

Sunscreen Increasingly Overshadows Alternative Sun-Protection Strategies

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Abstract The present study assessed perceptions of effective sun-protection strategies among the general public and whether these perceptions have changed in recent years. During five summers from 2007/2008 to 2011/2012, 4217 adolescents and adults living in a region with very high levels of solar UV radiation participated in annual, cross-sectional telephone surveys. Respondents' perceptions of the most effective sun-protection strategy were measured with a single open-ended question. In all survey years, sunscreen was the by far most frequently nominated sun-protection strategy, with an average mention rate of 71.0 %. The tendency to nominate sunscreen increased significantly over the 5-year study period and on average, was more common among adolescents compared to adults (81.6 vs 60.0 %) and females compared to males (73.6 vs 68.3 %). Despite respondents' increasing tendency to nominate sunscreen as the most effective sun-protection strategy, health experts have voiced concerns about flawed application practices. Current sun-protection hierarchies indicate that protective clothing and shade are better options.

Keywords Prevention · Skin cancer · Strategy · Sun-protection · Sunscreen

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Introduction

Overexposure to solar ultraviolet (UV) radiation is the leading cause of skin cancer [1]. By adopting behavioural sun-protection strategies that reduce the impact of UV radiation, skin cancer is largely preventable [1, 2].

Although individuals have various sun-protection strategies at their disposal (such as wearing sunscreen or protective clothing, seeking shade, or staying indoors), protection behaviour is generally poor and dominated by sunscreen use [3]. It is unclear, however, whether the heavy reliance on sunscreen as the primary sun-protection strategy reflects the belief that sunscreen is the most effective way of protecting the skin from sun damage or whether sunscreen is relied upon for other reasons (e.g., limited availability of alternative strategies such as shade).

From a health promotion perspective, the heavy reliance on sunscreen is problematic because alternative sun-protection strategies, most notably shade and protective clothing, have been assigned higher rankings in sun-protection hierarchies [3–5]. Despite its proven effectiveness in skin cancer prevention [6, 7], sunscreen depends on correct application [3] and should be used as an adjunct to other sun-protection behaviours rather than as a substitute [5, 8].

To inform future health promotion campaigns and identify potential deficits in sun-related knowledge and behaviours, the present study examined the general public's sun-protection beliefs, which may differ from the advice of expert groups. Respondents were asked to report the skin-protection advice they would give to others. By framing the relative importance of sun-protection strategies this way, responses were expected to be less influenced by individual characteristics, such as skin type or tanning preferences.

Method

The study received approval from the Curtin University Human Research Ethics Committee. Respondents were recruited via random digit dialling during five summers between 2007/2008 and 2011/2012 as part of a long-running survey that tracked Western Australians’ knowledge and behaviours relating to sun exposure. The annual cross-sectional surveys were conducted via computer-assisted telephone interviewing (CATI), with a total usable sample of 4217 respondents (50 % male, 50 % female) aged between 14 and 45 years. The age range reflects the importance of prevention in the younger years for reducing the lifetime risk of skin cancer [1, 9] and hence the focus on younger audiences in many sun-protection campaigns. The study findings may be used to identify specific domains that require additional educational effort and assist in informing future educational strategy.

Measurement of Perceived Importance of Sun-Protection Strategies

Respondents’ perceptions of the most effective sun-protection strategy were measured with a single open-ended question: ‘If you were going to advise someone on how to protect their skin from the sun, what would you tell them was the single most important thing to do?’. If responses contained more than one sun-protection strategy (e.g., ‘wearing a hat and sunscreen’; 3.8 % of all responses), the strategy mentioned first was entered into the analysis. An exception was the long-promoted Australian sun-protection campaign message ‘slip slop slap’ [2]. Although strictly speaking it refers to a combination of three sun-protection behaviours (i.e., slip on clothes, slop on

sunscreen, and slap on a hat), it was treated as a single strategy for the purpose of this study because of its common usage in Australian parlance.

Statistical Procedure

To evaluate the tendency to nominate sunscreen as the most important sun-protection strategy, a binomial logistic regression analysis was conducted with strategy (sunscreen versus other sun-protection strategies) as the dependent variable and survey year as a continuous predictor variable, controlling for the effects of age and gender. *P* values of 0.05 or less were considered statistically significant.

Results

Table 1 reports the percentages of respondents nominating the various skin-protection strategies in each survey year. With percentages ranging between 65.0 and 75.9 %, sunscreen was by far the most frequently reported sun-protection strategy in all years. This tendency increased significantly over the study period ($\beta=0.147$, $p<0.000$, OR = 1.158, Nagelkerke $R^2=0.096$). In addition to this increase over time, age and gender were significantly associated with the tendency to nominate sunscreen ($p<0.000$), with more frequent mentions of this sun-protection strategy by adolescents (81.6 %) and females (73.6 %) relative to adults (60.0 %) and males (68.3 %).

