



Sun Safe Partners: A pilot and feasibility trial of a couple-focused intervention to improve sun protection practices

Sharon Manne^{a,*}, Ashley Day^a, Elliot J. Coups^a, Deborah Kashy^b

^a Rutgers Cancer Institute of New Jersey, 195 Little Albany Street, New Brunswick, NJ 08903, USA

^b Michigan State University, Psychology Building, East Lansing, MI 48824, USA

ARTICLE INFO

Keywords:

Sun
Protection
Behavior intervention
Couples

ABSTRACT

This single arm pilot intervention study evaluated the feasibility and preliminary impact of a Sun Safe Partners, which is a couple-focused intervention targeting improved sun protection behavior. Data were collected from New Jersey between August 2015 and March 2016. Participants were 61 couples reporting low levels of sun protection recruited from an online panel. After providing online consent, couples received mailed pamphlets and participated in a call where they discussed current levels of sun protection, made an Action Plan to improve sun protection, and discussed ways of assisting one another in improving sun protection. A call summary was mailed afterwards. Feasibility was assessed by study enrollment, call participation, follow-up survey completion, and intervention evaluation. Participants completed a baseline survey, and a one month and six month post-intervention survey assessing sun protection as well as individual and relationship-centered sun protection attitudes and practices. Results indicated that acceptance into the trial was 22.1%. Call participation was high (84%) and the intervention was well-evaluated. Among the 51 couples who completed the call and a follow-up, the intervention improved sun protection behaviors. Sun protection benefits, photo-aging risk, and relationship-centered attitudes and practices increased. A couple-focused intervention shows promise for improving sun protection. Future studies using a randomized clinical trial as well as strategies to improve study participation are recommended.

1. Introduction

Skin cancer is the most common cancer. About 76,000 cases of melanoma and 3.5 million cases of non-melanoma skin cancer are diagnosed in the US each year (American Cancer Society, n.d.-a). Although the incidence of most solid tumors decreased or stabilized between 1975 and 2010, the incidence of melanoma continued to rise approximately 3% per year during this period (Siegel et al., 2012). Based on these facts, the US Surgeon General's *Call to Action to Prevent Skin Cancer* (U. S. Department of Health and Human Services, 2014) called for stronger skin cancer prevention efforts that include research, surveillance, and evaluation related to skin cancer prevention. The primary risk factor for skin cancer is excess exposure to ultraviolet (UV) light. The majority of skin cancers could be prevented if people consistently used sun protection measures such as applying sunscreen, wearing clothing that covers exposed areas of the skin, and staying in the shade (van der Pols et al., 2006; Green et al., 2011; American Cancer Society, n.d.-b). Engagement in recommended sun protection is low in the US. Up to 70% of the population do not regularly use

sunscreen, wear protective clothing, or avoid the sun while outdoors (Fischer et al., 2016; Buller et al., 2011). To understand why people do not engage in sun protection, most studies focused on individual factors, including demographics, objective risks, and attitudes and beliefs. For example, fewer perceived benefits of sun protection, more barriers to sun protection, and appearance benefits of having tanned skin predict lower levels of sun protection (Jackson and Aiken, 2000; Craciun et al., 2012; Cody and Lee, 1990).

A less-studied but potentially motivating factor for sun protection is the marital relationship. Because couples live together and share situations where UV exposure occurs (e.g., vacations to sunny places), may share actual sun protection (e.g., sunscreen), and share environmental supports for sun protection (e.g., a car where sunglasses can be stored), involving couples in intervention efforts may be an untapped opportunity to improve sun protection. The broader literature on marital relationships and health behaviors suggests that spouse involvement can enhance the effectiveness of health promotion interventions. For example, studies have indicated that behavioral interventions with spouse involvement enhance the effects of psychological

* Corresponding author at: 195 Little Albany Street, New Brunswick, NJ 08903, USA.

E-mail address: sharon.manne@rutgers.edu (S. Manne).

