Psychology Research and Behavior Management

Dovepress
open access to scientific and medical research

Open Access Full Text Article

REVIEW

Sun-protective behaviors in populations at high risk for skin cancer

Psychology Research and Behavior Management downloaded from https://www.dovepress.com/
For personal use only.

This article was published in the following Dove Press journal:
Psychology Research and Behavior Management
20 December 2013
Number of times this article has been viewed

Diana Y Diao[1]
Tim K Lee[1,2]

[1]Department of Dermatology and Skin Science, University of British Columbia, Vancouver, British Columbia, Canada; [2]Cancer Control Research Program, BC Cancer Agency, Vancouver, British Columbia, Canada

Abstract: Over 3 million new cases of skin cancer are diagnosed in the US annually. Melanoma, a subtype of skin cancer that can be fatal if the disease is not detected and treated at an early stage, is the most common cancer for those aged 25–29 years and the second most common cancer in adolescents and young adults aged 15–29 years. The primary carcinogen for the genesis of skin cancers is ultraviolet light from solar radiation and tanning beds. In spite of massive health campaigns to raise public awareness on ultraviolet radiation, sun-protective practices still fall behind. A plausible explanation is the lack of behavioral change in the populations at risk; in this review article, we examine sun-protective behavior in the four high-risk skin cancer groups: skin cancer survivors, individuals with a family history of melanoma, individuals with physical characteristics associated with skin cancer risk, and organ transplantation patients. Findings in the literature demonstrate that increased knowledge and awareness does not consequently translate into behavioral changes in practice. Behavior can differ as a result of different attitudes and beliefs, depending on the population at risk. Thus, intervention should be tailored to the population targeted. A multidisciplinary health team providing consultation and education is required to influence these much needed changes.

Keywords: skin cancer, melanoma, risk, prevention, behavior

Introduction to skin cancer prevention

Over 3.5 million cases of skin cancer are diagnosed in the US every year.[1] The most common are basal cell carcinoma and squamous cell carcinoma. The less common but potentially more deadly is malignant melanoma which accounts for about 75% of skin cancer deaths; and 1 in 49 people will be diagnosed with malignant melanoma during their lifetime.[2] Ultraviolet light is the most important carcinogen for the genesis of skin cancers, and solar radiation is classified as a carcinogen and the main source of human exposure to UV radiation.[3] Excessive sunlight exposure, especially when associated with sunburn history, has been implicated as the main environmental agent responsible for skin cancer occurrence.[4]

Since the Slip! Slop! Slap! campaign conducted by the Anti-Cancer Council of Victoria, Australia in 1980, numerous public health campaigns have been carried out to increase knowledge and awareness of the dangers of UV exposure and benefits of sun protection in countries with a large white population.[5–8] The overall themes of these recommendations are similar (Table 1 lists the current sun protection recommendations from relevant health agencies). These include primary prevention measures such as decreasing sun exposure and tanning bed usage, and increasing sun protection such as use of sunscreen, hats, and protective clothing; as well as secondary prevention

Correspondence: Tim K Lee
BC Cancer Agency, 675 West 10th Avenue, Vancouver, British Columbia, Canada V5Z 1L3
Email tlee@bccrc.ca

submit your manuscript | www.dovepress.com
Dovepress
http://dx.doi.org/10.2147/PRBM.S40457

© 2014 Diao and Lee. This work is published by Dove Medical Press Limited, and licensed under Creative Commons Attribution – Non Commercial (unported, v3.0) License. The full terms of the License are available at http://creativecommons.org/licenses/by-nc/3.0/. Non-commercial uses of the work are permitted without any further permission from Dove Medical Press Limited, provided the work is properly attributed. Permissions beyond the scope of the License are administered by Dove Medical Press Limited. Information on how to request permission may be found at: http://www.dovepress.com/permissions.php

Table 1 Summary of sun protection guidelines from relevant health agencies (Accessed October 24, 2013)

Australian Cancer Council (http://www.cancer.org.au/preventing-cancer/sun-protection/preventing-skin-cancer/)
- Slip on sun-protective clothing
- Slop on broad-spectrum, water-resistant SPF 30 sunscreen; 20 minutes before going outdoor; never use sunscreen to extend time in the sun
- Slap on a hat – broad brim or legionnaire style
- Seek shade
- Slide on some sunglasses

American Cancer Society (http://www.cancer.org/cancer/cancercauses/sunanduvexposure/skin-cancer-facts)
- Avoid direct exposure to the sun between 10 am and 4 pm
- Seek shade
- Follow the Slip! Slop! Slap! rules
- Wrap-on sunglasses
- Don't use sunscreen as a way to stay out in the sun longer
- Sun protect even on cloudy or overcast days
- Avoid other sources of UV light. Tanning beds and sun lamps are dangerous

US Preventive Service Task Force Recommendations (http://www.uspreventiveservicestaskforce.org/uspstf/uspsskco.htm)
- The USPSTF recommends counseling children, adolescents, and young adults aged 10–24 years who have fair skin about minimizing their exposure to ultraviolet radiation to reduce risk for skin cancer
- The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of counseling adults older than 24 years about minimizing risks to prevent skin cancer

Canadian Cancer Society (http://www.cancer.ca/en/prevention-and-screening/live-well/sun-and-uv/being-safe-in-the-sun/?region=bc)
- Plan outdoor activities before 11 am or after 3 pm or when the UV index is 3 or less
- Find shade or take an umbrella
- Cover up – loose-fitting, tightly woven, and lightweight clothing; wide-brimmed hat; SPF 15+ broad-spectrum sunscreen and SPF 30 sunscreen for planning to stay outdoor most of the day
- Wear sunglasses
- Don't use indoor tanning beds

European Skin Cancer Foundation (http://www.escf-network.eu/en/patients/prevention/being-in-the-sun.html)
- Avoid sun exposure between 11 am and 3 pm
- Use sunscreen regularly/daily SPF 30 or higher, effective for UVB and UVA
- Apply sunscreen 20–30 minutes prior to sun exposure
- Think of using sun-protective textiles
- Use a hat or cap
- Protect your eyes with sunglasses
- Drink enough water to ensure sufficient hydration
- Avoid artificial sunlight (sun beds/tanning salons)

