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

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

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

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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 represent-
ing 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 independ-
ent and Catholic secondary schools). Each 
school was offered a $200 incentive for its par-
ticipation; 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 indi-
viduals 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 com-
pleting 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 provid-
ing their consent that the survey related to sun 
protection. Participation was voluntary, with 
participants advised prior to the commence-
ment 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 protec-
tion 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 approxi-
ately 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 pro-
tection behaviours (Glanz et al., 2008). The 
additional items, a measure of lower body pro-
tective clothing and avoidance of peak UV 
hours, were included to increase the specificity 
of the assessment. Participants rated each ques-
tion on a 5-point Likert-type scale ranging from 
‘never’ (1) to ‘always’ (5).

A preliminary version of the survey instru-
ment was developed for pilot testing with ado-
lescents to guide the final selection of measures. 
Think-aloud sessions, a form of cognitive inter-
viewing 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 inter-
viewing 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 beha-
vours 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 were 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'...
$, \lambda = 0.503, F(6,575) = 94.51, P = 0.000$, 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 differences 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 [mean difference (SE)] | 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 | $0.45 (0.03)^*$ | $1.64 (0.05)^*$ | |
| Hat | Ref | $-0.02 (0.02)$ | $0.23 (0.03)^*$ | $-0.12 (0.06)$ |
| | Ref | $0.25 (0.03)^*$ | $-0.09 (0.06)$ | |
| Shade | Ref | $0.08 (0.02)^*$ | $-0.07 (0.02)^*$ | $-0.32 (0.04)^*$ |
| | Ref | $-0.14 (0.03)^*$ | $-0.40 (0.04)^*$ | |
| Shirt | Ref | $0.04 (0.02)$ | $-0.11 (0.03)^*$ | $-1.11 (0.05)^*$ |
| | Ref | $-0.15 (0.02)^*$ | $-1.15 (0.05)^*$ | |
| Pants | Ref | $0.02 (0.02)$ | $-0.07 (0.03)^*$ | $-0.95 (0.06)^*$ |
| | Ref | $-0.09 (0.02)^*$ | $-0.97 (0.06)^*$ | |
| Sunglasses | Ref | $-0.05 (0.02)$ | $0.13 (0.02)^*$ | $1.25 (0.05)^*$ |
| | Ref | $0.18 (0.02)^*$ | $1.30 (0.05)^*$ | |
| Peak | Ref | $0.04 (0.02)$ | $-0.00 (0.03)^*$ | $1.12 (0.05)^*$ |
| Hours | Ref | $-0.04 (0.02)$ | $-0.16 (0.05)^*$ | |
| Ref | | $-0.19 (0.05)^*$ | |
| | Ref | | $-1.5 (0.05)^*$ | |

Ref, reference category.

$^*P < 0.005$. 

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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
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
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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