<https://doi.org/10.1016/j.pmedr.2018.10.010>

Received 14 May 2018; Received in revised form 4 October 2018; Accepted 14 October 2018

Available online 18 October 2018

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interventions for cancer patients (Hopkinson et al., 2012), improve outcomes in weight-control interventions (McLean et al., 2003), and increase colorectal cancer screening participation (van Jaarsveld et al., 2006). The few studies evaluating the spouse influence on sun protection have done so in the broader context of general family influence. These studies suggest that families discuss sun protection with one another and that greater family support for sun protection is associated with higher levels of sun protection. (Manne et al., 2011; Loescher et al., 2009; Hay et al., 2005; Azzarello et al., 2006)

When considering how the marital relationship may influence health behavior, Lewis and colleagues (Lewis et al., 2006) proposed an integrative framework based on an interdependence theory and communal coping framework to explain how couples' interactions may influence engagement in a risk-reducing health behavior. This framework proposes that strong interdependence in long-term, successful close relationships (i.e., partners' influence on one another's preferences, behaviors, health outcomes) transforms their motivations from doing what is in their self-interest (self-centered) to doing what is in the best interest of their relationship (relationship-centered). The transformation from self- to relationship-centered motivation occurs when partners ascribe health threats and subsequent health changes as having meaning for the relationship and/or their spouse. Lewis and colleagues' (Lewis et al., 2006) model proposed four contributors to behavioral change: 1) predisposing factors of the couple (e.g., individual perceptions of the health threat); 2) how much partners agree that health changes should be made together; 3) partners' commitment to the relationship, and; 4) demographic factors. When relationship-centered motivation develops, communal coping begins. Communal coping efforts consist of joint decision making (e.g., discussing the change) and planning how to make the change (Revenson and Lepore, 2012). Finally, communal coping efforts lead to engagement in health behavior change for both partners (Lewis et al., 2006).

In our prior work (Manne et al., 2016), we found high couple concordance with sun protection practices ($r = 0.5$) and support for the interdependence and communal coping framework. Results suggested that targeting sun protection benefits, helping individuals form realistic perceptions of their skin cancer risk, helping partners perceive benefits to their relationship for adopting sun protection, and facilitating

discussion about sun protection may improve both partners' sun protection. Furthermore, couples who reported that they discussed sun protection and endorsed its benefits for their partner and their relationship were more likely to engage in sun protection. Taken together, this suggests that harnessing constructive relationship influences on sun protection via behavioral interventions may be a promising method for improving sun protection.

To date, a couple-focused sun protection intervention has not been developed and tested. This paper reports on the results of a pilot and feasibility study of a couple-focused sun protection intervention, called Sun Safe Partners. The Sun Safe Partners intervention content was guided by the interdependence and communal coping framework. It included the provision of mailed small media materials, a couple-focused telephone counseling call, and a mailed summary letter. This study had two aims. The first aim was to gather feasibility data as measured by study enrollment, call participation, follow-up survey completion, and intervention evaluation. The second aim was to examine the preliminary impact of the intervention on the primary outcome of sun protection behaviors and secondary outcomes of individual sun protection attitudes and relationship-centered attitudes and practices regarding sun protection. Intervention effects were assessed using a dyadic data analysis method in which multilevel analyses were used to take into account the non-independence due to the dyad (i.e., the married/cohabitating couple) and time (baseline, 1 month, 6 month). These models tested the effects of sex, time, and their interaction, so that differences between husbands and wives could be examined.

2. Materials and methods

2.1. Participant recruitment and setting

Participants were recruited from an online panel from a private research company, Qualtrics. Eligibility included 1) both partners age 45–75 years; 2) married or co-habiting with a significant other for at least one year; 3) panel member willing to pass the screening survey to their spouse; 4) panel member *and* spouse have an average score on the sun protection behaviors measure of less than or equal to 3 on the five-point scale (see measures section, below) (Glanz et al., 2008); 5) panel

Table 1
Components of the Sun Safe Partners intervention.

