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The Skin Awareness Study: Promoting thorough skin self-examination for skin cancer among men 50 years or older

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Abstract

Background: Incidence and mortality from skin cancers including melanoma are highest among men 50 years or older. Thorough skin self-examination may be beneficial to improve skin cancers outcomes.

Objectives: To develop and conduct a randomized-controlled trial of a video-based intervention to improve skin self-examination behavior among men 50 years or older.

Methods: Pilot work ascertained appropriate targeting of the 12-minute intervention video towards men 50 years or older. Overall, 968 men were recruited and 929 completed baseline telephone assessment. Baseline analysis assessed randomization balance and demographic, skin cancer risk and attitudinal factors associated with conducting a whole-body skin self-examination or receiving a whole-body clinical skin examination by a doctor during the past 12 months.

Results: Randomization resulted in well-balanced intervention and control groups. Overall 13% of men reported conducting a thorough skin self-examination using a mirror or the help of another person to check difficult to see areas, while 39% reported having received a whole-body skin examination by a doctor within the past 12 months. Confidence in finding time for and receiving advice or instructions by a doctor to perform a skin self-examination were among the factors associated with thorough skin self-examination at baseline.

Conclusions: Men 50 years or older can successfully be recruited to a video-based intervention trial with the aim reduce their burden through skin cancer. Randomization by computer generated randomization list resulted in good balance between control and intervention group and baseline analysis determined factors associated with skin cancer early detection behavior at baseline.

1. Introduction

The burden from skin cancer, including melanoma, is particularly high in fair skinned men 50 years or older throughout the world. For example, in the US, the incidence of melanoma is 70 and 33/100.000 in men and women aged 50 years or older, respectively [1]. In Queensland (QLD), Australia, while the incidence rates in this age group are approximately three times as high as in the US, males still have a two-fold higher risk of melanoma compared to women (incidence rates 209 and 112 /100 000 in men and women, respectively) [2]. The incidence of non-melanoma skin cancers (NMSC) in Australia is extremely high (age-standardized incidence = 2051/100.000 in men) [3]. While mortality is relatively low [4,5], NMSC management places high costs on health care systems both in Australia [6] and the US [7].

Most skin cancers, including melanoma, are located on the surface of the skin and thus can be detected through a visual skin examination. Removal of early lesions is associated with lower morbidity and mortality [8-10], suggesting that routine skin examination should result in better outcomes. Skin examinations can be conducted by a layperson (skin self-examination (SSE)) or a doctor (clinical skin examination (CSE)) and there is some evidence that both are effective in detecting melanoma earlier than would otherwise be the case. For example, within a case-control study in Queensland, melanomas detected during a deliberate skin examination (by a lay person or a doctor) were thinner than those detected otherwise[11]. A Connecticut case-control study found that people reporting skin awareness had a lower mortality from melanoma (HR 0.4; 95% CI 0.2-0.7) [12]. An employee screening program achieved a reduction in incidence of thick melanomas and mortality compared to the California population and assigned these effects mainly to the increased skin awareness and self-examination behavior of the employees [13]. Knowledge of cancer and interest in health were also found to be associated with thinner melanomas in men 40 years or older [14]. Increasing men's awareness of their skin by encouraging them to take notice of any changes or newly appearing skin lesions and seeing a doctor thus has the potential to reduce skin cancer morbidity and mortality.

Several efforts are now underway worldwide to further improve skin awareness [15-19], some specifically targeting men [20-24]. Two of these studies reported interventions to be less effective for men than women [19, 25], consistent with a general tendency for men to delay uptake of preventive medicine compared to women [26]. The Check-it-out trial successfully increased the prevalence of thorough SSE through a video-based

intervention [15-17, 27]. However, this trial recruited people attending doctors' practices, who presumably are already health conscious and only included a small proportion of men 50 years or older (mean age = 53 years; SD=14.8; 42% male) [28].

To improve the evidence on whether a video-based intervention can successfully motivate men 50 years or older to examine their own skin and present to a doctor with lesions of concern, we planned a randomized trial specifically for older males. The aim of the present paper is to describe the development of the intervention and study methods and report the baseline characteristics of participants. We also assessed men's sociodemographic characteristics, skin cancer risk factors and attitudes and intentions associated with pre-intervention SSE and CSE.

2. Trial design and methods

Ethical clearance was provided by the Queensland University of Technology ethics committee, and the trial was registered with the Australian New Zealand Clinical Trials Registry (ANZCTR N12608000384358).

