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Process and Outcomes of a Skin Protection Intervention for Young Adults

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Abstract

Background—Efforts to reduce skin cancer risk behaviors using appearance-oriented interventions (e.g., ultraviolet [UV] light photos showing skin damage) or Motivational Interviewing (MI) have shown promise in recent trials.

Method—A randomized 2 (UV photo versus no UV photo) $\times$ 2 (MI versus no MI) factorial design with longitudinal follow up.

Results—Progression in stage of change (SOC) was significantly more likely in the photo than the education condition. Treatment credibility as rated by participants and counselor perceived positive therapeutic alliance predicted SOC progression. There was also preliminary evidence for differential intervention effectiveness by baseline SOC.

Conclusions—Implications are discussed.

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Keywords

randomized controlled trial; skin protection; UV photos; motivational interviewing; young adults; stage of change

Introduction

Skin cancer is the most common form of cancer, with over two million new cases diagnosed yearly in the United States (ACS, 2009). Recommended protective practices to reduce skin cancer risk include sunscreen use, protective apparel, and limiting ultraviolet (UV) radiation exposure. Knowledge about UV radiation, skin cancer, and protection is high among the general population and has increased greatly in the past two decades (Robinson, Kim, Rosenbaum, & Ortiz, 2008; Stanton, Janda, Baade, & Anderson, 2004). Despite such awareness, American adolescents and young adults have the lowest skin protection rates of all age groups (Stanton, et al., 2004), receive large amounts of UV radiation (Baron, Kirkland, & Domingo, 2008; Coups, Manne, & Heckman, 2008; Heckman, Coups, & Manne, 2008), and increase their exposure to UV radiation as they move into adulthood (MacNeal & Dinulos, 2007).

Most of the literature suggests that the effect of tanning on appearance and the association of tanned appearance with positive attributes such as beauty and success are the primary motivations for high UV exposure and low skin protection (Hillhouse, Turrisi, Stapleton, & Robinson, 2008; Jackson & Aiken, 2006; Nolan, Taylor, Liguori, & Feldman, 2009; Poorsattar & Hornung, 2007). A recent systematic review (Dodd & Forshaw, 2010) of the available appearance-focused intervention studies (including UV light photo interventions showing current facial skin damage) primarily among adolescents and young adults found significant effects on skin protection behavior in favor of the interventions compared to controls. Intervention effects lasted up to five months (Jackson & Aiken, 2006; Jones & Leary, 1994; H. I. Mahler, Fitzpatrick, Parker, & Lapin, 1997; McClendon & Prentice-Dunn, 2001; McClendon, Prentice-Dunn, Blake, & McMath, 2002; Novick, 1997; Olson, Gaffney, Starr, & Dietrich, 2008).

The use of images such as UV-filtered photographs to emphasize the effects of UV exposure on appearance has been shown to be an effective intervention tool in promoting skin protective behaviors. UV photos reveal the chronic damage that has already occurred to an individual's skin as a result of UV exposure. Showing individuals these photos enhances the salience and immediacy of the negative consequences of UV exposure for participants' own personal physical appearance. A series of studies by Mahler and colleagues with primarily undergraduate participants has demonstrated significant outcomes using UV photos as an intervention to improve sun protection (H. I. Mahler, Kulik, Butler, Gerrard, & Gibbons, 2008; H. I. Mahler, Kulik, Gerrard, & Gibbons, 2007, 2010; H. I. Mahler, Kulik, Gibbons, Gerrard, & Harrell, 2003; H. I. Mahler et al., 2005; H. I. M. Mahler, 2006).

Motivational Interviewing (MI) (Miller & Rollnick, 1991; Miller & Rollnick, 2002) is a person-centered method of counseling to elicit and strengthen motivation for behavior change. The approach guides the individual to explore and resolve ambivalence about changing while increasing the perceived discrepancy [similar to cognitive dissonance; see (Festinger, 1957)] between an individual's current behavior and overall values. Self-motivational statements, or "change-talk", are thought to contribute greatly to changes in an individual's actual behavior. Reviews of the literature have supported the efficacy of MI as a durable stand-alone intervention, which has effects that are sustained over time (B. L. Burke, Arkowitz, & Menchola, 2003; Dunn, Deroo, & Rivara, 2001; Miller & Rollnick, 2002;

Noonan & Moyers, 1997; Resnicow et al., 2002; Vasilaki, Hosier, & Cox, 2006). Clear evidence for the use of MI in the treatment of alcohol and drug-related problems exists. There is growing evidence for the efficacy of MI in promoting smoking cessation, medication adherence, HIV prevention behaviors, diet and exercise, stress management; and addressing a variety of physical health problems such as diabetes (See reviews by (Heckman, Egleston, & Hofmann, 2010; Hyman, Pavlik, Taylor, Goodrick, & Moye, 2007; Knight, McGowan, Dickens, & Bundy, 2006; Martins & McNeil, 2009; Resnicow, et al., 2002)). The only study that tested the efficacy of MI in a skin cancer risk reduction context revealed a significant difference in indoor tanning behavior at three months post-intervention among young adult female tanners who had received one 30-minute session of peer-delivered MI versus a control group (Turrisi, Mastroleo, Stapleton, & Mallett, 2008).