Objective	Theoretical construct(s)	Mediating construct(s)	Key tasks in the Sun Safe Partners intervention
Reduce individual barriers to sun protection	Preventive Health Model (Myers et al., 1994)	Perceived risk Sun protection benefits and barriers	<ul style="list-style-type: none"> • Increase knowledge and awareness of personal risk factors for skin cancer • Provide information about current and recommended sun protection practices • Improve awareness of personal attitudes about sun protection • Increase discrepancy between individual health and cancer prevention values and present sun protection practices • Foster reconsideration of current sun protection practices and build counter-attitudinal thinking
Build communal relationship orientation and support for sun protection	Interdependence and communal coping (Lewis et al., 2006)	Promote relationship-centered attitudes and motivations for sun protection Promote relationship-centered practices by building willingness to provide support and accept influence	<ul style="list-style-type: none"> • Awareness of partner's skin cancer risk and sun protection attitudes and benefits to partner and relationship for better sun protection • Foster awareness of partners' influence on one another for health practices including sun protection (e.g., a shared environment) • Promote a communal change belief system • Promote open and supportive discussions about sun protection • Allow couples to identify what they would like in terms of support for sun protection and negotiate partner's agreement • Build ability to give and accept partner's influence on sun protection

Note. Data in this study were collected from New Jersey during August 2015–March 2016.

member *and* spouse have never been diagnosed with any type of skin cancer, and; 6) panel member *and* spouse have an email account, internet access, and phone service. This study is a one-arm clinical trial design with no control group.

2.2. Sun safe partners intervention

The intervention had three components: 1) small media materials mailed to each partner; 2) a 30 to 45 min telephone counseling call; 3) a summary letter of the call with an Action Plan document. Intervention components corresponded with two intervention goals: 1) address individuals' awareness and knowledge about skin cancer risk, beliefs, and barriers to sun protection; 2) build communal relationship orientation and support for sun protection. The intervention utilized behavioral construct tailoring (Kreuter et al., 2001) and was based on established correlates of sun protection practices (Manne et al., 2016; Manne et al., 2008). Theoretical guidance for came from the Preventive Health Model (PHM) (Myers et al., 1994); and Interdependence and communal coping framework. Details are in Table 1 (Lewis et al., 2006).

Print materials included an illustrated booklet that was tailored to participants' survey responses, three handouts to guide the call, and two publicly-available pamphlets. The illustrated booklet contained a sun protection behaviors "scorecard", ways to improve self and partner sun protection, ways to think about sunscreen barriers, and a doctor Q & A about skin cancer risk reduction. Couples were also mailed Centers for Disease Control and Prevention pamphlets, "Choose Your Cover," (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 1998) and "Sunscreen for Your Sun Day." (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2017) The call included: 1) the importance of the marital relationship in health; 2) rating the importance of each partners' health and of reducing risk for skin cancer and discussing motivations for sun protection; 3) review of skin cancer facts, sun exposure's association with skin cancer, and recommended sun protection behaviors, and a discussion of benefits of sun protection for their relationship and each partner; 4) couples' discussion of their barriers and alternative ways of overcoming them; 5) couples' discussion of ways to improve sun protection; 6) using an Action Plan handout, partners chose one sun protection habit to improve, discussed ways to assist one another, barriers, and overcoming barriers. A summary letter was sent with each partner's Action Plan.

2.3. Procedures

This study was approved by the Institutional Review Board. Qualtrics sent an eligibility survey via email to potential participants in their panel. Eligible panel members passed on an eligibility link to their partners. If both partners were eligible, the couple's contact information was passed to the study team at the corresponding author's institution. The team confirmed eligibility and ensured that there were two separate individuals participating via phone. Next, a link was sent to the online consent and baseline survey. Informed consent was obtained from all participants by clicking "yes" to "Do you agree to the terms and conditions of the consent?" and typing their initials and completing the survey. The print materials were mailed before the call. Calls were scheduled two weeks from the baseline survey to allow receipt of print materials. The study involved a baseline, one-month post-intervention call (Follow-up 1), and six-month post-intervention call follow-up survey (Follow-up 2). Electronic links to the online survey were sent to participants via Qualtrics. Participants were paid \$20 for completing the baseline, \$40 for the counseling call, and \$25 for each follow-up. Couples who did not complete the call were sent intervention materials if a mailing address was provided.