2.1. Qualitative intervention development

Interventions aimed at health behaviors should preferably be guided by a theoretical model to predict how the intervention will motivate and facilitate a change in the target health behavior [29]. Our intervention used the extended Health Belief Model (HBM) [30], which has been shown to have predictive value in the skin cancer area and in preventive behavior of older adults [31, 32]. It considered men's awareness of the seriousness of disease, their perceived susceptibility, perceived barriers to, benefits of, and self-efficacy for skin self-examination. Aspects from a number of other theoretical models which commonly inform health promotion programs were also used.[33]

Prior to developing the intervention, we recruited 20 male community volunteers 50 years or older to participate in two focus groups (six participants each) and eight telephone interviews to explore their views on SSE. We also sought to determine message framing and presentation preferences and to pre-test the age-appropriateness of proposed SSE messages. Focus groups and interviews followed a predetermined list of topics guided by the extended HBM, but also allowed room for unusual or unexpected topics to arise and were continued until saturation of themes was reached. Analysis was conducted utilizing the framework method [34]. While men were aware of melanoma as a serious disease, they were unaware of their higher risk compared to

other population subgroups, and were uncertain about what they should look for on their skin. One of the main barriers to seeking advice for suspicious skin lesions was the perception that they may bother a doctor unnecessarily, a tendency also described by others [26]. Importantly, men stated that they are very used to receiving DVDs or CDs as a means of communicating work-related or promotional information to them. In essence, men recommended a *disturb → educate → consolidate → close* sequence for the video contents.

2.2. Intervention materials

Based on these qualitative findings, a video script was written and a 12-minute video produced by a commercial audio-visual production company. A nationally-recognized sports personality volunteered as the "face" of the DVD, and provided voice-over commentary, and an experienced melanoma surgeon presented the doctor's perspective. The video presented information about what skin cancer is and that one form of skin cancer (melanoma) is particularly serious (perceived seriousness), risk factors for skin cancer and increased risk for men of their age group (perceived susceptibility), and how to detect skin cancer early. Skin cancer survivors and the mother of a man who died from melanoma explained why they performed and recommended SSE (benefits). An actor (a man aged 65 years) then guided viewers through a step-by-step SSE (self-efficacy), explaining what to look for and how to overcome common obstacles such as limited spare time, not having a mirror or not having a partner to help with difficult to see areas (barriers). Men were instructed to see a doctor if they detected a change on their skin and were shown a typical doctor's consultation, with encouraging words from the melanoma specialist recommending SSE, and that examinations with a benign outcome were beneficial and worthwhile (barriers).

In addition to the DVD, intervention group participants also received a body chart on which to note down skin lesions during SSE either to aid recall when visiting a doctor with that lesion or to facilitate self-monitoring. Men also received a colored brochure available from the Cancer Council Queensland showing benign and malignant skin lesions and describing their common features.

Men in the control group received this colored brochure only, which recommends SSE but does not give instructions on how to do such an examination.

2.3. Study population

For the main trial, potential study participants were randomly selected from the electoral roll Voting is compulsory in Australia and thus the electoral roll of all adult residents (aged ≥ 18 years) is regularly updated (according to the Australian Electoral Commission 97% of listings are enrolled and 95% up-to-date at any given time). Older age groups are more likely to be correctly enrolled compared to younger age groups. The Australian Electoral Commission generated a list of the names and addresses of 5000 men 50 years or older residing in the Australian state of Queensland, stratified by area of residence (metropolitan South-East Queensland or other). This list was compared to an online telephone directory and only men whose details could be matched with the telephone directory were deemed eligible. Therefore, men whose names or addresses appeared differently in the telephone directory, who had a telephone in their partner's name, or a silent number were not included in the study. Of the 2899 potential participants who were mailed a study pack, 2288 men responded (79%) with the following outcomes: 1032 did not consent to participate, 288 were ineligible due to cognitive or hearing impairment, non-English speaking, no access to either a video or DVD player or a previous melanoma diagnosis (these men would regularly visit their doctor for follow-up). Overall, 968 of the 2611 eligible men (37%) consented to participate. A further 39 men withdrew prior to the collection of baseline data, leaving a final sample of 929 participants (Figure 1).

2.4. Baseline survey

The baseline telephone interview collected extensive information on participants' socio-demographic characteristics, skin cancer risk factors and skin cancer history, and health-related attitudes and beliefs (see Tables 1-3 for details of questions and response categories of the baseline interview and Figure 1 for flow of participants).
2.4.1 Main outcome measures
A series of previously validated questions [35] established our main outcome variables: whether men ever examined their own skin and if so, the frequency of SSE; extent of SSE (participants were asked to nominate the body area(s) that they included in their last SSE; if they used a full-size mirror and/or hand-held mirror to conduct the SSE themselves; or whether another person assisted with hard-to-see areas). Our primary outcome measure was the most stringently defined form of whole-body SSE using a mirror or another person to check difficult to see areas. We also asked participants

about their confidence in performing SSE correctly and timely, and whether they specifically planned ahead for their next SSE.

A similar series of questions established consultations with a doctor about skin cancer. Participants were asked whether they ever received a CSE, whether it was a whole-body examination; who initiated the CSE; whether the doctor suggested or demonstrated SSE; if there was any delay in getting an appointment and the reasons for the delay; what management was chosen by the doctor for any lesion detected during this examination (excision/biopsy, non-surgical treatment, monitoring, or no treatment); and whether follow-up CSE was recommended.