World Health Organization (http://www.who.int/uv/sun_protection/en/)
- Limit time in the midday sun (between 10 am to 4 pm)
- Watch for the UV index
- Use shade wisely
- Wear protective clothing – wide-brimmed hat, sunglasses, tightly woven, loose-fitting clothes
- Use sunscreen: broad-spectrum sunscreen SPF 15+, reapply every 2 hours or after working, swimming, playing, or exercising outdoors
- Avoid sunlamps and tanning parlors

Abbreviations: SPF, sun protection factor; UV, ultraviolet; USPSTF, United States Preventive Service Task Force; UVA, ultraviolet A; UVB, ultraviolet B.

measures such as early detection screening programs.[9–12] However, the US Preventive Services Task Force limits its sun protection recommendations to only children, adolescents, and young adults who have fair skin and are aged 10–24 years. Despite these widespread public campaigns, sun-protective practices still fall behind, including Australia, the leading country in sun protection practice.[12–21]

The following gives a brief overview on the importance of preventive behavior in reducing skin cancer risk, and examines how sun-protective beliefs impact sun-protective behavior in various populations at risk for skin cancer. The goal of this article is not to provide a systematic review of sun behavior, to discuss the overarching behavioral theory, or to make comments on the current recommendations from the health agencies targeting the general population. Instead, we examine the sun behavior challenges facing specific high-risk groups based on existing medical and epidemiologic evidence. To the best of our knowledge, no published review paper examines the behavior findings of all the main high-risk groups discussed here. In addition, we would like to open the dialog with the psychology research community in advancing targeted strategies to help find solutions in the near future.

The importance of preventive behavior

Skin cancer can be prevented, and prevention should start in early childhood and continue through a person's lifetime.[22] A comprehensive meta-analysis has demonstrated that increased sunburns from childhood, adolescence, and adulthood all increase the risk of melanoma.[23] In addition, effective prevention as well as UV protection is necessary (such as regular self skin exams [SSEs] and total body skin exams [TBSEs] by a physician), with melanoma mortality rate reaching 24% in those between 75–84 years of age in the US.[1] From a health care cost and benefit perspective, the best available evidence from Australia suggests that routine sunscreen use is a cost-effective investment for the government in saving health care costs for the treatment of skin cancers in white populations residing in high sun areas;[24] however, a meta analysis suggested that fair-skinned individuals who live in high latitudes and rely on common sunscreens, which block off UVB but leak a large dose of UVA, for skin cancer prevention may result in higher risk of melanoma.[25] Thus, UV avoidance is the most important practice in primary prevention of skin cancer, and these methods include: 1) avoid intense midday sun, typically between 10 am and 3 pm, and seek shade whenever possible; 2) wear wide-brimmed hats and tightly woven, full-length clothing; 3) use broad-spectrum sunscreens with

an SPF of at least 30, apply adequate amounts, and reapply every 2 hours (more frequently if swimming or sweating); 4) avoid sunlamps and tanning salons.

It has been shown that melanoma is a progressive disease whose prognosis in survival is strongly inversely related to tumor thickness at the time of diagnosis;[26–28] therefore screening programs, such as regular SSEs and TBSEs, for early detection of skin cancer are an important form of secondary prevention, as early detection and treatment has the potential to improve survival in melanoma patients.

Although there is a current debate on whether sun protective behavior is harmful, including vitamin D deficiency adults living in high latitudes, the US Preventive Services Task Force reported in 2012 that there is little evidence to support such a hypothesis.[29] Thus, the current best medical practice is to recommend sun protection and early cancer detection.[30] However, while public health campaigns have been widespread, melanoma incidence and mortality rates are still rising. One plausible explanation for this is the lack of behavioral change in the populations at high risk for skin cancer.

Populations at risk

Statistics from the US are cited here to illustrate the main populations at risk. Although the mean age of diagnosis for melanoma is 52 years, over 35% of cases occur in people less than 45 years of age; it is the most common type of cancer in those aged 25–29 years and the second most common cancer in adolescents and young adults aged 15–29 years.[31] Individuals who are at significantly elevated risk for skin cancer have been identified as those who have one or more of the following (literature cited in discussing each high-risk group in this paper was obtained using key search terms on PubMed/MEDLINE, and only those published in English were used. Updated dermatology textbook chapters were cited for pathophysiology of skin cancers):

1. Previous personal history of skin cancer; with melanoma patients having an elevated risk of 4%–9% for developing another primary melanoma.[32–34] (Search terms used: skin neoplasms; health knowledge, attitudes, practice; health behavior; melanoma; medical history).
2. Family history of melanoma; having one first-degree relative (FDR) doubles one's risk, and three or more FDRs increases risk by 35–70 times.[35] (Search terms used: skin neoplasms; health knowledge, attitudes, practice; health behavior; family health; family history).
3. Physical attributes such as fair skin ± freckling, tendency to sunburn with high number of sunburns in life, red/blond hair, or having a high number of nevi (or moles) or any number of atypical nevi.[36] (Search terms used: skin neoplasms; health knowledge, attitudes, practice; health behavior; skin pigmentation; skin type; dysplastic nevus syndrome; multiple nevi).
4. History of organ transplantation, and/or been taking immunosuppressive medication regimens.[37] (Search terms used: skin neoplasms; health knowledge, attitudes, practice; health behavior; organ transplant; transplant).

The next sections explore whether there has been a change in people's sun-protective behavior, especially in those who are particularly at high risk for skin cancer, and examine how their behaviors are influenced, if at all, by their beliefs on sun-protection. We will examine how sun-protective behavior is influenced in each of the above groups. Most studies are cross-sectional surveys. Other study types such as a case-control study are specified in the manuscript. Other groups at known elevated risk for melanoma and/or non-melanoma skin cancers are not examined here, as they are very distinct entities and few studies examining sun-protective behavior in these specific groups exist, including those with known specific genetic predispositions (eg, xeroderma pigmentosum, melanocortin-1 receptor mutations, CDKN2A mutations, etc), and those with specific disease states (eg, HIV patients, non-Hodgkin's lymphoma patients, etc). We hope that as advancements such as whole genome screening become more readily accessible and widespread, more data on sun behavior would become available in these specific populations.