Not only is it important to determine which interventions are effective in modifying health behaviors but also to understand which specific aspects of the interventions affect outcomes. When conducting an intervention trial, it is important to assess counselor adherence and competence in delivering the specific aspects of the treatment being studied. Other variables that have been found to be key determinants of client responses to psychosocial interventions in general include therapeutic alliance (Catty, 2004; Martin, Garske, & Davis, 2000) and treatment credibility (Hoyt, 1996; Weaver, 1998). When interventions do not have expected outcomes, such process data can also help in determining whether the interventions were delivered as planned and why they may not have worked as expected. Few research studies have focused on the therapeutic process of MI (See reviews by (Bach et al., 2007; B.L. Burke, Arkowitz, & Dunn, 2002; B. L. Burke, et al., 2003; Dunn, et al., 2001; Miller & Rollnick, 2002; Noonan & Moyers, 1997; Resnicow, et al., 2002; Vasilaki, et al., 2006)).

MI can be a useful individualized method for working with people who may not currently be ready to make a behavioral change, and thus its consideration of how behavioral changes are undertaken is consistent with the Transtheoretical Model (TTM) philosophy that readiness to change varies across individuals and over time. The TTM proposes that health behavior change is a process that occurs in stages rather than as a one-time event (J.O. Prochaska & DiClemente, 1982). A great deal of research has demonstrated the utility of the TTM in describing and evaluating changes in several health behaviors including cancer risk-reduction behaviors such as tobacco cessation (DiClemente et al., 1991; J. O. Prochaska et al., 2005; J. O. Prochaska et al., 2004) and sun protection (Johnson, 2002; Norman et al., 2007; J. O. Prochaska, et al., 2005; J. O. Prochaska, et al., 2004). Two studies that have used a UV-filtered photo intervention found significant improvements in sun exposure and protection behavior stage of change (SOC), with participants moving from inaction to action and behavioral maintenance, which endured for up to 12 months (Pagoto, McChargue, & Fuqua, 2003; Weinstock, Rossi, Redding, & Maddock, 2002).

The current study had two aims. The first aim was to compare the efficacy of a UV-photo intervention alone, MI counseling alone, education alone, and a combination of UV-photo and MI counseling in increasing sun protection SOC among young adults. We hypothesized that the combined UV-photo and MI condition would have greater impact on skin protection SOC (controlling for baseline SOC) than either intervention alone or the education only control condition. Although limited in power for such analyses, we also tentatively assessed potential differential intervention effects on SOC by baseline SOC. The second aim was to examine whether treatment process variables contributed to sun protection SOC. We hypothesized that treatment process (i.e., therapeutic alliance; treatment credibility; MI spirit, adherence, and competence; as well as MI skills including giving information, asking questions, and reflecting statements) would vary by intervention condition, with highest

scores in the combined condition and lowest in the education condition, and that higher ratings would be associated with greater increases in skin protection SOC over time.

Methods

Recruitment, Screening, and Participants

Participants were recruited for the study via a university psychology student participant pool, as well as announcements, flyers, emails, and advertisements in academic departments and around campuses from three universities in the Philadelphia, Pennsylvania region during two spring semesters. Participants were eligible if they were between 18 and 24 years of age, planned to be available for in-person follow ups one year later (e.g., not graduating seniors), and had at least one of several possible behavioral or family skin cancer risk factors (sunbathing, indoor tanning, low sunscreen use, or family history of skin cancer). This study was approved by the appropriate institutional review boards.

Eligible students attended an in-person session in which measures and prevention interventions were administered. Upon arrival to the in-person session, participants were randomized using the online program <http://www.randomizer.org/> to one of the four treatment conditions described below (See Figure 1). Immediately after the intervention, participants completed a brief follow-up survey. They were also reassessed approximately three (summer), six (fall), and twelve (spring) months later.

Three-hundred seventeen individuals were screened for eligibility (See Figure 1 for Study Flow Chart). Power was not calculated as this was a pilot study. One hundred ninety-seven participants (62% of those screened) attended the in-person session. These participants were 82% female and were on average 20.47 years of age ($SD = 1.56$). Participants described their ethnicity as 76% Caucasian. In terms of eligibility risk factors, 95% of the sample reported spending at least four hours per week in the sun during the summer, 84% reported having had at least two bad sunburns, 66% reported wearing sunscreen less than half the time during the summer, 58% reported having tanned indoors, and 37% reported a family history of skin cancer.