In addition, the 10-item 4-point Likert scaled Generalized Self-efficacy Scale (GSE)[26, 36] was used, which has extensive support for its reliability and validity [37][38]; published means range from 29.5 (SD=5.1) for American adults [39] to 31.0 (SD=4.9) for a group of Australian men with HIV [40]. Higher scores indicate greater feelings of self-efficacy. Perceived social support was measured using the validated Multidimensional Scale of Perceived Social Support [41], a 12 item measure (7-point Likert scale) of social support from family, friends and significant others with good reliability and validity (higher scores indicate greater perceived social support). A recent Australian study reported a mean of 66.4 (SD=13.4) (range:2-84) for 214 men (mean age 50 yrs).[42] We also asked whether men engaged in other cancer screening behaviors (prostate specific antigen test or fecal occult blood test) and whether they had co-morbidities.

2.5. The intervention and follow-up.

After the baseline survey, participants were randomized to intervention or control group using an independently generated random number list, stratified by men's residence (metropolitan South-East Queensland or other). Materials for both groups were sent by mail approximately two to three weeks later. Men in the intervention group also received postcard reminders after two weeks and again after four weeks (one addressing barriers to watch the DVD, one to address barriers to do a SSE). Follow-up telephone interviews will be conducted 6 and 12 months after intervention materials were sent. During these follow-up interviews, men will be asked whether they went to a doctor for a CSE. If so, consent will be sought to confirm the outcomes of these examinations with the treating doctor, and pathology reports for lesions removed during the most recent CSE will be obtained (Figure 1).

2.6. Cost-effectiveness analysis

For the cost-effectiveness analysis, we will collect information relating to the intervention, delivery or operational costs, and other expenses incurred by participants. To investigate the use of health care resources attributable to the intervention, the costs of diagnosis and management by GPs or pathologists subsequent to CSEs will also be estimated. The data on costs will be derived from doctors' reports to obtain type and quantity of health resources used and valued using the Australian Medicare Benefits Schedule[43]. All Australian permanent residents are covered by this public health insurance, which pays scheduled fees for services, for example depending on the size and depth of the skin cancer.

2.7. Sample size and power calculations

The following primary aim was defined for the present trial: to measure the impact and cost-effectiveness of a video-delivered intervention with two mailed reminders compared to usual care on whole-body SSE among men aged 50 years or older. The trial also has two secondary aims: to describe the impact of the intervention on part or whole-body CSE and to describe the management by doctors of suspicious skin lesions identified among the intervention group compared to the control group. Our previous work established that approximately 20% of men 50 years or older report a whole-body SSE within the past 12 months. A community-based intervention increased peoples' early detection behavior, in particular whole-body skin examinations by a doctor by ~10% within the first year [44]. Assuming a similar increase in SSE and 10% attrition of participants, using a 0.05 (2-sided) significance level, a sample size of 500 men in each the intervention and control group will provide 91% power to detect an increase in the prevalence of reported SSE at 12 months of 9.9% i.e., from an assumed 20% at baseline to 30% at 12 months. This conservative endpoint will allow sufficient power for subgroup analyses (for example men who perceive their risk of developing skin cancer as high versus low). For equal subgroups (250 in each group) using the above assumptions we will have 80% power to detect an increase of 12% in reported SSE at 12 months within these subgroups.

2.8. Statistical Analysis

Statistical analysis of baseline data was performed using the SPSS statistical package (version 16.0). Descriptive analysis established whether characteristics differed

between the intervention and control groups and thus may require adjustment in subsequent intention-to-treat analyses once follow-up data has been collected. To establish factors associated with whole-body SSE and CSE at baseline we combined the intervention and control groups and established the proportion of men already performing SSE and CSE at baseline. We assessed factors associated with SSE and CSE in bi-variate logistic regression analyses (data not shown), and then entered those factors found to be associated at a conservative p-value of ≤0.1 into multivariable logistic regression models to investigate their independent contribution to men reporting these behaviors.

3. Results

3.1. Randomization success

Tables 1-3 present the baseline characteristics of the 929 men with complete baseline data randomized to the intervention and control group. There were very few significant differences between men randomized to these groups at baseline, with three exceptions. Men in the control group were more likely (38%) to strongly agree that they were confident in their doctors ability to diagnose skin cancer correctly, compared to men in the intervention group (28%), however, when examining the agree/strongly agree categories combined, both groups were similarly confident in their doctors (82% versus 84%). Men in the intervention group were somewhat less likely to report having ever looked at their skin (63%) compared to control group participants (72%) (Table 3). However, there was no difference in the proportion of men in the intervention (13%) and control (12%) group who reported a whole-body SSE in the past 12 months, or who reported a whole-body CSE by a doctor in the past 12 months (39% in both the intervention and control groups). Lastly, men in the control group where less likely to rate their confidence that they could check their own skin as high (14%) compared to intervention group participants (20%) (Table 3).

