Title: Can skin cancer prevention and early detection be improved via mobile phone text messaging? A randomised, attention-control trial.

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Abstract

Objective. To test the impact of a theory-based, SMS (text message)-delivered behavioural intervention (Healthy Text) targeting sun protection or skin self-examination behaviours compared to attention-control.

Method. Overall, 546 participants aged 18–42 years were randomised using a computer-generated number list to the skin self-examination (N = 176), sun protection (N = 187), or attention-control (N = 183) text messages group. Each group received 21 text messages about their assigned topic over 12 months (12 weekly messages for three months, then monthly messages for the next nine months). Data was collected via telephone survey at baseline, three-, and 12-months across Queensland from January 2012 to August 2013.

Results. One year after baseline, the sun protection (mean change 0.12; P = 0.030) and skin self-examination groups (mean change 0.12; P = 0.035) had significantly greater improvement in their sun protection habits (SPH) index compared to the attention-control group (reference mean change 0.02). The increase in the proportion of participants who reported any skin self-examination from baseline to 12 months was significantly greater in the skin self-examination intervention group (103/163; 63%; P < 0.001) than the sun protection (83/173; 48%), or attention-control (65/165; 36%) groups. There was no significant effect of the intervention for participants who self-reported whole-body skin self-examination, sun tanning behaviour, or sunburn behaviours.

Conclusion. The Healthy Text intervention was effective in inducing significant improvements in sun protection and any type of skin self-examination behaviours.

Trial registration. The Australian and New Zealand Clinical Trials register (ACTRN12612000577819).

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Introduction

Melanoma incidence rates vary widely across the world, but are highest in countries with a large proportion of Caucasians and high ultraviolet radiation (UVR) such as Australia/New Zealand (age standardised incidence 40/100000 in men and 30/100,000 in women), where rates are about double compared to those observed in the United States of America (U.S.A.), Northern, or Western Europe (Ferlay et al., 2013). Among Australians 15–44 years, melanoma is the most common cancer (loss of 22,300 disability-adjusted-life-years [DALYs] each year) (Australian Institute of Health and Welfare, 2010). While most skin cancer deaths are attributable to melanoma (1,430 deaths per year) keratinocyte cancers cause 420 deaths per year, and costed the Australian health system $511 million in 2010 (Fransen et al., 2012).

Risk factors for all skin cancers include sun exposure, susceptible skin, eye, or hair colour, and a propensity to burn (Green et al., 1999). Sunburn reflects the biological active dose of UVR people receive relative to their skin melanin density (Del Bino and Bernerd, 2013). Additionally, melanoma is associated with large numbers of naevi, family history, or genetic predisposition (Armstrong and Kricker, 2001; Dennis et al., 2008; Veierod et al., 2003). The 2010 U.S. National Health Interview Survey data (N = 24,970) revealed sunburn was most common among younger adults (52.0%), those with sun-sensitive skin (45.9%), white ethnicity (44.3%), those with a family history of melanoma (43.9%), the highly physically active (41.7%), and indoor tanners (44.1%) (Holman et al., 2014).

Prevention programs focused on preventing skin cancer have been conducted in Australia, the U.S.A., and form part of the European Code against Cancer (Dobbinson et al., 2014; Glanz et al., 2001; Lombard et al., 1991; Volkov et al., 2013) for at least the past 20 years. More recently, providing health promotion programs via short message service (SMS) has been successfully trialled for various health behaviours (Cole-Lewis and Kershaw, 2010; Fjeldsoe et al., 2009), often achieving small to moderate effect sizes. However, success has been heterogeneous, with greater effect for smoking cessation and physical activity interventions. Tailored and personalised messages produced larger effects (Head et al., 2013). One factor that limited the observed impact of the studies was the changes in desired behaviour in both the control and intervention groups (Waters et al., 2012; Waters et al., 2011).