How sun-protective beliefs impact on behavior

Previous personal history of skin cancer

In people with a previous history of skin cancer and melanoma survivors, studies in Western countries have consistently shown that attitudes toward sun-protection methods do change significantly before versus after skin cancer diagnosis.[20,34,38–43] Surprisingly, it was not the lack of sun-protection knowledge prior to diagnosis that determined attitude, because over 70% of melanoma survivors in six different dermatologic practices in the northeastern US stated that they were well-informed about sun-protection methods before diagnosis.[38] These patients knew about the risks of sun exposure, but believed that they were not at risk of developing melanoma, which led to inadequate preventive practices and subsequent carcinogenesis.[38] Melanoma survivors state that the diagnosis of melanoma is the major factor affecting change in behavior.[38] Alarmingly, perhaps the social and media influence on the physical attractiveness of a tan is so

alluring, that 27% in a population-based case-control study conducted in the west coast of Canada still had a positive or neutral attitude toward tanning, even after melanoma diagnosis.[41] This demonstrates one of the barriers in motivating at-risk populations to put knowledge into practice.

Although there appears to be significant changes in attitude and behavior with a diagnosis of skin cancer, these changes are inadequate given the high mortality rate associated with melanoma. In several Australian, US, and Canadian studies, melanoma survivors showed improved sun-protection behavior such as avoidance of sun exposure, wearing protective clothing and accessories, and application and reapplication of sunscreen.[34,38–41] However, a significant proportion of melanoma survivors still engaged in outdoor activities, showed lack of sun protection habits, and some admitted to getting sunburns.[41,44] It is difficult to explain the risk behavior of this group of melanoma survivors. Research with French and Swiss university students has shown that people will rationalize many hours of high UV exposure in the sun because they have applied sunscreen;[45] perhaps some melanoma survivors rationalize fewer sun-protective behaviors because they have routine skin exams and follow-up visits with their physician and/or dermatologist.

In terms of secondary prevention, routine skin self-examinations (SSEs) are recommended by the US and the UK for skin cancer survivors even though mortality reduction data is insufficient,[46,47] whereas regular total body skin exams (TBSEs) by physicians are pertinent and can decrease melanoma deaths by more than 50% as reported by a study in northern Germany.[48] Surveys of high-risk skin cancer patients have shown that a variety of factors contribute to skin cancer survivors' likelihood to perform SSE, such as being female, dermatology visits with lesion biopsy, and perceived personal risk for skin cancer.[39,44,49] According to an Australian study, although a higher proportion of skin cancer survivors perform SSE than the general population, only less than half of melanoma survivors (42%) and non-melanoma skin cancer patients (46%) performed SSE within the past year.[50] Of the melanoma survivors who do perform SSEs, only 13.7%–22% of these individuals reported performing thorough SSEs.[34,39,44] This means that over 75% of people in this high-risk group could be missing potential malignancies if SSEs were the only form of secondary prevention, highlighting the importance of two things: 1) the need for increased education on how to conduct proper and thorough SSEs, as only half of melanoma survivors reported having received education on how to do a SSE;[44] and 2) the establishment that skin cancer survivors are to receive regular TBSEs performed by physicians. A total of 88% of survivors reported having a TBSE in the past few years, and it was shown that perceived risk of melanoma positively correlates to having TBSEs.[39,44] Therefore, the lower a patient's perceived risk is for melanoma the less likely that patient would have a TBSE.

Despite exposure to sun-awareness campaigns for melanoma and skin cancer prevention, data from a Canadian study suggest that the high-risk individuals' and melanoma survivors' pre-diagnosis knowledge, attitudes, and behavior, was similar to those of the general population.[40] These patients did not seem to be more specifically targeted to receive increased sun-awareness advice prior to being diagnosed with melanoma. Health care professionals such as primary care physicians and dermatologists have a key role to play in actively counseling not only those with a previous diagnosis of skin cancer, but also those at an elevated risk for skin cancer.

Family history of melanoma

Individuals with first-degree relatives (FDRs) who have a history of melanoma are at greatly increased risk for developing melanoma.[35] Despite this increased risk amongst family members, engagement in skin cancer risk-reduction behaviors is low and a significant proportion of these individuals participate in sun-seeking and tanning behaviors.[51–56] A US study reported more than one-third of relatives of melanoma survivors rarely used sunscreen and more than 60% rarely or never wore protective clothing.[54] In another study of 404 siblings of recently diagnosed patients in the Boston area, about half of the adult siblings did not report routine sunscreen use.[56] An Australian study from 2008 showed that even in individuals with a strong family history (ie, more than three family members with confirmed diagnoses of melanoma), some participants still expressed ambiguity regarding the causes of melanoma and the effectiveness of health behaviors such as sun protection.[57] Various demographic, psychological, and social factors contributed to differing sun-protection and sunbathing behaviors in these family members. A UK case-control study of 170 individuals with a family history of melanoma and 140 geographic healthy controls reported that higher education level, lower perceived benefits of sunbathing, older age, and greater concerns about photo-aging were associated with higher sun protection behaviors.[51,58] Similar observations were found in a recent phone survey in the northeastern US, which also confirmed that less educated and younger females who expressed higher perceived benefits of sunbathing endorsed higher tanning norms.[51] Also the sun protection and tanning practices of celebrities, friends, and

family also influenced sun behavior.[51] However, characteristics of the proband's disease, such as stage and time since diagnosis as well as attitudinal variables associated with the severity of cancer such as distress, disease severity, and perceived risk, were not associated with sun protection or sunbathing.[51,55] These findings suggest that targeted intervention in less educated and female relatives of melanoma survivors focusing on attitudinal factors such as perceived benefits of sunbathing, photo-aging knowledge, and social influences may be of benefit in this at-risk group.

When examining sun-protection practices amongst children with a family history of skin cancer, reported sun-protection behavior such as use of sunscreen varied between 42% (all skin cancer types in the family)[53] and 79% (diagnosis of melanoma in the parent).[59] The subjects of these two studies were from the US, although the mean age of the former study (14.5 years) was older than that of the latter study (8.1 years). In addition, the proportion of these children that had sunburns in the past year was relatively high, between 39%[53] and 49%,[59] which is similar to the rate of sunburns observed in a large study of over 10,000 US children and adolescents.[60] The high incidence of sunburns may be indicative of inadequate protection as well as the phenotypic predisposition to sunburns inherited from parents who had skin cancer. A number of factors may contribute to a child's level of sun protection, such as parental enforcement of sun-protective practices and level of outdoor activities at school. It has been demonstrated that older children use sun protection strategies less often and are more likely to experience sunburns, potentially reflecting independence from parental control and increased level of sun-exposed recreational activities.[59]

Adolescents and young adults with a family history of melanoma reported low engagement in sun protection and high levels of sun exposure, with almost one-third of young Swedish adults reporting frequent sunbathing and tanning bed use at least once per month.[52] In this at-risk age group, sun behavioral influences have been reported to include the preference for tanned skin, having many friends who were tanned, and belief in the worth of enduring the unpleasantness of burning to get a tan.[52,60] A large population-based study of more than 10,000 US adolescents and children showed that the majority of teenagers do not follow sun-protection practices.[60] It also showed a significant sex difference where girls are more likely to be influenced by their peer network, and had a 6-fold increase in tanning bed use than boys.[60] Moreover, tanning bed use in older girls was far more likely than younger girls, with rates increasing from 7% in 14-year-old girls to 35% in 17-year-old girls.[60] Other studies have showed similar female predisposition,[54,56] but some studies did not.[52,55,58] The overall trend in this age group again highlights the importance of targeting a set of specific beliefs, attitudinal factors, and peer and media influences in shaping sun behaviors in adolescents and young adults at risk.