3.2. Baseline characteristics

We then combined intervention and control groups for subsequent baseline analysis. The mean age of the 929 men was 64 years (S.D=7.8). Consistent with the stratified selection, approximately equal numbers of men lived in metropolitan south-east Queensland (49%) and areas outside south-east Queensland (51%) All except 84 men (9%) had completed at least some secondary schooling, while 46% had post-school

education or training. Most men were either employed full-time (42%) or retired (42%). The vast majority of men were married or living with a partner (85%), and 51% had full private health insurance. Most were of British, Scottish or Welsh/Irish heritage (79%). Almost all men (92%) reported having a regular GP (Table 1), and this was the same for men living inside and outside metropolitan QLD (data not shown). Despite this, we found that men living outside metropolitan QLD were less likely to report a whole-body CSE within the past 12 months (35%) compared to men in metropolitan QLD (44%) (p=0.012). In contrast, there was no significant difference in the proportion of men living within (65%) or outside (69%) metropolitan areas who reported having looked at their own skin within the past 12 months (p=0.272).

In accord with their mostly northern European heritage the majority of men reported common skin cancer risk factors such as light hair (59%) and eye color (76%). Prevalence of other skin cancer risk factors are listed in Table 2. Very few men attempted to get a suntan in the past 12 months (5%) but despite this, half of the participants reported at least one sunburn over the past 12 months (50%). Almost two-thirds of participants (n=660, 71%) reported that they had had one or more skin lesions treated in the past (Table 2).

Attitudes and beliefs regarding skin cancer early detection behaviors were generally positive. For example, the majority of men thought that checking their skin was a priority for them (65%), that they could find something suspicious on their skin (68%), and that they would see a doctor straight away with a suspicious lesion (87%). Men's self-efficacy scores and social support scores were similar to those observed in previous male samples (Table 3).

3.3. Multivariable Analyses

After adjusting for other factors, men were more likely to report a whole-body SSE within the past 12 months if they were of Northern/Western European ethnicity, were confident they would find time in the next 12 months to check their skin and their doctor had suggested or instructed on SSE (Table 4).

Men were significantly more likely to have undergone CSE in the past 12 months if they had higher levels of household income, lived in metropolitan south-east Queensland, classified themselves as Australians, had a tendency to burn if exposed to the sun, reported freckling, and removal of a skin spot in the past, and agreed or

strongly agreed with the statement that checking their skin is a priority for them
(Table 5).

4. Discussion

Video-based health information materials are very commonly used by health organizations world-wide, but are infrequently tested for their effectiveness to improve health behaviors. With regards to SSE one trial in the US increased SSE behavior and thoroughness within a family practice setting [28]. Our video-based intervention was specifically designed for men 50 years of older who are at high risk of developing skin cancer in Queensland, Australia. The current paper provides evidence that participants were successfully randomized based on the similar distributions of characteristics between the intervention and control groups.

Our baseline survey results provide some interesting insights into skin examination behaviors and associated factors of men 50 years or older, and to our knowledge this population subgroup has not been studied in such detail before. The most common location of melanoma in men is the back and men therefore need to look at their whole body to gain the greatest health benefit from SSE. While two-thirds of men reported performing some form of SSE, only 13% of men were conducting a thorough SSE exam according to the most precise definition of whole-body SSE (whole body inspected with the aid of mirrors and/or help of another person). Our intervention was specifically designed to improve the thoroughness of SSE by providing men with clues and reminders to using those aids. A similar video-based intervention in the US was able to achieve an increase from 18% to 55% among a sample of men and women with an average age of 50 years [28]. Others have also recommended improving health professionals' awareness of the importance of checking men's backs during routine physical examinations [45].

Interestingly, few of the common skin cancer risk factors or sun protective behaviors were associated with thorough whole-body SSE in bi-variate analyses and none remained independently significant in the multivariable analysis. Only three factors were independently associated with thorough whole-body SSE in our age-adjusted analysis. One of these was attitudinal (having confidence in finding time for SSE). This finding is encouraging for our intervention trial, as the video-based intervention specifically addresses common barriers to SSE (such as finding time) and also aims to increase men's self-efficacy for SSE. A previous study among patients with familial atypical multiple mole melanoma syndrome found a positive attitude towards SSE and intention to perform SSE to be most highly associated with adequate SSE behavior [46].

Another factor associated with whole-body SSE in our study was receiving a doctor's recommendation (increased SSE by 9%) and/or instruction regarding SSE (increased SSE by 15%). In a previous study among men and women 30 years or older the importance of a doctor's recommendation for SSE was also highlighted [47][48]. A doctor's recommendation has also been found strongly associated with participation in other cancer screening behvaiors [49][50]. Overall, almost a third of men (30%; 29% living in metropolitan SE QLD, and 33% in the other parts of QLD) reported receiving a recommendation by a doctor to self-examine their skin. This is higher than the 24% we previously observed in men 50 years or older from rural Queensland in 2003[48]. About 71% of men reported removal of a skin cancer, spot or mole in the past, which is about 7% higher than we observed in 1998 [51]. Despite this history of skin surgery only 23% of men were currently concerned about a spot or mole (similar to our previous findings), and about 40% thought that it was unlikely (or were unsure) that they would develop skin cancer in the future, which is about 7% higher than what we observed earlier [51]. While there was a correlation between having a history of skin cancer treatment and perceived likelihood of developing skin cancer in the future, 20% of men with a history of having a spot or mole removed thought that it was unlikely that they would develop skin cancer in the future. This finding fits with our observations during the qualitative phase of this study that at least some men 50 years and older are unaware of their increased risk, and it is interesting to note that this perception can persist even if men have experienced skin surgery or treatment. Once the results of our subsequent assessment time-points are available, we will determine if men changed their perceived skin cancer risk as a result of this trial and will establish whether this mediates uptake of SSE.