Few studies have used SMS-delivered interventions for sun protection or skin examination behaviour outcomes, and the U.S. Surgeon General called for more research in this area (U.S. Department of Health and Human Services, 2014). One study reminded adults via SMS to use sunscreen and observed a significant increase in use in the intervention group (Armstrong et al., 2009). Another tested the value of sun-safe SMS messages on mobile phone subscribers (Gold et al., 2011). Further, SMS messages formed part of a comprehensive interactive computerised education program for dermatology clinic participants (Aneja et al., 2012a; Aneja et al., 2012b).

The aim of the Healthy Text study was to test in a randomised trial design the impact of a social cognitive theory-based, SMS-delivered behavioural intervention targeting either sun protection or skin

self-examination behaviours compared to attention-control, with the main outcomes being sun protection, skin self-examination, as well as sunburn in a population aged 18–42 years at high risk of skin cancer.

Methods

Study design and participants

The Healthy Text trial, conducted in Queensland, Australia used a three-group design with two intervention groups (sun protection or skin self-examination) and an attention-control group which received an equivalent number of messages about physical activity. Approval was received from the Queensland University of Technology's ethics committee (QUT1100000942). All efforts were made to keep the trial information and consent forms generic rather than specifically referring to skin cancer. This trial was designed in accordance with the guidelines published by the Consolidated Standards of Reporting Trials group (CONSORT), except for blinding of participants to intervention type (not possible due to the nature of the behavioural intervention).

A random sample of 15,000 men and women 18–42 years of age (the upper age range was determined by the groupings in the recruitment source database) from the Queensland electoral roll or Medicare register (the population wide free health insurance for Australian residents) were invited to participate via mailed invitation from January–May 2012. Of the 678 (4.5%) potential participants who indicated interest by email, text message, or return mail, 574 (84.7%) were eligible and 546 completed the baseline telephone interview. Complete data was available for 512 (93.7%) participants at the end of the intervention period (August 2013).

Randomisation and masking

After the baseline telephone survey conducted in the southern hemisphere autumn (March to May), participants were randomised using a computer-generated random number list. The randomisation list was derived by the study statistician, separate from all other study procedures. The interviewers were blinded to the participants' group allocation.

Interventions

Participants received weekly SMS over 12 weeks in the southern hemisphere winter (in Queensland, people receive almost as much personal ultraviolet exposure in winter as in summer) (Neale et al., 2010) and then completed the three-month follow-up telephone interview. Thereafter, participants received monthly text messages for the remaining nine months, resulting in a full year of intervention delivery to accommodate potential differences in sun protection by season. The intervention was followed

by a 12-month telephone interview. Text messages were designed using data from a pilot study (Mair et al., 2012), examples from a previous physical activity text-message study (Fjeldsoe et al., 2010), and according to social cognitive theory (Bandura, 1986). Messages were personalised using participants' name and gender, skin cancer risk factors (e.g., hair colour), number of times being sunburnt, previous performance of skin self-examinations (Janda et al., 2013b), and reviewed for quality (Centers for Disease Control and Prevention, 2012). As previously reported (Janda et al., 2013b), they aimed to address the constructs of the social cognitive model, such as increasing self-efficacy (example message: <Participant Name>, melanoma rarely has symptoms so look out for the AC rule when checking your moles ASYMMETRY (halves that differ) and more than one COLOUR. HealthyTexts); Building behavioral capacity (example message: Hi <Participant Name>. Always have your exercise clothes clean & ready. Leave your shoes where you can see them to remind you. HealthyTexts); or guiding outcome expectations (<Participant Name>, it's great that you have thought about reducing your risk of skin cancer. Make this a reality by protecting your skin from the sun when outdoors. HealthyTexts).

Main outcome measures

A telephone survey company independent from the researchers collected all outcome data across Queensland. The main outcome measure for sun protection behaviours was the sun protection habits (SPH) index developed by Glanz et al (Glanz et al., 2009; Hall et al., 2009). This index correlates well with other measures of sun protection evidencing its validity and has good test-retest reliability (0.78) (Janda et al., 2013b). It queries the frequency of six sun protective methods that are used when outdoors between 10am and 3pm (4-point Likert scale, 1 = never/rarely to 4 = always) including: wearing a shirt with sleeves, sunglasses, hat or sunscreen, staying in the shade, and limiting time in the sun during midday hours. Answers to the six questions are averaged (range: 1–4). Data on sunburn (any/frequency) and suntan over the past 12-months were also collected.