Given the known elevated risk in this population with a family history of skin cancer and melanoma, compliance to sun-protective behaviors and avoidance of sun exposure and tanning are overall inadequate. Furthermore, it has been reported that FDRs of melanoma patients rarely present to dermatologists for TBSEs, despite recommendations made to do so;[61] the reported rates of SSEs among those at risk were varied from 39% in a US study,[62] 41% in an Australian study,[50] to 81% in a Swedish study.[9] These disconcerting trends may suggest that high-risk individuals actually were not made aware of the important facts of skin cancer and risk of melanoma in family members. The potential lack of discussion about this topic between those diagnosed with melanoma and their relatives resulted in inadequate understanding regarding the seriousness of melanoma and level of risk conferred upon family members.

Physical characteristics at increased risk

Light skin pigmentation, blond or red hair, blue or green eyes, and prominent freckling tendency are phenotypic features associated with an increased risk of melanoma.[31] Tendency to sunburn with Fitzpatrick skin phototype I–II (ie, white skin, does not tan or tans with difficulty, and burns easily) is also associated with increased risk, whereas melanoma occurs much less frequently in type V–VI skin (ie, brown or black skin, tans easily, and usually does not or never burns).[31] Individuals with the above at-risk phenotypic features are typically of European descent, and their vulnerability to elevated skin cancer risk suggests that skin pigmentation plays a protective role. When comparing skin phototypes in terms of sun exposure, a Danish study utilized personal dosimeter and sun-exposure behavior diaries and found that there were no differences in the number of days with UV exposure in skin types I and II, but the UV dose received per day with sunscreen applied was significantly lower in types I and II.[63] Reassuringly, subjects with skin types I and II also applied sunscreen with a higher SPF than those with other skin types.[63] These findings are in agreement with a UK case-control study showing that hair color and Fitzpatrick skin type were not predictive of sunburn frequency.[58] An Australian telephone survey also observed that skin type was significantly linearly related to sun-protective behavior, such

that protection was greatest among skin types I and II.[64] It was also found that skin cancer beliefs were poor correlates of tanning and protection behaviors in young adults.[64] While it is encouraging to see that sun-protective behavior is higher in this group due to a tendency to burn and not tan, any sunburn episodes in these individuals incur greater risk for skin cancer given their phenotypic predisposition, and thus, there needs to be continued education and emphasis on hypervigilance when it comes to sun protection in this group.

On the other hand, the above findings also show that those with skin types III and IV (ie, white and light brown/olive skin, tan easily but may initially burn or hardly burn) report the highest tendency to participate in routine indoor and outdoor tanning, especially amongst the younger female population in Europe and Australia.[63–65] A recent US survey of over 3,800 young females (ages 14–22 years) by the American Academy of Dermatology also showed that a vast majority (86%) of young females who use tanning beds knew that tanning beds cause skin cancer, highlighting risk-taking behavior in the younger population.[66] This trend is alarming and the psychology driving such risk behavior is intriguing;[14] it has become a topic of great interest and warrants a separate discussion.

Another physical feature that is an independent risk factor for melanoma occurrence is the high number of melanocytic nevi and/or the presence of atypical nevi. Atypical nevi were defined using the following criteria: there must be a macular component in at least one area; in addition, at least three of the following features must be present: 1) border not well defined; 2) size 5 mm or more; 3) color variegated; 4) contour uneven; 5) presence of erythema.[67] The relationship between nevi and melanoma has been examined extensively and shown in a meta-analysis of 46 studies,[67] showing that the risk for people with a high nevi count (between 101 and 120) had almost seven times increased risk than for people with a low nevi count (between 0 and 15). Also, those with five or more atypical nevi were at an increased risk that was six times higher than people without atypical nevi.[67] In epidemiological studies, the nevi count was consistently correlated with a history of sunburns and with intense sun exposure, especially before the age of 20 years.[68–72] Given this correlation, intervention and protection early in life is paramount in decreasing the risk for melanoma. Studies of children aged 7 and 9 years from Sweden and Paris, respectively, found that a child's nevi count is strongly influenced by the attitude of his or her parents, and that a higher nevi count was found in children whose parents actively sought the sun on their holidays or for outdoor tanning.[73,74] This means that the parents' lifestyle preferences could determine nevi development and therefore elevated risk of melanoma in children. Another postal questionnaire study targeted at the parents of preschool and primary school children in New Zealand showed that 30% of the parents believed their child looked healthier with a suntan, and 40% intended to let their child get a suntan during the summer, with 29% of the children reported as being sunburned.[75] Education and prevention campaigns must be aimed at both parents and their children, as parents represent a social model for their children.

In terms of examining influences of sun-seeking or sun-protective behaviors specifically in adults with a high nevi count, existing literature is lacking. Studies of SSE in 440 Canadian adults with atypical nevi using anonymous questionnaires showed that although the majority claimed to perform SSE, those who did so on a monthly basis was less than 10%.[76] An Australian study showed less than 40% compliance in performing SSE in individuals with phenotypic risks, including skin phototypes I and II, blond/red hair, blue/green eyes, or many nevi.[50] In individuals within familial atypical multiple mole melanoma families with known histories of atypical nevi and melanoma, one study in the Netherlands found that attitude towards SSEs was the only reliable predictor for SSE performance, even if an individual was capable of performing the examination and had a strong intention to carry out the examination.[77]

Immunosuppression and organ transplantation

Squamous cell carcinoma (SCC) and basal cell carcinoma (BCC) account for over 90% of skin cancers in organ transplant patients and affect over 50% of white transplant recipients. SCC is the most common in this population, occurring 65–250 times more frequently than in the general population; BCC is increased about ten times; whereas melanoma risk has been reported to be increased by a factor of 1.6–4.[78] A combination of longstanding immunosuppression and UV radiation likely induces carcinogenesis in this group.[78] Although transplant patients are also at elevated risk for other types of skin cancers (eg, Kaposi's sarcoma, Merkel cell carcinoma, etc), we will not be examining those here. Given the significantly elevated risk for SCC and BCC, effective sun-protection behavior is of great importance in these individuals, as UV avoidance is more pragmatic and less hazardous than modifying immunosuppressive therapy for transplant patients.