Protective clothing ranked second at an average of 16.0 %, while other sun-protection strategies were nominated by less than 5 % of the total sample. Contrary to sunscreen, protective

Table 1 Percentage of respondents nominating sunscreen versus alternative sun-protection strategies as the most important for skin protection

	2007/2008 <i>n</i> = 1080 (%)	2008/2009 <i>n</i> = 914 (%)	2009/2010 <i>n</i> = 805 (%)	2010/2011 <i>n</i> = 812 (%)	2011/2012 <i>n</i> = 606 (%)	Total <i>N</i> = 4217 (%)
Use sunscreen	65.0	70.5	71.6	75.9	74.9	71.0
Alternative sun-protection						
Wear protective clothing	20.2	15.0	16.2	13.3	13.5	16.0
Stay out of sun	4.0	5.5	4.6	4.3	3.6	4.4
Wear a hat	4.9	3.5	3.9	2.6	4.0	3.8
Use shade	2.8	1.9	1.2	2.2	1.7	2.0
Slip slop slap	1.9	2.4	0.9	0.7	1.3	1.5
Stay inside	0.3	0.7	0.7	0.4	0.5	0.5
Wear sunglasses	0.1	0.1	0.1	0.0	0.0	0.1
Do mole check	0.2	0.0	0.0	0.0	0.0	0.0
Others	0.3	0.2	0.4	0.1	0.2	0.2

clothing was nominated less frequently over time, reflecting a possible trade-off between these two strategies.

Discussion

The present study investigated how perceptions of the most effective sun-protection strategy varied over a 5-year period among people living in a region with very high levels of solar UV radiation. In all survey years, sunscreen was by far the most frequently nominated strategy, with 74.9 % of respondents recommending sunscreen in the most recent survey year. The tendency to nominate sunscreen increased significantly over the study period. Consistent with previously observed higher sunscreen usage rates among females [10], females were more likely to nominate sunscreen than males. In addition, adolescents were more likely to nominate this sun-protection strategy relative to adults.

Although sunscreen effectiveness in preventing skin cancer has been clearly demonstrated [6, 7], it needs to be applied correctly to provide the expected level of protection. In reality, people often use too little sunscreen, fail to apply it to all exposed skin, reapply inadequately, and/or view sunscreen as a substitute for other sun-protection practices rather than as an adjunct [5]. In addition, sunscreen is frequently used as the primary sun-protection strategy, with generally low rates of practising multiple sun-protection behaviours at the same time [11]. Sun-protection hierarchies generally rank shade seeking first, followed by protective clothing, with sunscreen ranked as the third most effective sun-protection strategy [3–5]. The heavy reliance on sunscreen use as a sun-protection strategy indicates that information about correct application needs to be strongly emphasised in health promotion messages or skin cancer prevention programmes [12].

More importantly, the present findings suggest that alternative or complementary forms of protection need to be highlighted as part of comprehensive sun-protection approaches, particularly protective clothing and shade that rank above sunscreen in sun-protection hierarchies. Australian sun-protection education programmes (e.g., *SunSmart*) have traditionally been multi-faceted in their approach, promoting sun-safe behaviour in various contexts such as schools and workplaces, and via various mass media channels [13]. The current findings may assist in identifying possible avenues for future campaigns, for instance dedicating a television commercial to the apparently less salient sun-protection strategies and building new shade structures in highly frequented places.

Despite the importance of the present findings for health promotion and educational strategy, potential limitations of the present study need to be considered, including its cross-sectional nature. More specifically, the surveys were conducted with groups of respondents sampled each summer rather than with one group tracked for the duration of the study.

Consequently, results do not represent trends at the individual level, but provide insights into population-based changes over time. In addition, only the first response was entered in the analysis if answers contained more than one sun-protection strategy. This decision was based on the basic assumption that primacy is related to perceived importance and because less than 4 % of answers reported more than one strategy.

Conclusion

The results suggest that the vast majority of people living in a high-UV region regard sunscreen as the most important sun-protection strategy, with especially high levels of support evident among adolescents and females. However, the effectiveness of sunscreen is often suboptimal due to flawed application, and as a result, health experts tend to prioritise alternative strategies such as protective clothing and shade. Although sunscreen plays an important role in skin cancer prevention, it appears that it may be necessary to increase awareness of its limitations when used in isolation.

Compliance with Ethical Standards The study received approval from the Curtin University Human Research Ethics Committee.

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Conflict of Interest The authors declare that they have no competing interests.

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