For skin self-examination outcomes, participants were asked whether (ever, during the past 3 months and during the past 12-months), "you or someone who is not a doctor, such as your spouse or partner, deliberately checked any part of your skin for early signs of skin cancer". For those who answered yes, a series of questions assessed frequency and thoroughness (any, part-body, whole-body). We used these questions in previous studies (Aitken et al., 2004; Janda et al., 2011a) and found them reasonably reliable (better reliability with shorter recall periods) (Aitken et al., 2004). We also collected data on participants' socio-demographics, skin cancer risk factors (hair, eye/skin colour, tendency to burn, ability to tan, personal or family history of skin excisions, or skin cancer), and measures to allow assessment of whether behaviour change was enacted through the proposed components of the social cognitive theory (data not reported here). At the end of the 12-month interview, two questions assessed overall level of satisfaction with the intervention and importance of the allocated health behaviours (10-point Likert scales, 1 = not at all to 10 = extremely satisfied; 1 = unimportant to 10 = very important,

respectively). As measures of engagement, we asked whether participants' sent a message back to Healthy Text, whether they referred back to the SMS's after receiving them, or forwarded them to a friend/family member.

Statistical analyses

Sample size calculations were reported previously (Janda et al., 2013b) and indicated that at least 126 participants per group were required. The intention-to-treat principle was used for analysis. The change from baseline in the SPH index score was compared for each intervention to the attention-control group using t-tests. For binary outcomes, logistic regression analyses were used to compare intervention and control groups at each time-point; generalised estimating equations for overall group-by-time interactions. To assess whether the intervention was more effective for subgroups based on commonly known differences in response to behavioural sun protection or sun exposure interventions (moderator analyses), we compared the odds of performing any skin self-examination in the past three-months at 12-month follow-up by age (<32 years versus age ≥32 years), gender (male versus female), skin colour (very fair/fair versus medium/olive skin), and baseline skin self-examination intentions (yes versus no). We also calculated the mean difference in SPH index score between the sun protection intervention group and the control group by age, gender, skin colour, and baseline intention to reduce skin cancer risk.

Results

Figure 1 presents participant flow through the study (The Consort Group, 2009). As reported previously (Janda et al., 2013b), the groups were well balanced at baseline with only a few exceptions, specifically a larger proportion of skin self-examination group participants indicted they had attempted to suntan during the past year ($p<0.012$) (Table 1).

From baseline to three months, SPH index change was similar between the groups. By 12-months, both the sun protection and skin self-examination groups' scores improved on average by 0.12, significantly more than the change observed in the attention-control group (0.02) (Table 2). The group-by-time interaction for the SPH index was significant, with both intervention groups increasing their sun protection more compared to the attention-control group (skin self-examination: $P = 0.050$; sun protection: $P = 0.032$) (Table 2).

The proportion of participants who reported any skin self-examination did not change significantly in the attention-control group from baseline to 12-months follow-up (8.1% change), but increased by 26.4% ($P < 0.001$) in the skin self-examination group. After three-months, the proportion of participants reporting a whole-body skin self-examination increased from baseline for all three groups with no statistical significant differences between groups. By 12-month follow-up all three groups had returned to baseline rates of whole-body skin self-examination (Table 3). We observed a significant group-by-time

interaction for any type of skin self-examination at both three- ($P < 0.001$) and 12-month follow-up ($P < 0.001$) in the skin self-examination group compared to the attention-control group. There were no significant group-by-time interaction findings for the other main outcomes reported in Table 3.