Studies have shown that many organ transplant patients do not use adequate sun protection. A Canadian study showed that one-third of patients did not use sunscreens,

and only one-third of patients wore hats and protective clothing regularly and 23% continued to actively seek a tan.[79,80] Alarmingly, a study comparing 200 organ transplant recipients in the US and a random sample of 1,091 US residents discovered that 79% of these patients believed that the appearance of a tan is attractive.[80] The patients reported an attitude where people look 'better, healthier' with a tan;[80] this may be a key factor in influencing sun behavior in this population, who may be particularly concerned with the perception of good health after organ transplantation. Evidence also suggests that education in this population is inadequate, given that 88% of organ transplant patients in the study reported not being aware of their increased risk of skin cancer.[80] Similar deficiencies are observed in other studies carried out in central-eastern Europe and the UK, and a need for education from the transplant health team and dermatologists is clearly demonstrated.[81,82] When dermatology consultation or specific education has been integrated into patient care, follow-up studies in specifically renal transplant patients have demonstrated that the level of knowledge regarding UV protection post-transplantation increased remarkably.[83,84] However, awareness and the perception of risk do not always inhibit risk behavior in this group, shown in a study conducted in Paris where 91% of transplant patients state they have been informed on at least three occasions of the need for sun protection but less than two-thirds of patients avoided sun exposure and/or used sunscreen, and less than half wore protective clothing.[84] Those exhibiting better compliance were women and of Fitzpatrick skin phototype I and II.[84]

Aside from attitudinal factors and limited patient knowledge mentioned above as sources of behavioral influence, the cost of sunscreen might be another barrier in some transplant patients, especially those who are retired with fixed incomes.[85] Oftentimes, this elderly population of transplant patients is particularly at high risk for skin cancer especially if they have had significant lifelong sun exposure. Although the mortality rate is low in non-melanoma skin cancers, they can be a source of increased morbidity in transplant patients (eg, multiple surgical excisions and the risks associated with surgery). The need for dermatology consultation and follow-up examinations in transplant patients is evident, and continued education and awareness is required.

Long-term effects on patient health

When preventive behavior is inadequate and a diagnosis of skin cancer is made, the news is never pleasant but the impact of the diagnosis on patients' long-term health and quality of life can be highly variable. The outcome depends on circumstances related to both the disease and the patient. Disease-related factors include: 1) the type of skin cancer (ie, SCC and BCC in general have a better prognosis than melanoma); 2) the stage of the cancer (ie, curable topically, procedurally, or surgically if diagnosed and treated in the early phase, but potentially lethal with increased risk and morbidities when diagnosed and treated late); and 3) the nature of the treatment (eg, minor procedure versus major surgery ± systemic treatment such chemotherapy or radiation therapy). Patient-related factors include: 1) one's personal outlook and attitude regarding the diagnosis of skin cancer (eg, tumor-related stress), 2) existing social situations (eg, level of education, socioeconomic status, etc), and 3) other stresses and support network (eg, single vs married, relationships with family and friends, etc). All these can have an impact on patient outcome and long-term quality of life. The most important influences on mortality are arguably the stage of the cancer and the socioeconomic status of the patient.[86,87]

After an individual is treated, those at high risk for developing another skin cancer or recurrence should be followed up by a physician and/or dermatologist on a regular basis. This follow-up care for secondary prevention can also affect long-term health and quality of life for patients. An Australian study on melanoma survivor follow-up showed both perceived benefits (eg, reassurance, information/education, psychosocial support, etc) and downsides (eg, anxiety, inconvenience of travel and time, frequency of visits, etc) to regular follow-up.[88] The care plan patients receive after the initial treatment of skin cancer is also an important topic to be addressed by the physician at the time of diagnosis.

Conclusion

Skin cancer is by far the most common cancer, and melanoma is one of the few forms of cancer whose mortality rates continue to rise worldwide, with incidence rates increasing faster than any other cancer.[89] Primary and secondary prevention education has been widespread, but population behavior has not followed adequately, especially among at-risk groups.

Behavior can differ as a result of different attitudes and beliefs, depending on the population at risk. For example, believing the physical attractiveness of a suntan is appealing, contrasted with the effects of photoaging as a motivator for sun protection in women might provide attitude-specific intervention in this population. However, education and behavioral intervention would be different in improving SSE and TBSE rates in high-risk individuals

such as melanoma survivors, as one's perceived risk for melanoma can play a key role. In terms of changing behavior in skin cancer survivors, family members of melanoma survivors, and parents who suntan and put their children at elevated risk, there may be significant challenges in translating knowledge into behavior given social and media influences. On the other hand, sun-protective behaviors are practiced to a greater extent in those with Fitzpatrick skin phototype I and II, possibly because of their tendency to burn which is unpleasant, and their inability to tan.

Findings in the literature demonstrate that increased knowledge and awareness does not consequently translate into behavioral changes in practice (eg, transplant patients, adolescent females, etc). A recent systematic review showed that behavioral counseling could influence sun-protective behavior;[90] thus, this should be carried out keeping in mind that intervention needs to be tailored to the population targeted. More research is needed to gain a better understanding of all the complex factors contributing to low compliance rates in these specific high-risk groups, which would hopefully aid in the development of targeted risk communication interventions that can influence behavior. A concerted effort from a multidisciplinary health team may help in addressing specific concerns and needs, and in turn tailor counseling and education to influence much needed change.

Disclosure

The authors report no conflicts of interest in this work.