In this sample, we found a high proportion of men had a regular doctor (90%) and in accord with this, the proportion of men reporting a whole-body CSE in the past 12 months was also higher (39%) than previously reported in Queensland (26%) had a CSE [52]. There are two possible reasons for this. Doctors may be conducting skin examinations more frequently (and this is in accordance with recommendations by the Cancer Council Australia to specifically target high-risk groups [53]), and/or our sample of men may contain a greater proportion of those who regularly visit their doctor for a skin check compared to other men in the population. Our results must be viewed in light of this potential bias. Supporting the indication of participation bias, men in the present study were more likely to report at least some private health insurance (70%) compared to population data (54%).

In contrast to the SSE findings above, besides being Australian (which increases the risk of skin cancer compared to European sun exposure during childhood), some skin cancer risk factors as well as previous history of skin treatment were associated with CSE in multivariate analysis.

This indicates that doctors' selection of at risk men lead to CSE. In addition a positive attitude towards skin checks was also independently predictive of CSE in this group of men 50 years or older, an attitude which is amenable to instructions by their doctor.

In summary, our baseline results highlight that within this sample of men 50 years or older from an area of Australia with a very high incidence of skin cancer, a large number of men have already experienced SSE, CSE and/or skin surgery. Despite this, appropriate use of SSE is low with only 13% performing a thorough examination. Therefore most men would be unlikely to notice changes on their skin, particularly on their back or the back of the neck. Further analysis will establish whether our targeted intervention material can successfully improve the thorough SSE behavior among men 50 years or older.

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Figure 1: Participant recruitment, randomization and follow-up schedule

Table 1: Demographic and health characteristics

Characteristic	Intervention group N=469 (%)		Control group N=460 (%)	
Area of Queensland				
South East Queensland	234	(49.9)	221	(48.0)
Other	235	(50.1)	239	(52.0)
Age group				
50-60 years	186	(39.7)	206	(44.8)
61-70 years	170	(36.2)	161	(35.0)
71-90 years	113	(24.1)	93	(20.2)
Highest level of education completed [a]				
Less than junior high school	45	(9.6)	39	(8.5)
Completed junior high school	109	(23.3)	131	(28.7)
Completed senior high school	91	(19.4)	76	(16.6)
Trade or technical certificate or diploma	107	(22.8)	120	(25.8)
University or college degree	117	(24.9)	93	(20.4)
Employment status				
Employed full-time	189	(40.3)	199	(43.3)
Employed part-time or casual	48	(10.2)	58	(12.6)
Permanently ill/unable to work/looking for work	19	(4.0)	21	(4.6)
Retired	213	(45.4)	182	(39.6)
Marital status				
Married/living together	400	(85.3)	391	(85.0)
Living alone/other	69	(14.7)	59	(15.0)
Private health insurance				
No cover	145	(30.9)	142	(30.9)
Partial cover	73	(15.6)	60	(13.0)
Full cover	251	(53.5)	258	(56.1)
Household income (yearly, before tax)				
Less than $20,000	64	(13.6)	56	(12.2)
$20,001 to $40,000	131	(27.9)	111	(24.1)
$40,001 to $60,000	81	(17.3)	84	(18.3)
$60,001 to $80,000	65	(13.9)	47	(10.2)
>$80,001	105	(22.4)	127	(27.6)
Refused	23	(4.9)	35	(7.6)
Country of birth				
Australia	363	(77.4)	360	(78.3)
Other	106	(22.6)	100	(21.7)
Ethnicity [a]				
British/Scottish/Welsh/Irish	374	(79.9)	362	(78.7)
Other	94	(20.1)	98	(21.3)

Table 1 continued: Demographic and health characteristics

Characteristic	Intervention group N=469 (%)		Control group N=460 (%)	
Has a regular family doctor				
Yes	428	(91.3)	424	(92.2)
No	41	(8.7)	36	(7.8)
Distance to family doctor				
0-< 15 kms	370	(78.9)	359	(78.0)
15-< 50 kms	78	(16.6)	82	(17.8)
>50 kms	21	(4.5)	19	(4.1)
Regularly visit doctor for health checkups				
Yes	301	(64.2)	290	(63.0)
No	168	(35.8)	170	(36.9)
Ever had a prostate specific antigen test (PSA test)				
Yes	350	(74.6)	366	(79.6)
No	104	(22.2)	82	(17.8)
Don't know/unsure	15	(3.2)	12	(2.6)
Ever had a fecal occult blood test (FOBT)				
Yes	175	(37.3)	191	(41.5)
No	252	(53.7)	236	(51.3)
Don't know/unsure	42	(9.0)	33	(7.2)
Doctor suggested self-checking of skin	138	(36.4)	147	(39.0)
Doctor showed how to check skin	98	(25.9)	84	(22.3)
Number of co-morbidities [a][b]				
none	53	(11.3)	40	(8.7)
1	99	(21.1)	100	(21.8)
2 or more	317	(67.6)	319	(69.5)

[a] Data missing for 1 participant

[b] Co-morbidities include: Heart conditions, high blood pressure, high cholesterol/lipid problems, stroke, diabetes/high blood sugar, lung conditions, stomach/duodenal ulcer, chronic headaches/migraine, Muscular-skeletal disorders (osteoporosis, back problems), arthritis/other joint problems, cancer/leukaemia (excluding skin cancer), mental health problems, any other prolonged/serious illness.