The proportion of participants reporting any sunburn decreased by about 10% from baseline to 12-months, and decreased by about 17–21% in all three groups over time for two or more sunburns. Although not statistically different between the groups, the proportion of participants who reported attempting a suntan in the past 12-months increased for the attention-control (5.3%) and sun protection groups (2.3%), but decreased for the skin self-examination group (3.7%) (Table 3).

In subgroup analyses, the skin self-examination intervention appeared to be somewhat more effective for participants younger than the participants' mean age of 32 years, those with fair/very fair skin phenotype, and those who had made plans at baseline to check their skin for early signs of skin cancer compared with control (Figure 2).

The sun protection intervention appeared to be somewhat more effective for males, those with very fair/fair skin phenotype, and those who had made plans at baseline to reduce their risk of skin cancer compared with control (Figure 3). However, all confidence intervals in the interactions studied overlapped.

Participants' average level of satisfaction with the intervention messages was 6.79 (SD = 2.07; range: 1–10), and similar between the three groups ($F (2, 498) = 2.54$, $P = 0.08$). Overall, 33% (167/501) of participants reported referring back to the messages ($\chi^2 (4, 501) = 4.80$, $P = 0.31$) with no difference between the groups. Around 17% (84/501) of participants forwarded the messages to friends/family with no differences between the groups ($\chi^2 (4, 501) = 5.39$, $P = 0.25$). The majority of participants read then stored the messages (337/501, 67%), others read and deleted them (155/501, 31%), while a few deleted them before reading (9/501, 2%). The overall mean importance rating of the health behaviours was 7.23 (SD = 2.11) with little difference between the groups ($F (2, 497) = 0.34$, $P = 0.71$).

Discussion

Our study found that text messages about sun protection or skin self-examination significantly improved the self-reported sun protection among intervention participants, compared to those in the attention-control group, 12-months after baseline. Text messages about skin self-examination significantly improved the proportion of participants' who reported conducting any, but not specifically whole-body skin self-examination compared to attention-control. There was no significant intervention effect on the proportion of participants who self-reported being sunburnt, with all three groups reporting decreasing rates in this outcome.

The improvements in sun protection observed in the present study were significant compared to the attention-control, but small in absolute terms, increasing by only one quarter of a standard deviation. The intervention effect was considerably smaller (0.12 points) than that reported in the U.S. SCAPE intervention (Glanz et al., 2010) (0.23 points) where intervention delivery was via a tailored mail

intervention package. However, other studies using telephone-delivered intervention sessions, similarly achieved only small improvements in sunscreen use, and no significant change in sun avoidance (Head et al., 2013; Prochaska et al., 2004). Armstrong et al.'s intervention was more successful using SMS-delivered reminders with a significant increase in the proportion of participants who dispensed sunscreen daily (56%) compared to control (30%) (Armstrong et al., 2009). Placed into the context of these previous studies, and considering the relatively low intervention intensity (21 text messages over one year), this intervention compares reasonably well with regards to its efficacy, but may not have been intensive enough to significantly reduce sunburn rates. Intervention messages were specifically designed to address each of the social cognitive theory constructs to optimise the likelihood of behaviour change occurring. This may have contributed to the positive changes observed, but may not have targeted barriers (such as desire for a tan) sufficiently. It was interesting to note that the skin self-examination group improved their sun protection behaviours to a similar degree as that observed in the sun protection group. It may be that repeated messages about early detection of skin cancers and encouragement to conduct skin self-examination also prompted participants to consider skin cancer risk more broadly.