References

1. Skin Cancer Facts [webpage on the Internet]. Atlanta: American Cancer Society, Inc; 2013 [updated March 25, 2013]. Available from: http://www.cancer.org/Cancer/CancerCauses/SunandUVExposure/skin-cancer-facts?sitearear_PED2008. Accessed July 1, 2013.
2. Howlader N, Noone AM, Krapcho M, et al. SEER Cancer Statistics Review, 1975–2010 [webpage on the Internet]. 2013 [updated Nov 2012]. Available from: http://seer.cancer.gov/csr/1975_2010/. Accessed July 1, 2013.
3. El Ghissassi F, Baan R, Straif K, et al ; WHO International Agency for Research on Cancer Monograph Working Group. A review of human carcinogens – part D: radiation. *Lancet Oncol.* 2009;10(8):751–752.
4. Gandini S, Sera F, Cattaruzza MS, et al. Meta-analysis of risk factors for cutaneous melanoma: II. Sun exposure. *Eur J Cancer.* 2005;41(1):45–60.
5. Dobes WL. Public education: an approach, skin cancer awareness project using the solar meter. *J Am Acad Dermatol.* 1986;14(4):676–679.
6. Koh HK, Geller AC. Public health interventions for melanoma. Prevention, early detection, and education. *Hematol Oncol Clin North Am.* 1998;12(4):903–928.
7. Koh HK, Geller AC, Miller DR, Grossbart TA, Lew RA. Prevention and early detection strategies for melanoma and skin cancer. Current status. *Arch Dermatol.* 1996;132(4):436–443.
8. Montague M, Borland R, Sinclair C. Slip! Slop! Slap! and SunSmart, 1980–2000: Skin cancer control and 20 years of population-based campaigning. *Health Educ Behav.* 2001;28(3):290–305.
9. Brandberg Y, Bolund C, Michelson H, Mansson-Brahme E, Ringborg U, Sjoden PO. Perceived susceptibility to and knowledge of malignant melanoma: screening participants vs the general population. *Prev Med.* 1996;25(2):170–177.
10. Geller AC, Zhang Z, Sober AJ, et al. The first 15 years of the American Academy of Dermatology skin cancer screening programs: 1985–1999. *J Am Acad Dermatol.* 2003;48(1):34–41.
11. Rivers JK, Gallagher RP. Public education projects in skin cancer. Experience of the Canadian Dermatology Association. *Cancer.* 1995;75(Suppl 2):661–666.
12. Stanton WR, Janda M, Baade PD, Anderson P. Primary prevention of skin cancer: a review of sun protection in Australia and internationally. *Health Promot Int.* 2004;19(3):369–378.
13. Rossi JS, Blais LM, Redding CA, Weinstock MA. Preventing skin cancer through behavior change. Implications for interventions. *Dermatol Clin.* 1995;13(3):613–622.
14. Koblenzer CS. The psychology of sun-exposure and tanning. *Clin Dermatol.* 1998;16(4):421–428.
15. Boggild AK, From L. Barriers to sun safety in a Canadian outpatient population. *J Cutan Med Surg.* 2003;7(4):292–299.
16. Jemec GB. Primary prevention of malignant melanoma: to know may not be enough. *J Am Acad Dermatol.* 1993;28(5 Pt 1):799–800.
17. Theobald T, Marks R, Hill D, Dorevitch A. "Goodbye Sunshine": effects of a television program about melanoma on beliefs, behavior, and melanoma thickness. *J Am Acad Dermatol.* 1991;25(4):717–723.
18. Jerkegren E, Sandrieser L, Brandberg Y, Rosdahl I. Sun-related behaviour and melanoma awareness among Swedish university students. *Eur J Cancer Prev.* 1999;8(1):27–34.
19. Martin RH. Relationship between risk factors, knowledge and preventive behaviour relevant to skin cancer in general practice patients in south Australia. *Br J Gen Pract.* 1995;45(396):365–367.
20. Robinson JK. Behavior modification obtained by sun protection education coupled with removal of a skin cancer. *Arch Dermatol.* 1990;126(4):477–481.
21. Volkov A, Dobbinson S, Wakefield M, Slevin T. Seven-year trends in sun protection and sunburn among Australian adolescents and adults. *Aust N Z J Public Health.* 2013;37(1):63–69.
22. Rigel DS. Cutaneous ultraviolet exposure and its relationship to the development of skin cancer. *J Am Acad Dermatol.* 2008;58(5 Suppl 2):S129–S132.
23. Dennis LK, Vanbeek MJ, Beane Freeman LE, Smith BJ, Dawson DV, Coughlin JA. Sunburns and risk of cutaneous melanoma: does age matter? A comprehensive meta-analysis. *Ann Epidemiol.* 2008;18(8):614–627.
24. Hirst NG, Gordon LG, Scuffham PA, Green AC. Lifetime cost-effectiveness of skin cancer prevention through promotion of daily sunscreen use. *Value Health.* 2012;15(2):261–268.
25. Gorham ED, Mohr SB, Garland CF, Chaplin G, Garland FC. Do sunscreens increase risk of melanoma in populations residing at higher latitudes? *Ann Epidemiol.* 2007;17(12):956–963.
26. Breslow A. Thickness, cross-sectional areas and depth of invasion in the prognosis of cutaneous melanoma. *Ann Surg.* 1970;172(5): 902–908.
27. Clark WH Jr, Elder DE, Guerry Dt, Epstein MN, Greene MH, Van Horn M. A study of tumor progression: the precursor lesions of superficial spreading and nodular melanoma. *Human Pathology.* 1984;15(12):1147–1165.
28. Balch C, Soong S, Shaw H, Urist M, McCarthy W. An analysis of prognostic factors in 8500 patients with cutaneous melanoma. In: Balch CM HA, Milton GW, Sober AJ, Soong SJ, editors. *Cutaneous Melanoma*. 2nd ed. Philadelphia: Lippincott; 1992:165–187.
29. Moyer VA. Behavioral counseling to prevent skin cancer: US Preventive Services Task Force recommendation statement. *Ann Intern Med.* 2012;157:59–65.
30. Bailey E, Sober A, Tsao H, Mihm MJ, Johnson T. Cutaneous melanoma. In: Goldsmith L, Katz S, Gilchrest B, Paller A, Leffell D, Wolff K, editors. *Fitzpatrick's Dermatology in General Medicine*. New York: McGraw-Hill; 2012.