Table 2: Skin type, sun & skin protection behaviors

Characteristic	Intervention group N=469 (%)		Control group N=460 (%)	
Natural hair color at age 21				
Red/fair/blonde	126	(26.8)	125	(27.2)
Light or mouse brown	144	(30.7)	149	(32.4)
Dark brown	129	(27.5)	127	(27.6)
Black/other	70	(14.9)	59	(12.8)
Eye color				
Blue or grey	222	(47.3)	211	(45.9)
Green or hazel	138	(29.4)	135	(29.3)
Brown or black	109	(23.2)	114	(24.8)
Skin color before tanning or on unexposed areas				
Very fair	73	(15.6)	78	(17.0)
Fair	230	(49.0)	198	(43.0)
Medium	112	(23.9)	105	(22.8)
Olive or brown	54	(11.5)	79	(17.2)
If exposed to strong sun without protection, skin would..				
Burn and not tan afterwards	91	(19.4)	97	(21.1)
Burn then tan	244	(52.0)	233	(50.7)
Tan slightly without burning	111	(23.7)	101	(22.0)
Tan a lot without burning	23	(4.9)	29	(6.3)
Tanning after being exposed to sun over several days				
Never tan, only burn or freckle	28	(6.0)	29	(6.3)
Slight tan	95	(20.3)	96	(20.9)
Moderate tan	241	(51.4)	210	(45.7)
Deep tan	105	(22.4)	125	(27.2)
Freckling at end of summer as a child				
None	216	(46.1)	203	(44.1)
Few	181	(38.6)	184	(40.0)
Some	53	(11.3)	51	(11.1)
Many	19	(4.1)	22	(4.8)
Freckling at end of summer as an adult				
None	250	(53.3)	234	(50.9)
Few	172	(36.7)	181	(39.3)
Some	33	(7.0)	37	(8.0)
Many	14	(3.0)	8	(1.7)
Number of moles				
None	68	(14.5)	74	(16.1)
Few	306	(65.2)	293	(63.7)
Some	78	(16.6)	73	(15.9)
Many	17	(3.6)	20	(4.3)
Attempted to get a suntan in the past 12 months				
Yes	15	(3.2)	28	(6.1)
No/don't know	454	(96.8)	432	(93.9)
How many times got sunburnt in the past 12 months				
Never	229	(48.8)	227	(49.3)
Once	83	(16.5)	70	(15.2)
2-5 times	118	(25.2)	123	(26.7)
6 or more times	35	(7.5)	37	(8.0)
Don't know/unsure	4	(0.9)	3	(0.7)

Table 2 continued: Skin type, sun & skin protection behaviours

Characteristic	Intervention group N=469 (%)		Control group N=460 (%)	
How often wear a shirt with sleeves				
Rarely/never	115	(24.5)	117	(25.4)
Sometimes	96	(20.5)	90	(19.6)
Usually	73	(15.6)	74	(16.1)
Always	185	(39.4)	179	(38.9)
How often wear sunglasses				
Rarely/never	141	(30.1)	124	(27.0)
Sometimes	75	(16.0)	69	(15.0)
Usually	69	(14.7)	78	(17.0)
Always	184	(39.2)	189	(41.1)
How often stay in the shade				
Rarely/never	79	(16.8)	80	(17.4)
Sometimes	158	(33.7)	154	(33.5)
Usually	167	(35.6)	174	(37.8)
Always	65	(13.9)	52	(11.3)
How often use sunscreen				
Rarely/never	203	(43.3)	195	(42.4)
Sometimes	106	(22.6)	118	(25.7)
Usually	91	(19.4)	81	(17.6)
Always	69	(14.7)	66	(14.3)
How often limit time in the sun during midday hours				
Rarely/never	129	(27.5)	121	(26.3)
Sometimes	82	(17.5)	110	(23.9)
Usually	157	(33.5)	136	(29.6)
Always	101	(21.5)	93	(20.2)
How often wear a hat				
Rarely/never	35	(7.5)	30	(6.5)
Sometimes	49	(10.4)	56	(12.2)
Usually	118	(25.2)	110	(23.9)
Always	267	(56.9)	264	(57.4)
How often stay under an umbrella				
Rarely/never	397	(84.6)	397	(86.3)
Sometimes	38	(8.1)	34	(7.4)
Usually	19	(4.1)	20	(4.3)
Always	15	(3.2)	9	(2.0)
Ever had a skin cancer, mole, or other spot/s removed or treated				
Yes	333	(71.0)	327	(71.1)
No/not sure	136	(29.0)	133	(28.9)
How many skin cancers, moles, or other spots had treated [a]				
1	61	(18.3)	61	(18.7)
2 to 5	113	(33.9)	112	(34.3)
6 to 10	51	(15.3)	50	(15.3)
11 to 20	43	(12.9)	40	(12.2)
21 to 50	39	(11.7)	35	(10.7)
More than 50	26	(7.8)	29	(8.9)
Currently concerned about a spot or a mole				
Yes	106	(22.6)	105	(22.8)
No/not sure	363	(77.4)	355	(77.2)
How likely will get skin cancer in the future				
Not at all likely	127	(27.1)	122	(26.5)
Somewhat likely	173	(36.9)	159	(34.6)
Very likely	108	(23.0)	111	(24.1)
Don't know/unsure	61	(13.0)	68	(14.8)