Interventions aiming to improve self-examination behaviours have targeted increases in prevalence, thoroughness, or accuracy. Boone and colleagues (Boone et al., 2009) examined the thoroughness of deliberate skin self-examinations after distributing an educational and skills training intervention to either individuals or couples, and observed greater effect in the partner intervention group (Boone et al., 2009). In comparison, our SMS-delivered intervention only increased the proportion of people who conducted any, but not whole-body (a marker for thoroughness) skin self-examination. Thus, there may be a need to include more partner-relevant messaging in the future. Other studies (Chiu et al., 2006; Hamidi et al., 2008) have sought to improve the accuracy of skin self-examinations using mole-mapping diagrams or photographs of skin lesions. One study (Chiu et al., 2006) suggested that drawing moles on a diagram may help people identify new skin lesions. Another study (Hay et al., 2006) found that the provision of a whole-body digital photography book depicting the entire skin surface increased skin self-examination adherence and self-efficacy beliefs. Video-based interventions which provide detailed instructions on how to self-examine achieved positive changes, with increases in skin self-examination knowledge and thoroughness (Janda et al., 2011b; Loescher et al., 2010). Video-intervention group participants tended to check the back more and conducted skin checks more frequently (Janda et al., 2011b). In the future, multimedia messages could provide people with examples of benign or malignant skin lesions, or a body map to encourage the examination of body areas that individuals may not yet have included in their skin check. Overall to date, assessment of skin self-examination prevalence and thoroughness was largely by self-report, with little apparent validation, which could change in the future with the increasing use of mobile photo-documentation (Janda et al., 2014; Janda et al., 2013a).

Study strength and limitations

Participants may have self-reported a higher SPH index in contrast to their real-life behaviours due to social desirability or reporting bias; however, this should be similar between the groups. Our intervention individualised messages with regards to some important baseline characteristics such as skin and hair colour, sunburn within the past year, and previous skin self-examination behaviours. However, further individualisation of the text messages based on participants early action may have improved the response to the intervention (Borschmann et al., 2012), as level of concern with sun protective and skin examination behaviours may have changed during the intervention period. Future research could use a smart design and randomise participants more than once if their response to the initial intervention is small (Free et al., 2011). Furthermore, participants' level of change may have depended on their preference for the allocated text message group. However, we did not find a significant difference between groups in overall satisfaction with the intervention or importance of the assigned health behaviour. Some participants commented that the messages were too infrequent (i.e., sent weekly for the first three months, then monthly for the remaining time); however, it is likely this needs to be balanced as potentially messages that are too frequent could be treated as spam. Future health promotion programs delivered via SMS could allow participants' to control timing, frequency, and intensity. While we report here on some main moderators, full mediational analyses still needs to be undertaken and is not included here. It will be interesting to establish whether behaviour change effected through the main constructs proposed by the social cognitive model or different pathways.

Participants began the intervention during the southern hemisphere winter as the weather is usually very stable, sunny and warm (daytime temperature around 20 to 25 degree Celsius) and we expected very similar conditions to occur at the 12 month assessment. In comparison the weather is much more variable in summer and may have confounded our measurements. In addition, we previously found that people in Queensland receive almost as much personal ultraviolet radiation in winter as in summer, most likely due to warm and dry conditions likely to foster participation in outdoor activities. (Neale et al., 2010). In addition, during winter the population is less likely to use sun protection, and this may have contributed to the only very small changes in use of sun protection seen at the three month assessment. It is possible that more significant increases may have been observed had the intervention started at the beginning of summer.

To avoid a strong control group effect, which is frequently observed in behavioural intervention trials (Waters et al., 2012), we kept the recruitment and enrolment procedures general and health behaviour-focussed. We did not specifically inform participants that our trial targeted improvements in skin cancer-related behaviours, as it was not possible to fully blind our participants to the intervention they received or our main target behaviours. The low recruitment response rate meant that the final sample was probably more health conscious than the general population of a similar age. This could be interpreted encouragingly as the intervention led to changes in individuals who were already health

conscious at baseline. Thus, it is possible that a greater change could be obtained among the general population who may have lower levels of sun protection and skin self-examination behaviours than observed here at baseline. Finally, the impact of text messaging may diminish over time and longer studies are needed to assess this.

Conclusions

In conclusion, the SMS-delivered intervention was far-reaching, flexible, and individualised. While it showed some promising impact on sun protection and skin self-examination behaviours, future research could consider using multimedia text messages or a more flexible SMS program design allowing for participant input into program features. The addition of visual components that highlight sunburn, appropriate sun protective clothing, or thorough skin self-examination practices may help to further improve these behaviours.

