
- Glanz, K. and Mayer, J. (2005) Reducing ultraviolet radiation exposure to prevent skin cancer methodology and measurement. *American Journal of Preventive Medicine*, **29**, 131–142.
- Glanz, K., Yaroch, A., Dancel, M., Saraiya, M., Crane, L., Buller, D. et al. (2008) Measures of sun exposure and sun protection practices for behavioural and epidemiologic research. *Archives of Dermatology*, **144**, 217–222.
- Livingston, P., White, V., Hayman, J. and Dobbinson, S. (2003) Sun exposure and sun protection behaviours among Australian adolescents: trends over time. *Preventive Medicine*, **37**, 577–584.
- Lower, T., Girgis, A. and Sanson-Fisher, R. (1998a) The prevalence and predictors of solar protection use among adolescents. *Preventive Medicine*, **27**, 391–399.
- Lower, T., Girgis, A. and Sanson-Fisher, R. (1998b) How valid is adolescents' self-report as a way of assessing sun protection practices? *Preventive Medicine*, **27**, 385–390.
- Montague, M., Borland, R. and Sinclair, C. (2001) Slip! Slop! Slap! and SunSmart, 1980–2000: skin cancer control and 20 years of population-based campaigning. *Health Education and Behaviour*, **28**, 290–305.
- NSW Skin Cancer Prevention Working Group. (2007) *Reducing the Impact of Skin Cancer in NSW Strategic Plan NSW 2007–2009*. Sydney.
- Saraiya, M., Glanz, K., Briss, P. A., Nichols, P., White, C., Das, D. et al. (2004) Interventions to prevent skin cancer by reducing exposure to ultraviolet radiation. *American Journal of Preventive Medicine*, **27**, 422–466.
- Weinstock, M., Colditz, G., Willett, W., Stampfer, M., Bronstein, B., Mihm, M. et al. (1989) Nonfamilial cutaneous melanoma incidence in women is associated with sun exposure before age twenty. *Pediatrics*, **84**, 199–204.
- Whiteman, D. C., Whiteman, C. A. and Green, A. C. (2001) Childhood sun exposure as a risk factor for melanoma: a systematic review of epidemiologic studies. *Cancer Causes and Control*, **12**, 69–82.
- World Health Organization. (2002) *WHO Information Services on School Health: Sun Protection: An Essential Element of a Health Promoting School*. WHO, Geneva.