2.4. Measures

2.4.1. Intervention evaluation

At the Follow-up 1, participants completed a 12-item scale used in prior research (Manne et al., 2013) that assessed the degree to which the materials were comprehensible, valuable, prepared with them and their partner in mind, and increased the ease of discussion about sun protection with the partner. Sample items included, "The information I received from the pamphlets and the counselor was valuable," and "The information I received helped me understand why practicing better sun protection might benefit my partner as well as our relationship." Alphas were 0.95 for men and 0.94 for women.

2.4.2. Primary outcome: sun protection behaviors (baseline and follow-up 2)

This measure assessed current engagement in six sun protection behaviors when outside on a warm sunny day (sunscreen, hat, shade, shirt with sleeves, long pants, sunglasses) using a five-point Likert scale (1 = *never*, 5 = *always*) (Glanz et al., 2008). Items were averaged.

2.4.3. Secondary outcome: individual attitudes about sun protection (baseline, follow-up 1, follow-up 2)

The sun protection benefits scale (Branstrom et al., 2010) had nine items (1 = *strongly disagree*, 5 = *strongly agree*). Alphas ranged from 0.84 to 0.89 for wives and 0.90 to 0.92 for husbands. The barriers to using sunscreen scale (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 1998) had nine items (1 = *strongly disagree*, 5 = *strongly agree*). Alphas ranged from 0.77 to 0.90 for wives and 0.78 to 0.80 for husbands. The sun protective clothing barriers scale (Branstrom et al., 2010) had seven items (1 = *strongly disagree*, 5 = *strongly agree*). Alphas ranged from 0.78 to 0.87 for wives and 0.82 to 0.95 for husbands. The sun avoidance barriers scale (U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 1998) had six items (1 = *strongly disagree*, 5 = *strongly agree*). Alphas ranged from 0.79 to 0.86 for wives and 0.80 to 0.87 for husbands.

The photo-aging risk scale (Janssen et al., 2011) assessed perceived likelihood of damage to one's skin if one did not engage in sun protection and had three items (1 = *strongly disagree*, 5 = *strongly agree*). Alphas ranged from 0.90 to 0.95 for wives and 0.90 to 0.93 for husbands.

2.4.4. Secondary outcomes: relationship-centered attitudes and practices (baseline, follow-up 1, follow-up 2)

Relationship-centered attitudes were assessed using four measures. The first measure was the benefits of sun protection for the relationship scale, which had six items (1 = *strongly disagree* to 5 = *strongly agree*) (Manne et al., 2016). Alphas ranged from 0.85 to 0.93 for wives and 0.87 to 0.93 for husbands. The second measure was the relationship influence scale which was composed for this study and assessed the influence of the spouse on the participants' sun protection. The scale had five items (1 = *not at all true*, 4 = *very true*). Alphas were 0.72 to 0.88 for wives and 0.84 to 0.87 for husbands. The third measure assessed how much the participant supported his/her spouse's sun protection which was assessed using a single item (1 = *not at all supportive*, 5 = *very supportive*). The fourth measure assessed the degree to which participants perceived that their spouse supported their sun protection, using a single item (1 = *not at all supportive*, 5 = *very supportive*).

Relationship-centered practices were assessed by a single item, "I talk to my spouse/partner about using sun protection" (1 = *strongly disagree*, 5 = *strongly agree*). As an exploratory outcome, at Follow-up 2, participants reported whether or not they engaged in ten behaviors since the counseling call. Items are shown in Table 7.

2.5. Data analysis

Because data were collected from both marital partners, a dyadic data analytic approach was taken in which individuals were nested within couples, and time (Baseline, Follow-ups) was crossed with dyad (i.e., each individual provided scores at each time-point). Data were analyzed using dyadic over-time multilevel mixed models in which the effects of participant sex, time, and their interaction were treated as fixed effects predicting the primary and secondary outcomes. Covariates included were age, education level (effect coded as $-1 =$ high school diploma or less, $1 =$ more than high school), and relationship length. Significant time main effects were followed with post-hoc Tukey tests. Evidence of mean differences between baseline measures and the follow-up measures support an intervention effect. The random effects components of the models included separate intercept variances for men and women, with the covariance between them modeling similarity in average outcomes for the two partners, and separate residual variances for men and women, with the covariance between them. The covariance between the residuals measures the time-specific similarity between the two partners' outcomes after taking time, sex, and the covariates into account. Couples had to have at least two observations (Baseline and one follow-up) to be included in analyses.