[a] For people who had cancer(s)/mole(s)/spot(s) treated only

Table 3: Skin examination attitudes, beliefs and behaviors

Characteristic	Intervention group N=469 (%)		Control group N=460 (%)	
It is important to check my skin for skin cancer even if I have no symptoms				
Strongly disagree/disagree	13	(2.8)	13	(2.9)
Unsure	23	(4.9)	15	(3.3)
Agree	238	(50.7)	225	(48.9)
Strongly agree	195	(41.6)	207	(45.0)
I think checking my skin would make me anxious				
Strongly disagree	124	(26.4)	128	(27.8)
Disagree	260	(55.4)	235	(51.1)
Unsure	25	(5.3)	33	(7.2)
Agree/strongly agree	60	(12.7)	64	(13.9)
Checking my skin regularly is a priority for me				
Strongly disagree/disagree	92	(19.6)	92	(20.0)
Unsure	74	(15.8)	66	(14.3)
Agree	227	(48.4)	208	(45.2)
Strongly agree	76	(16.2)	94	(20.4)
I think I could find something suspicious on my skin if it was there				
Strongly disagree/disagree	53	(11.3)	44	(9.6)
Unsure	108	(23.0)	90	(19.6)
Agree	253	(53.9)	259	(56.3)
Strongly agree	55	(11.7)	67	(14.6)
If I saw something suspicious on my skin, I'd go to the doctor straight away				
Strongly disagree/disagree	28	(6.0)	25	(5.5)
Unsure	32	(6.8)	33	(7.2)
Agree	235	(50.1)	215	(46.7)
Strongly agree	174	(37.1)	187	(40.7)
I am confident in a doctor's ability to diagnose skin cancer				*
Strongly disagree/disagree	19	(4.0)	17	(5.4)
Unsure	56	(11.9)	54	(11.7)
Agree	260	(55.4)	208	(45.2)
Strongly agree	134	(28.6)	173	(37.6)
I have made plans on when to examine my own skin				
Strongly disagree/disagree	190	(41.8)	171	(37.2)
Unsure	80	(17.1)	94	(20.4)
Agree	148	(31.6)	153	(33.3)
Strongly agree	45	(9.6)	42	(9.1)
I am confident that I can take up examining my own skin again even if I have not looked at my skin in the past few months				
Strongly disagree/disagree	49	(10.4)	38	(8.2)
Unsure	60	(12.8)	52	(11.3)
Agree	291	(62.0)	299	(65.0)
Strongly agree	69	(14.7)	71	(15.4)

Table 3 continued: Skin examination attitudes, beliefs and behaviors

	Intervention group N=469 (%)		Control group N=460 (%)		
Have you or someone who is not a doctor ever deliberately checked any part of your skin for early signs of skin cancer					*
Yes	293	(62.5)	331	(72.0)	
No	176	(37.5)	129	(28.0)	
Whole-body skin self-examination in the past 12 months[a]	62	(13.2)	57	(12.4)	
Doctor never checked any parts of your skin for early signs of skin cancer	90	(19.2)	80	(17.4)	
Doctor has checked skin on whole body in the last 12 months	182	(38.8)	180	(39.1)	
Confidence that can check skin correctly					*
Very low (0-2)	78	(16.6)	65	(14.1)	
Low (3-5)	152	(32.4)	155	(33.7)	
Moderate (6-8)	147	(31.3)	177	(38.5)	
High (9-10)	92	(19.6)	63	(13.7)	
Confidence that will find time in the next 12 months to check skin					
Very low (0-2)	31	(6.6)	35	(7.6)	
Low (3-5)	69	(14.7)	60	(13.0)	
Moderate (6-8)	123	(26.2)	126	(27.4)	
High (9-10)	246	(52.5)	239	(52.0)	
Confidence that will remember to check skin at least monthly					
Very low (0-2)	72	(15.4)	84	(18.3)	
Low (3-5)	121	(25.8)	113	(24.6)	
Moderate (6-8)	120	(25.6)	125	(27.2)	
High (9-10)	156	(33.3)	138	(30.0)	
	median (range)		median (range)		
Self-efficacy score	32.1	(10-40)	32.3	(10-40)	
Multidimensional scale of perceived social support	70.0	(17-84)	71.4	(17-84)	

[a] To qualify for this, men must have used a handheld and a fullsize mirror and/or had another person help them