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Conflict of interest statement

Monika Janda (#1045247), Alison Marshall (#553000) and Peter Baade (#1005334) are funded by separate Australian National Health and Medical Research Council (NHMRC) Career Development Awards. Philippa Youl is funded by a NHMRC Early Career Fellowship (#1054038). All authors declare that there are no conflicts of interest, except H.P. Soyer who declares skin cancer early detection related ownership and consultancies.

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References

Aitken, J.F., Janda, M., Lowe, J.B., Elwood, M., Ring, I.T., Youl, P.H., Firman, D.W., 2004. Prevalence of whole-body skin self-examination in a population at high risk for skin cancer (Australia). Cancer Causes Control 15 (5), 453-463.

Aneja, S., Brimhall, A.K., Aneja, S., Kast, D.R., Carlson, D., Cooper, K.D., Bordeaux, J.S., 2012a. Computerized interactive educational tools used to improve use of sun-protective clothing and sunscreen: a randomized controlled study. Arch Dermatol 148 (11), 1325-1327.

Aneja, S., Brimhall, A.K., Kast, D.R., Aneja, S., Carlson, D., Cooper, K.D., Bordeaux, J.S., 2012b. Improvement in patient performance of skin self-examinations after intervention with interactive education and telecommunication reminders: a randomized controlled study. Arch Dermatol 148 (11), 1266-1272.

Armstrong, A.W., Watson, A.J., Makredes, M., Frangos, J.E., Kimball, A.B., Kvedar, J.C., 2009. Text-message reminders to improve sunscreen use: a randomized, controlled trial using electronic monitoring. Arch Dermatol 145 (11), 1230-1236.

Armstrong, B.K., Kricker, A., 2001. The epidemiology of UV induced skin cancer. J Photochem Photobiol B 63 (1-3), 8-18.

Australian Institute of Health and Welfare, 2010. Cancer in Australia 2010: an overview, in: AIHW (Ed.), Cancer series no. 60. Cat. no. CAN 56. AIHW, Canberra, ACT.

Bandura, A., 1986. Social foundations of thought and action: a social cognitive theory. Englewood Cliffs, NJ, Prentice Hall International Inc.

Boone, S.L., Stapleton, J., Turrisi, R., Ortiz, S., Robinson, J.K., Mallett, K.A., 2009. Thoroughness of skin examination by melanoma patients: influence of age, sex and partner. Australas J Dermatol 50 (3), 176-180.

Borschmann, R., Lines, K., Cottrell, D., 2012. Sun protective behaviour, optimism bias, and the transtheoretical model of behaviour change. Aust J Psychol 64 (4), 181-188.

Centers for Disease Control and Prevention, 2012. CDC'S guide to writing for social media. Available at http://www.cdc.gov/socialmedia/Tools/guidelines/pdf/GuidetoWritingforSocialMedia.pdf (Last accessed on August 12, 2012).

Chiu, V., Won, E., Malik, M., Weinstock, M.A., 2006. The use of mole-mapping diagrams to increase skin self-examination accuracy. J Am Acad Dermatol 55 (2), 245-250.

Cole-Lewis, H., Kershaw, T., 2010. Text messaging as a tool for behavior change in disease prevention and management. Epidemiol Rev 32 (1), 56-69.

Del Bino, S., Bernerd, F., 2013. Variations in skin colour and the biological consequences of ultraviolet radiation exposure. Br J Dermatol 169 (Suppl 3), 33-40.

Dennis, L.K., Vanbeek, M.J., Beane Freeman, L.E., Smith, B.J., Dawson, D.V., Coughlin, J.A., 2008. Sunburns and risk of cutaneous melanoma: does age matter? a comprehensive meta-analysis. Ann Epidemiol 18 (8), 614-627.