3. Results

3.1. Feasibility

3.1.1. Acceptance

Of the 551 potential participants who were eligible, 274 individuals consented (49.7%). Of the 274, 183 completed baseline surveys (48.9%). Of the 183, 61 were excluded due to unreliable data (possible duplicates/fake surveys) or only one partner completed the survey. Thus, the final sample included 122 individuals from 61 couples. Acceptance was 22.1% of eligible participants (122/551). Comparison of the 122 participants and the 61 non-participants on available demographic and baseline data did not indicate differences.

3.1.2. Call and follow-up survey completion

Eighty-two percent ($N = 52$) of couples attended the call. Of the 61 couples enrolled, 49 husbands (80.3%) and 52 wives (85.2%) completed Follow-up 1, and 50 husbands (85.2%) and 50 wives (82%) completed Follow-up 2. It should be noted that all 10 couples who did not complete the call also did not complete the follow-up surveys. Thus, the effective sample size for the intervention analyses was 51.

A comparison between the 51 couples who participated and the 10 couples who did not complete the call/follow-ups with regard to baseline scores indicated that there were no significant differences between the two groups.

3.1.3. Intervention evaluation

(Table 2) Participants found the intervention helpful, valuable, and easy to understand. Most felt the intervention facilitated their ability to talk to their partners about engaging in better sun protection and helped them understand why engaging in regular sun protection would benefit their relationship.

3.2. Intervention effects

The sample for analysis consisted of 51 couples. Sample characteristics are shown in Table 3. The majority of wives (88.2%) and husbands (90.2%) were non-Hispanic White.

Table 4 presents the estimated marginal means, standard errors, and F-tests examining the effects of sex, time, and the sex by time interaction for the primary outcome. There was a modest sex effect with women reporting slightly higher sun protection, as well as a strong time

Table 2
Sun Safe Partners intervention evaluation.

Variable	Wives	Husbands
	<i>M (SD)</i>	<i>M (SD)</i>
Helpful	6.4 (1.00)	6.3 (0.85)
Learned something new	6.1 (1.20)	6.2 (1.30)
Was interesting	6.5 (0.75)	6.5 (0.80)
Was valuable	6.5 (0.83)	6.4 (0.91)
Was easy to understand	6.8 (0.53)	6.7 (0.59)
Was valid	6.7 (0.53)	6.7 (0.70)
Prepared with couple in mind	6.4 (0.89)	6.5 (0.88)
Made it easier to talk to my partner about engaging in sun protection	6.4 (0.85)	6.4 (0.84)
Helped me understand why practicing better sun protection might benefit my partner and our relationship	6.5 (0.85)	6.5 (0.84)
After receiving materials, I feel comfortable talking to my partner about regular sun protection	6.6 (0.74)	6.6 (0.76)
I feel discussion with my partner on the call was comfortable and helpful	6.7 (0.70)	6.6 (0.76)

Note. Data in this study were collected from New Jersey during August 2015–March 2016.

Table 3
Descriptive information for the study sample.

Variable	Wives		Husbands	
	<i>N(%)</i>	<i>M(SD)</i>	<i>N(%)</i>	<i>M(SD)</i>
Age (years)		53.8 (5.9)		55.4 (6.2)
Race/Ethnicity				
Non-Hispanic White	45 (88.2)		46 (90.2)	
Hispanic White	1 (2.0)		2 (3.9)	
Black	2 (3.9)		1 (2.0)	
Asian	3 (5.9)		2 (3.9)	
Education				
Less than high school	0 (0)		2 (3.9)	
High school	19 (37.3)		13 (25.5)	
Some college	16 (31.4)		17 (33.3)	
Bachelor degree or higher	11 (21.6)		19 (37.2)	
Has medical insurance	45 (88.2)		52 (85.2)	
Relationship length (years)		24.8 (10.5)		23.9 (10.0)
More than five blistering sunburns in lifetime	7 (13.7)		13 (25.3)	
History of indoor tanning	20 (39.2)		3(5.9)	

Note. Data in this study were collected from New Jersey during August 2015–March 2016.

effect such that participants reported higher sun protection at Follow-up 2 relative to Baseline, $d = 1.29$.