31. Goldsmith L, Katz S, Gilchrest B, Paller A, Leffell D, Wolff K. Cutaneous Melanoma. *Fitzpatrick's Dermatology in General Medicine;* New York: McGraw-Hill; 2012.
32. Giles G, Staples M, McCredie M, Coates M. Multiple primary melanomas: an analysis of cancer registry data from Victoria and New South Wales. *Melanoma Res.* 1995;5(6):433–438.
33. Ferrone CR, Ben Porat L, Panageas KS, et al. Clinicopathological features of and risk factors for multiple primary melanomas. *JAMA.* 2005;294(13):1647–1654.
34. McMeniman E, De'Ambrosis K, De'Ambrosis B. Risk factors in a cohort of patients with multiple primary melanoma. *Australas J Dermatol.* 2010;51(4):254–257.
35. Niendorf KB, Tsao H. Cutaneous melanoma: family screening and genetic testing. *Dermatol Ther.* 2006;19(1):1–8.
36. Rhodes AR, Weinstock MA, Fitzpatrick TB, Mihm MC Jr, Sober AJ. Risk factors for cutaneous melanoma. A practical method of recognizing predisposed individuals. *JAMA.* 1987;258(21):3146–3154.
37. Berg D, Otley CC. Skin cancer in organ transplant recipients: epidemiology, pathogenesis, and management. *J Am Acad Dermatol.* 2002;47(1):1–17; quiz 18–20.
38. Soto E, Lee H, Saladi RN, et al. Behavioral factors of patients before and after diagnosis with melanoma: a cohort study – are sun-protection measures being implemented? *Melanoma Res.* 2010;20(2): 147–152.
39. Bowen D, Jabson J, Haddock N, Hay J, Edwards K. Skin care behaviors among melanoma survivors. *Psychooncology.* 2012;21(12): 1285–1291.
40. Freiman A, Yu J, Loutfi A, Wang B. Impact of melanoma diagnosis on sun-awareness and protection: efficacy of education campaigns in a high-risk population. *J Cutan Med Surg.* 2004;8(5):303–309.
41. Lee TK, Brazier AS, Shoveller JA, Gallagher RP. Sun-related behavior after a diagnosis of cutaneous malignant melanoma. *Melanoma Res.* 2007;17(1):51–55.
42. Rhee JS, Matthews BA, Neuburg M, Smith TL, Burzynski M, Nattinger AB. Quality of life and sun-protective behavior in patients with skin cancer. *Arch Otolaryngol Head Neck Surg.* 2004;130(2):141–146.
43. Meyer N, Pruvost-Balland C, Bourdon-Lanoy E, Maubec E, Avri MF. Awareness, knowledge and attitudes towards sun protection among skin cancer-treated patients in France. *J Eur Acad Dermatol Venereol.* 2007;21(4):520–525.
44. Manne S, Lessin S. Prevalence and correlates of sun protection and skin self-examination practices among cutaneous malignant melanoma survivors. *J Behav Med.* 2006;29(5):419–434.
45. Autier P, Dore JF, Negrier S, et al. Sunscreen use and duration of sun exposure: a double-blind, randomized trial. *J Natl Cancer Inst.* 1999;91(15):1304–1309.
46. Marsden JR, Newton-Bishop JA, Burrows L, et al. Revised UK guidelines for the management of cutaneous melanoma 2010. *Br J Dermatol.* 2010;163(2):238–256.
47. US Preventive Services Task Force. Screening for skin cancer: US Preventive Services Task Force recommendation statement. *Ann Intern Med.* 2009;150(3):188–193.
48. Breitbart EW, Waldmann A, Nolte S, et al. Systematic skin cancer screening in Northern Germany. *J Am Acad Dermatol.* 2012;66(2): 201–211.
49. Robinson JK, Fisher SG, Turrisi RJ. Predictors of skin self-examination performance. *Cancer.* 2002;95(1):135–146.
50. Aitken JF, Janda M, Lowe JB, et al. Prevalence of whole-body skin self-examination in a population at high risk for skin cancer (Australia). *Cancer Causes Control.* 2004;15(5):453–463.
51. Manne SL, Coups EJ, Jacobsen PB, Ming M, Heckman CJ, Lessin S. Sun protection and sunbathing practices among at-risk family members of patients with melanoma. *BMC Public Health.* 2011;11:122.
52. Bergenmar M, Brandberg Y. Sunbathing and sun-protection behaviors and attitudes of young Swedish adults with hereditary risk for malignant melanoma. *Cancer Nurs.* 2001;24(5):341–350.
53. Geller AC, Brooks DR, Colditz GA, Koh HK, Frazier AL. Sun protection practices among offspring of women with personal or family history of skin cancer. *Pediatrics.* 2006;117(4): e688–e694.
54. Azzarello LM, Dessureault S, Jacobsen PB. Sun-protective behavior among individuals with a family history of melanoma. *Cancer Epidemiol Biomarkers Prev.* 2006;15(1):142–145.
55. Manne S, Fasanella N, Connors J, Floyd B, Wang H, Lessin S. Sun protection and skin surveillance practices among relatives of patients with malignant melanoma: prevalence and predictors. *Prev Med.* 2004;39(1):36–47.
56. Geller AC, Emmons K, Brooks DR, et al. Skin cancer prevention and detection practices among siblings of patients with melanoma. *J Am Acad Dermatol.* 2003;49(4):631–638.
57. Kasparian NA, Butow PN, Meiser B, Mann GJ. High- and average-risk individuals' beliefs about, and perceptions of, malignant melanoma: an Australian perspective. *Psychooncology.* 2008;17(3):270–279.
58. Bishop JA, Taylor T, Potts HW, et al. Sun-protective behaviors in families at increased risk of melanoma. *J Invest Dermatol.* 2007;127(6):1343–1350.
59. Glenn BA, Bastani R, Chang LC, Khanna R, Chen K. Sun protection practices among children with a family history of melanoma: a pilot study. *J Cancer Educ.* 2012;27(4):731–737.
60. Geller AC, Colditz G, Oliveria S, et al. Use of sunscreen, sunburning rates, and tanning bed use among more than 10 000 US children and adolescents. *Pediatrics.* 2002;109(6):1009–1014.
61. Geller AC, Koh HK, Miller DR, Lew RA. Practices and beliefs concerning screening family members of patients with melanoma. Results of a survey of New England dermatologists. *J Am Acad Dermatol.* 1992;26(3 Pt 2):419–422.
62. Friedman LC, Bruce S, Webb JA, Weinberg AD, Cooper HP. Skin self-examination in a population at increased risk for skin cancer. *Am J Prev Med.* 1993;9(6):359–364.
63. Thieden E, Philipsen PA, Sandby-Moller J, Wulf HC. Sunscreen use related to UV exposure, age, sex, and occupation based on personal dosimeter readings and sun-exposure behavior diaries. *Arch Dermatol.* 2005;141(8):967–973.
64. Clarke VA, Williams T, Arthey S. Skin type and optimistic bias in relation to the sun protection and suntanning behaviors of young adults. *J Behav Med.* 1997;20(2):207–222.
65. Branstrom R, Ullen H, Brandberg Y. Attitudes, subjective norms and perception of behavioural control as predictors of sun-related behaviour in Swedish adults. *Prev Med.* 2004;39(5):992–999.
66. You're So Vain: New Survey Shows Teens Use Tanning Beds to Look Good Despite Knowing Health Risks [webpage on the Internet]; 2011. Available from: http://www.pwrnewmedia.com/2011/aad/melanoma_monday/. Accessed July 25, 2013.
67. Gandini S, Sera F, Cattaruzza MS, et al. Meta-analysis of risk factors for cutaneous melanoma: I. Common and atypical naevi. *Eur J Cancer.* 2005;41(1):28–44.
68. Goldsmith L, Katz S, Gilchrest B, Paller A, Leffell D, Wolff K. Atypical (Dysplastic) Melanocytic Nevi. *Fitzpatrick's Dermatology in General Medicine;* New York: McGraw-Hill; 2012.
69. Dennis LK, White E, Lee JA, Kristal A, McKnight B, Odland P. Constitutional factors and sun exposure in relation to nevi: a population-based cross-sectional study. *Am J Epidemiol.* 1996;143(3): 248–256.
70. Coombs BD, Sharples KJ, Cooke KR, Skegg DC, Elwood JM. Variation and covariates of the number of benign nevi in adolescents. *Am J Epidemiol.* 1992;136(3):344–355.
71. Gallagher RP, McLean DI, Yang CP, et al. Suntan, sunburn, and pigmentation factors and the frequency of acquired melanocytic nevi in children. Similarities to melanoma: the Vancouver Mole Study. *Arch Dermatol.* 1990;126(6):770–776.
72. Chamlin SL, Williams ML. Moles and melanoma. *Curr Opin Pediatr.* 1998;10(4):398–404.
73. de Maleissye MF, Beauchet A, Aegerter P, Saiag P, Mahe E. Parents' attitudes related to melanocytic nevus count in children. *Eur J Cancer Prev.* 2010;19(6):472–477.