Dobbinson, S.J., Jamsen, K., Dixon, H.G., Spittal, M.J., Lagerlund, M., Lipscomb, J.E., Herd, N.L., Wakefield, M.A., Hill, D.J., 2014. Assessing population-wide behaviour change: concordance of 10-year trends in self-reported and observed sun protection. Int J Public Health 59 (1), 157-166.

Ferlay, J., Soerjomataram, I., Ervik, M., Dikshit, R., Eser, S., Mathers, C., Rebelo, M., Parkin, D.M., Forman, D., et al., 2013. GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11 [Internet]. Available at http://globocan.iarc.fr (Last accessed on June 30, 2014).

Fjeldsoe, B.S., Marshall, A.L., Miller, Y.D., 2009. Behavior change interventions delivered by mobile telephone short-message service. Am J Prev Med 36 (2), 165-173.

Fjeldsoe, B.S., Miller, Y.D., Marshall, A.L., 2010. MobileMums: a randomized controlled trial of an SMS-based physical activity intervention. Ann Behav Med 39 (2), 101-111.

Fransen, M., Karahalios, A., Sharma, N., English, D.R., Giles, G.G., Sinclair, R.D., 2012. Non-melanoma skin cancer in Australia. The Medical journal of Australia 197 (10), 565-568.

Free, C., Knight, R., Robertson, S., Whittaker, R., Edwards, P., Zhou, W., Rodgers, A., Cairns, J., Kenward, M.G., et al., 2011. Smoking cessation support delivered via mobile phone text messaging (txt2stop): a single-blind, randomised trial. Lancet 378 (9785), 49-55.