Results for secondary outcomes assessing individual attitudes are presented in Table 5. Men reported significantly greater barriers to avoiding the sun, and women reported higher photo-aging risk. Significant time effects were found for these outcomes, and post-hoc Tukey tests demonstrated significant changes from baseline to both follow-ups for all outcomes (Cohen's d were 0.39 to 0.89, average = 0.58). Sun protection benefits and photo-aging risk increased and perceived barriers decreased over time. Sunscreen barriers ($d = 0.29$) differed from Follow-up 1 to Follow-up 2, and both continued to decrease over time. There were no significant interactions between sex and time for any outcomes.

Results for relationship-centered attitudes and practices are shown in Table 6. The only significant sex main effect was for participants' reports of discussing sun protection with their spouse: Women reported discussing sun protection more than men. Participants reported significantly higher relationship benefits for sun protection and

Table 4
Means, standard deviations, and *F*-tests assessing the effects of participant sex, time, and the interaction between sex and time on sun protection.

	Baseline	Follow-up 2	Sex	Time	Sex by Time	ICC for intercepts ^d	ICC for residuals ^d
	<i>M</i>	<i>M</i>	<i>F</i>	<i>F</i>	<i>F</i>		
	(<i>SE</i>)	(<i>SE</i>)	(<i>df</i>)	(<i>df</i>)	(<i>df</i>)	ρ	ρ
Sun protection behaviors							
Wives	2.50 (0.07)	3.34 (0.08)	2.91 ^{ab} (1,67)	107.81 ^c (1,53)	0.41 (1,54)	0.42 ^a	0.60 ^c
Husbands	2.36 (0.08)	3.26 (0.09)					

Models also included age, education status (−1 = high school or less, +1 = more than high school), and relationship length. Means are estimated marginal means controlling for the covariates. Data in this study were collected from New Jersey during August 2015–March 2016.

^a *p* < .10.

^b *p* < .05.

^c *p* < .01.

^d ICC, intraclass correlation between partners' scores.

Table 5
Means, standard deviations, and *F*-tests assessing the effects of participant sex, time, and the interaction between sex and time on secondary outcomes assessing individual attitudes.

	Baseline	Follow-up 1	Follow-up 2	Sex	Time	Sex by Time	ICC for intercepts ^d	ICC for residuals ^d
	<i>M</i>	<i>M</i>	<i>M</i>	<i>F</i>	<i>F</i>	<i>F</i>		
	(<i>SE</i>)	(<i>SE</i>)	(<i>SE</i>)	(<i>df</i>)	(<i>df</i>)	(<i>df</i>)	ρ	ρ
Sun protection benefits								
Wives	4.11 (0.08)	4.54 (0.08)	4.55 (0.08)	3.75 ^a (1,59)	28.92 ^c (2,99)	1.61 (2,99)	0.59 ^c	0.56 ^c
Husbands	3.90 (0.09)	4.48 (0.10)	4.41 (0.10)					
Barriers to wearing protective clothing								
Wives	3.68 (0.12)	3.12 (0.12)	3.11 (0.13)	0.01 (1,64)	19.26 ^c (2,94)	1.32 (2105)	0.53 ^c	0.39 ^c
Husbands	3.72 (0.13)	3.24 (0.14)	2.98 (0.14)					
Barriers to avoiding the sun								
Wives	2.71 (0.13)	2.34 (0.14)	2.34 (0.14)	9.38 ^c (1,61)	12.79 ^c (2,99)	0.51 (2104)	0.49 ^c	0.08
Husbands	3.14 (0.13)	2.78 (0.14)	2.62 (0.14)					
Barriers to using sunscreen								
Wives	2.58 (0.09)	2.27 (0.09)	2.14 (0.09)	3.25 ^a (1,58)	25.22 ^c (2,98)	1.62 (2103)	0.44 ^c	0.33 ^c
Husbands	2.84 (0.10)	2.42 (0.11)	2.21 (0.10)					
Photo-aging risk								
Wives	4.17 (0.09)	4.51 (0.10)	4.56 (0.10)	14.47 ^c (1,58)	16.44 ^c (2101)	0.48 (2,99)	0.47 ^c	0.23 ^b
Husbands	3.68 (0.13)	4.10 (0.14)	4.20 (0.14)					

Models also included age, education status (−1 = high school or less, +1 = more than high school), and relationship length. Means are estimated marginal means controlling for the covariates.