* $p \leq 0.05$

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Table 4 Adjusted multivariable logistic regression analysis of factors predicting skin self-examination (whole body) within the last 12 months

	Number of men	% checked whole body [a]	Adjusted [b] OR [c]	95% CI [d]	Sig [e]
Age	929	12.8	0.994 [f]	(0.97-1.02)	0.675
Ethnicity					
British/Scottish/Welsh/Irish	736	11.8	1.0	referent	0.062
Australian	26	23.1	1.82	(0.68-4.90)	
Northern/Western European	67	17.9	2.06	(1.02-4.14)	
Central/Eastern European	36	2.8	0.24	(0.03-1.77)	
Southern European	31	22.6	2.01	(0.80-5.06)	
Other	32	18.8	2.02	(0.77-5.34)	
Have confidence that will remember to check skin at least monthly					
Very low (0-2)	156	1.9	1.0	referent	<0.001
Low (3-5)	234	9.0	4.65	(1.35-16.02)	
Moderate (6-8)	245	13.5	6.97	(2.08-23.39)	
High (9-10)	294	21.1	10.93	(3.32-35.95)	
During last skin check doctor					0.001
Neither suggested SSE nor showed how to perform	439	9.1	1.0	referent	
Suggested SSE only	135	12.6	1.28	(0.69-2.37)	
Showed how to perform SSE only	32	25.0	2.54	(1.04-6.22)	
Suggested SSE & showed how to perform	150	24.7	2.70	(1.61-4.52)	
Not applicable g	173	9.8	1.07	(0.57-1.99)	

[a] In addition to reporting having checking his own body, men also must have reported using mirrors and/or having a second person help to be classified as having checked their whole body

[b] odds ratios mutually adjusted for all other variables in the table

[c] OR, odds ratio of checking skin in the last 12 months

[d] CI, confidence interval for true estimate of adjusted odds ratio

[e] statistical significance of the adjusted odds ratio

[f] OR for age can be interpreted that for every increase of one year of age, OR of checking skin is 0.994 times what is was for a given age

[g] Not applicable as have not had doctor check their skin

Table 5 Adjusted multivariable logistic regression analysis of factors associated with whole-body clinical skin examination within the last 12 months

	Number of men	% had skin checked by a doctor [a]	Adjusted [b] OR [c]	95% CI [d]	Sig [e]
Age	929	39.0	1.01 [f]	(0.98-1.03)	0.638
Yearly household income before tax					
Less than $20,000	120	29.2	1.0	referent	0.001
$20,001 to $40,000	242	36.0	1.34	(0.81-2.23)	
$40,001 to $60,000	165	34.5	1.43	(0.82-2.45)	
$60,001 to $80,000	112	36.6	1.54	(0.83-2.84)	
$80,001 to $100,000	79	48.1	2.66	(1.36-5.17)	
Over $100,000	153	52.3	3.19	(1.79-5.71)	
Refused	57	42.1	1.96	(0.96-3.98)	
Area of residence					
Metropolitan Queensland	451	43.5	1.0	referent	0.005
Outside Metropolitan Queensland	465	35.3	0.66	(0.49-0.88)	
Ethnic background					
British/Scottish/Welsh/Irish	736	39.1	1.0	referent	0.020
Australian	26	61.5	3.70	(1.44-9.54)	
Northern/Western European	67	41.8	1.35	(0.77-2.36)	
Central/Eastern European	36	41.7	1.37	(0.64-2.91)	
Southern European	31	22.6	0.51	(0.20-1.27)	
Other	32	21.9	0.53	(0.21-1.33)	
Tan following strong sun for 30 minutes					
Burn and not tan afterwards	188	44.7	1.0	referent	0.033
Burn then tan	477	38.8	0.83	(0.57-1.21)	
Tan slightly without burning	212	31.1	0.63	(0.40-0.995)	
Tan a lot without burning	52	51.9	1.60	(0.81-3.14)	
Degree of freckling as an adult					
None	484	33.1	1.0	referent	0.055
Few	353	45.6	1.55	(1.13-2.11)	
Some	70	45.7	1.20	(0.69-2.11)	
Many	22	40.9	1.15	(0.45-2.95)	
Have ever had a skin cancer, mole or other spot(s) removed or treated					
No	264	20.5	1.0	referent	<0.001
Yes	660	46.4	2.84	(1.96-4.11)	
Don't know/unsure	5	40.0	3.16	(0.45-22.37)	
Attitude towards statement: Checking my skin regularly is a priority for me					
Strongly disagree/Disagree	184	25.0	1.0	referent	<0.001
Unsure	140	30.0	1.27	(0.74-2.17)	
Strongly agree/Agree	605	45.3	2.32	(1.55-3.46)	

[a] in the last 12 months
[b] odds ratios mutually adjusted for all other variables in the table
[c] OR, odds ratio of checking skin in the last 12 months
[d] CI, confidence interval for true estimate of adjusted odds ratio
[e] statistical significance of the adjusted odds ratio
[f] OR for age can be interpreted that for every increase of one year of age, OR of checking skin is 1.01 times what is was for a given age