Glanz, K., Maddock, J.E., Lew, R.A., Murakami-Akatsuka, L., 2001. A randomised trial of the Hawaii SunSmart program's impact on outdoor recreation staff. J Am Acad Dermatol 44 (6), 973-978.
Glanz, K., McCarty, F., Nehl, E.J., O'Riordan, D.L., Gies, P., Bundy, L., Locke, A.E., Hall, D.M., 2009. Validity of self-reported sunscreen use by parents, children, and lifeguards. Am J Prev Med 36 (1), 63-69.
Glanz, K., Schoenfeld, E.R., Steffen, A., 2010. A randomized trial of tailored skin cancer prevention messages for adults: Project SCAPE. Am J Public Health 100 (4), 735-741.
Gold, J., Aitken, C.K., Dixon, H.G., Lim, M.S.C., Gouillou, M., Spelman, T., Wakefield, M., Hellard, M.E., 2011. A randomised controlled trial using mobile advertising to promote safer sex and sun safety to young people. Health Educ Res 26 (5), 782-794.
Green, A., Whiteman, D., Frost, C., Battistutta, D., 1999. Sun exposure, skin cancers and related skin conditions. J Epidemiol 9 (6 Suppl), S7-13.
Hall, D.M., McCarty, F., Elliott, T., Glanz, K., 2009. Lifeguards' sun protection habits and sunburns association with sun-safe environments and skin cancer prevention program participation. Arch Dermatol 145 (2), 139-144.
Hamidi, R., Cockburn, M.G., Peng, D.H., 2008. Prevalence and predictors of skin self-examination: prospects for melanoma prevention and early detection. Int J Dermatol 47 (10), 993-1003.
Hay, J.L., Oliveria, S.A., Dusza, S.W., Phelan, D.L., Ostroff, J.S., Halpern, A.C., 2006. Psychosocial mediators of a nurse intervention to increase skin self-examination in patients at high risk for melanoma. Cancer Epidemiol Biomarkers Prev 15 (6), 1212-1216.
Head, K.J., Noar, S.M., Iannarino, N.T., Grant Harrington, N., 2013. Efficacy of text messaging-based interventions for health promotion: a meta-analysis. Soc Sci Med 97, 41-48.
Holman, D.M., Berkowitz, Z., Guy, G.P., Jr., Hartman, A.M., Perna, F.M., 2014. The association between demographic and behavioral characteristics and sunburn among U.S. adults - National Health Interview Survey, 2010. Prev Med 63C, 6-12.
Janda, M., Loescher, L.J., Banan, P., Horsham, C., Soyer, H.P., 2014. Lesion selection by melanoma high-risk consumers during skin self-examination using mobile teledermoscopy. JAMA Dermatol 150 (6), 656-658.
Janda, M., Loescher, L.J., Soyer, H.P., 2013a. Enhanced skin self-examination: a novel approach to skin cancer monitoring and follow-up. JAMA Dermatol 149 (2), 231-236.
Janda, M., Neale, R.E., Youl, P., Whiteman, D.C., Gordon, L., Baade, P.D., 2011a. Impact of a Video-Based Intervention to Improve the Prevalence of Skin Self-examination in Men 50 Years or Older The Randomized Skin Awareness Trial. Arch Dermatol 147 (7), 799-806.
Janda, M., Neale, R.E., Youl, P., Whiteman, D.C., Gordon, L., Baade, P.D., 2011b. Impact of a video-based intervention to improve the prevalence of skin self-examination in men 50 years or older: the randomized skin awareness trial. Arch Dermatol 147 (7), 799-806.
Janda, M., Youl, P., Marshall, A.L., Soyer, H.P., Baade, P., 2013b. The HealthyTexts study: a randomized controlled trial to improve skin cancer prevention behaviors among young people. Contemp Clin Trials 35 (1), 159-167.
Loescher, L.J., Hibler, E., Hiscox, H., Quale, L., Harris, R., 2010. An internet-delivered video intervention for skin self-examination by patients with melanoma. Arch Dermatol 146 (8), 918-935.
Lombard, D., Neubauer, T.E., Canfield, D., Winett, R.A., 1991. Behavioural community intervention to reduce the risk of skin cancer. J Appl Behav Anal 24 (4), 677-686.
Mair, S., Soyer, H.P., Youl, P., Hurst, C., Marshall, A., Janda, M., 2012. Personalised electronic messages to improve sun protection in young adults. J Telemed Telecare 18 (5), 247-252.
Neale, R.E., Hamilton, A.R., Janda, M., Gies, P., Green, A.C., 2010. Seasonal variation in measured solar ultraviolet radiation exposure of adults in subtropical Australia. Photochem Photobiol 86 (2), 445-448.
Prochaska, J.O., Velicer, W.F., Rossi, J.S., Redding, C.A., Greene, G.W., Rossi, S.R., Sun, X., Fava, J.L., Laforge, R., et al., 2004. Multiple risk expert systems interventions: impact of simultaneous stage-matched expert system interventions for smoking, high-fat diet, and sun exposure in a population of parents. Health Psychol 23 (5), 503-516.
The Consort Group, 2009. Consort: transparent reporting of trials Available at http://www.consort-statement.org/ (Last accessed on March 20, 2011).

U.S. Department of Health and Human Services, 2014. The surgeon general's call to action to prevent skin cancer. Washington (DC), U.S. Dept of Health and Human Services, Office of the Surgeon General.

Veierod, M.B., Weiderpass, E., Thorn, M., Hansson, J., Lund, E., Armstrong, B., Adami, H.O., 2003. A prospective study of pigmentation, sun exposure, and risk of cutaneous malignant melanoma in women. J Natl Cancer Inst 95 (20), 1530-1538.

Volkov, A., Dobbinson, S., Wakefield, M., Slevin, T., 2013. Seven-year trends in sun protection and sunburn among Australian adolescents and adults. Aust N Z J Public Health 37 (1), 63-69.

Waters, L., Reeves, M., Fjeldsoe, B., Eakin, E., 2012. Control group improvements in physical activity intervention trials and possible explanatory factors: a systematic review. J Phys Act Health 9 (6), 884-895.

Waters, L.A., Reeves, M.M., Fjeldsoe, B.S., Eakin, E.G., 2011. Characteristics of control group participants who increased their physical activity in a cluster-randomized lifestyle intervention trial. BMC Public Health 11, 27.