Data in this study were collected from New Jersey during August 2015–March 2016.

^a *p* < .10.

^b *p* < .05.

^c *p* < .01.

^d ICC, intraclass correlation between partners' scores.

significantly higher relationship influence, support for one another's sun protection, and discussion after the intervention relative to baseline (*ds* were 0.39 to 1.15, with a mean of 0.74). However, there was no evidence of changes in these outcomes (i.e., a greater increase) from Follow-up 1 to Follow-up 2.

Table 7 illustrates the exploratory outcome of relationship-centered practices. Overall, engagement in methods to encourage spouse sun protection behaviors was prevalent. Husbands reported higher levels of encouragement not to sunbathe than wives.

4. Discussion

Incorporating individuals' social networks into sun protection interventions represents a novel and potentially important approach to improving engagement in these practices. In this study, we report on a new couple-focused sun protection intervention, which was delivered using small media materials and couple-focused telephone counseling call. Feasibility data suggest that study participation was low. Once enrolled, participation in the telephone call was relatively high. Moreover, the intervention was highly evaluated, and the completion rate for the

Table 6

Means, standard deviations, and *F*-tests assessing the effects of participant sex, time, and the interaction between sex and time on relationship-centered attitudes and practices.

	Baseline	Follow-up 1	Follow-up 2	Sex	Time	Sex by Time	^d ICC for intercepts	^d ICC for residuals
	<i>M</i>	<i>M</i>	<i>M</i>	<i>F</i>	<i>F</i>	<i>F</i>	ρ	ρ
	(<i>SE</i>)	(<i>SE</i>)	(<i>SE</i>)	(<i>df</i>)	(<i>df</i>)	(<i>df</i>)		
Relationship benefits								
Wives	4.20 (0.08)	4.68 (0.08)	4.66 (0.08)	3.01 ^a (1,60)	33.55 ^c (2,96)	0.71 (2103)	0.69 ^c	0.42 ^c
Husbands	4.03 (0.09)	4.57 (0.09)	4.61 (0.09)					
Relationship influence								
Wives	1.72 (0.10)	2.50 (0.11)	2.56 (0.11)	3.83 ^a (1,63)	67.24 ^c (2102)	0.39 (2101)	0.74 ^c	0.42 ^c
Husbands	1.82 (0.10)	2.69 (0.11)	2.71 (0.11)					
Support for spouse's SP								
Wives	4.03 (0.11)	4.54 (0.12)	4.61 (0.12)	0.94 (1,60)	36.91 ^c (2102)	6.14 ^c (2104)	0.74 ^c	0.32 ^c
Husbands	3.67 (0.10)	4.54 (0.11)	4.73 (0.11)					
Spouse supports participant's SP								
Wives	3.81 (0.13)	4.32 (0.14)	4.48 (0.14)	1.68 (1,54)	20.62 ^c (2101)	1.53 (2,97)	0.32	0.34 ^c
Husbands	3.77 (0.12)	4.55 (0.14)	4.73 (0.14)					
Talked to spouse about SP								
Wives	3.52 (0.12)	4.26 (0.13)	4.37 (0.13)	4.21 ^b (1,55)	38.52 ^c (2,98)	0.28 (2101)	0.67 ^c	0.12
Husbands	3.30 (0.15)	4.07 (0.16)	4.06 (0.16)					

Note. SP = sun protection ^a $p < .10$, ^b $p < .05$, ^c $p < .01$. ^d ICC, intraclass correlation between partners' scores. Models also included age, education status (−1 = high school or less, +1 = more than high school), and relationship length. Means are estimated marginal means controlling for the covariates. Data in this study were collected from New Jersey during August 2015–March 2016.

Table 7

Relationship-centered practices at follow-up 2.