74. Rodvall Y, Wahlgren CF, Ullen H, Wiklund K. Common melanocytic nevi in 7-year-old schoolchildren residing at different latitudes in Sweden. *Cancer Epidemiol Biomarkers Prev.* 2007;16(1):122–127.
75. Morris J, McGee R, Bandaranayake M. Sun protection behaviours and the predictors of sunburn in young children. *J Pediatr Child Health.* 1998;34(6):557–562.
76. Hull PR, Piemontesi NG, Lichtenwald J. Compliance with self-examination surveillance in patients with melanoma and atypical moles: an anonymous questionnaire study. *J Cutan Med Surg.* 2011;15(2):97–102.
77. Mesters I, Jonkman L, Vasen H, de Vries H. Skin self-examination of persons from families with familial atypical multiple mole melanoma (FAMMM). *Patient Edu Couns.* 2009;75(2):251–255.
78. Euvrard S, Kanitakis J, Claudy A. Skin cancers after organ transplantation. *N Engl J Med.* 24 2003;348(17):1681–1691.
79. Donovan JC, Rosen CF, Shaw JC. Evaluation of sun-protective practices of organ transplant recipients. *Am J Transplant.* 2004;4(11):1852–1858.
80. Robinson JK, Rigel DS. Sun protection attitudes and behaviors of solid-organ transplant recipients. *Dermatol Surg.* 2004;30(4 Pt 2):610–615.
81. Szepietowski JC, Reich A, Nowicka D, Weglowska J, Szepietowski T. Sun protection in renal transplant recipients: urgent need for education. *Dermatology.* 2005;211(2):93–97.
82. Seukeran DC, Newstead CG, Cunliffe WJ. The compliance of renal transplant recipients with advice about sun protection measures. *Br J Dermatol.* 1998;138(2):301–303.
83. Rose RF, Moniem K, Seukeran DC, Stables GI, Newstead CG. Compliance of renal transplant recipients with advice about sun protection measures: completing the audit cycle. *Transplant Proc.* 2005;37(10): 4320–4322.
84. Mahe E, Morelon E, Fermanian J, et al. Renal-transplant recipients and sun protection. *Transplantation.* 2004;78(5):741–744.
85. Hall HI, May DS, Lew RA, Koh HK, Nadel M. Sun protection behaviors of the US white population. *Prev Med.* 1997;26(4):401–407.
86. Auvinen A, Karjalainen S. Possible explanations for social class differences in cancer patient survival. *IARC Sci Publ.* 1997;(138):377–397.
87. Reyes-Ortiz CA, Goodwin JS, Freeman JL, Kuo YF. Socioeconomic status and survival in older patients with melanoma. *J Am Geriat Soc.* 2006;54(11):1758–1764.
88. Morton RL, Rychetnik L, McCaffery K, Thompson JF, Irwig L. Patients' perspectives of long-term follow-up for localised cutaneous melanoma. *Eur J Surg Oncol.* 2013;39(3):297–303.
89. Lens MB, Dawes M. Global perspectives of contemporary epidemiological trends of cutaneous malignant melanoma. *Br J Dermatol.* 2004;150(2):179–185.
90. Lin JS, Eder M, Weinmann S. Behavioral counseling to prevent skin cancer: a systematic review for the US Preventive Services Task Force. *Ann Intern Med.* 2011;154(3):190–201.

Psychology Research and Behavior Management

Dovepress

Publish your work in this journal

Psychology Research and Behavior Management is an international, peer-reviewed, open access journal focusing on the science of psychology and its application in behavior management to develop improved outcomes in the clinical, educational, sports and business arenas. Specific topics covered include: Neuroscience, memory & decision making; Behavior modification & management; Clinical applications; Business & sports performance management; Social and developmental studies; Animal studies. The manuscript management system is completely online and includes a quick and fair peer-review system. Visit http://www.dovepress.com/testimonials.php to read real quotes from published authors.

Submit your manuscript here: http://www.dovepress.com/psychology-research-and-behavior-management-journal