Behavior	Wives	Husbands
	%	%
Discussed importance of improving sun protection with spouse	90.0	80.0
Purchased sunscreen for my spouse to wear	62.0	50.0
Purchased a hat for my spouse to wear	52.0	34.0
Purchased sunglasses or sun protective clothing for my spouse to wear	52.0	54.0
Placed sun protection items in a specific place in our home so it is handy for my spouse	74.0	66.0
Encouraged my spouse to wear sunscreen	90.0	70.0
Encouraged my spouse to wear a hat	74.0	54.0
Encouraged my spouse to wear sunglasses	78.0	66.0
Encouraged my spouse to wear sun protective clothing	82.0	66.0
Encouraged my spouse not to sunbathe	58.0	90.0

Note. Data in this study were collected from New Jersey during August 2015–March 2016.

follow-up surveys was satisfactory. Overall, the acceptability to couples once they enrolled in the study was good, but enrolling couples into the study was challenging.

Results regarding preliminary efficacy were promising. Pre-post comparisons illustrated that couples' sun protection behaviors significantly increased after intervention. Individual attitudes about sun protection were more favorable. Effect sizes were in the medium to large magnitude range. Our findings were promising in terms of couples' ability to view sun protection from a relational perspective, with increases in the importance of one's own engagement in sun protection for the partner and relationship and partner-centered motivations engage in better sun protection. Couples reported more discussion about sun

protection after the intervention relative to before the intervention (*ds* ranged from 0.39 to 1.15 with a mean of 0.74). Importantly, there was no evidence of changes in these outcomes from one month to six months after the intervention, suggesting that these positive changes persisted.

The results support Lewis and colleagues' (Lewis et al., 2006) framework to explain how couples' interactions influence sun protection. By focusing the intervention on couples' awareness of one another's risks, attitudes and sun practices and by fostering agreement and commitment that changes in sun protection could be made together, we built relationship orientation and support for sun protection. These findings are corroborated by the fact that participants reported encouraging and assisting their partners in adopting sun protection behaviors.

Before drawing conclusions, it is important to point out limitations. First, because this was a pilot and feasibility study, one limitation is that there was no control group. Second, study acceptance was low, even with financial incentives. This raises concern about possible interest in this intervention outside of a study. Third, couples received print materials with the telephone counseling call, and thus we cannot determine if changes were due to the print materials and/or the counseling call. Fourth, data collection spanned the late summer through the winter months. For participants who resided in southern climates, the follow-up occurred in a warm, sunny time frame. However, for participants who resided in non-southern climates, the follow-up occurred in the spring. A one-year time span would have provided a more comprehensive assessment of the effects. Finally, due to the innovative couples' focus, several measures were composed for this study. Future studies should develop validated measures.

4.1. Conclusions

This paper presents a novel approach to facilitating engagement in sun protection by harnessing spouse influences. Our findings suggest

that a couple-focused intervention may hold promise as a way to improve sun protection behaviors. Participants reported positive evaluations of the intervention and there were significant increases in sun protection behaviors as well as the importance of sun protection for themselves, their partners, and their relationship. Encouraging couples to consider the effects of their sun protection on their partner and on their relationship and facilitating their support for each other's sun protection may be effective approach. Based on the outcome of our pilot study, future studies are needed that: 1) utilize a controlled randomized clinical trial design; 2) utilize a longer follow-up; 3) evaluate couples during summer months; 4) use enhanced recruitment methods or an online method of intervention delivery, 5) include whether children reside in the home in intervention and assessment, and; 6) include a larger more diverse sample. Participation was low, which suggests that future research should consider other strategies to facilitate increased uptake. Enhancing participation by providing quotes from previous participants, a study information page, following up with email reminders, including information about the importance of sun protection in skin cancer risk reduction, and using multiple social media recruitment methods (Google, Instagram) may increase uptake (Treweek et al., 2018; Watson et al., 2018).

Funding

Funding for this study was provided by a grant from the National Cancer Institute P30 (CA072720) awarded to Dr. Steven Libutti. The National Cancer Institute had no involvement in study design, collection, analysis, and interpretation of data as well as in the writing of the report, and in the decision to submit the article for publication.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Acknowledgments

We would like to acknowledge Sara Frederick, Travis Logan, and Katie Darabos for data collection.

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