The mean follow up rate across treatment conditions was 89% at three months, 78% at six months, and 83% at 12 months. Despite the use of computerized randomization at the individual level and for unknown reasons, the number of participants allocated to each intervention group was not equivalent. Once this was realized, the study statistician created a block randomization scheme that was then used. Participants randomly assigned to the four intervention groups differed by sex but not age, race, or baseline SOC. Thus, sex was controlled for in subsequent analyses. Attrition rates did not differ significantly by age, sex, race, or baseline SOC.

Interventions/Procedures

Educational Control—Participants were given a packet of standard skin cancer prevention educational brochures and handouts from major professional organizations (NCI, ACS, AAD, EPA, and the Skin Cancer Foundation) to review independently for 10-15 minutes. The counselor then discussed the pamphlets with participants for 14 minutes on average. Participants were asked open-ended questions about their reactions to the pamphlets and quizzed on a few major points (e.g., “What are some recommendations for skin protection?”). Participants in the active treatment conditions were given the pamphlets to review but did not discuss them in detail with the counselor.

UV Photographs—Participants were shown a regular black and white photo and a black and white UV-filtered photo of their face taken with a Canfield instant Polaroid UV Reflect camera (Fairfield, NJ). UV light is selectively absorbed by the melanotic or damaged areas of the epidermis, thus the UV photos dramatically enhance the contrast between these areas and surrounding normal skin (Fulton, 1997). Current skin damage appears as irregular spots, freckling, and areas of darkness and uneven coloring (Fulton, 1997). Participants were told that “Any dark, spotted, freckled, wrinkled, uneven, or pitted areas indicate existing underlying skin damage that is difficult to reverse. However, protecting the skin from UV radiation can prevent future damage.” Participants were asked what they noticed about the photos, what their reactions were, and how this might affect their behavior. Anecdotally, most participants noticed some damage, and many noticed extensive damage in their photos. These sessions took 12 minutes on average.

MI and Combined (Photo plus MI) Counseling Sessions—In the MI conditions, the counselor primarily utilized the basic MI skills of open-ended questions, reflection of participant statements, affirmations or positive feedback, and summarization of major points throughout the discussion. The counselor first reviewed (MI-style) any personalized feedback of risk derived from the baseline assessment (e.g., Fitzpatrick Skin Sensitivity, history of sunburns, self-reported UV exposure and protective behaviors) and UV photos as above if randomized to the combined condition. Consistent with MI principles, the counselor then facilitated some or all of the following exercises depending on participant interest: decisional balance (pros and cons) of changing, discussion of participants' confidence and readiness to change; and change planning. The MI-only condition took approximately 22 minutes, and the combined condition took approximately 25 minutes to administer.

Intervention Training and Supervision—All four interventions were administered primarily by one individual with a bachelor's degree in a social science field and several years of clinical research experience. Training included reading the MI textbook and about skin cancer, several days of didactics over a period of several weeks, reviewing professional and amateur videos of MI sessions, role playing, and using the MI Treatment Integrity Scale-3 (MITI; (T.B. Moyers, Martin, Manuel, Miller, & Ernst, 2007)) to code several sample video sessions. Supervision was provided in a weekly supervision session using video recordings of the intervention sessions and on an as-needed basis.

Measures

Stage of Change—The four-item Sun Stage of Change (SOC) Scale (Rossi, Blais, Redding, & Weinstock, 1995) has been widely used to assess health behavior changes such as reduction of smoking or drinking. A few studies have used it to measure the outcome of skin protection SOC (Pagoto, McChargue, & Fuqua, 2003; Weinstock, Rossi, Redding, & Maddock, 2002). Participants are asked whether they have been protecting their skin for the past year (maintenance), if they protect their skin now (action), whether they intend to protect their skin in the next 30 days (preparation), whether they intend to protect their skin in the next year (contemplation), or none of the above (pre-contemplation). The measure was reported to have good one-week test-retest reliability (intraclass correlation (ICC) = 0.70) in a sample of 33 adolescents (Norman, et al., 2007). Internal reliability among the items in the current sample at each of the three time-points was good with Cronbach's alpha scores ranging from 0.79 to 0.81.

Provision of Motivational Interviewing—The Motivational Interviewing Treatment Integrity scale-3 (MITI-3; T.B. Moyers, et al., 2007) was designed to rate recordings of interventions as to MI “spirit” and behavioral skills. The MITI has been shown to be reliable

for evaluating the use of MI and has shown good discriminant validity with regard to in-session behavior and MI skill development (Forsberg, Forsberg, Lindqvist, & Helgason, 2010; Madson, Loignon, & Lane, 2009; Mitcheson, Bhavsar, & McCambridge, 2009; T. B. Moyers et al., 2008). We examined MITI-3 behavioral counts of the generic skills of giving information, closed questions, open questions, simple reflections, and complex reflections. The MITI-3 also includes ratings of evocation (eliciting material from the participant), collaboration, support of autonomy, direction, and empathy (1=low, 5=high). The latter five items were averaged to create an MI spirit global score.

Video sessions were rated using the MITI-3 by a trained rater who was an upper-level counseling psychology doctoral student. As recommended by the MITI-3 manual (T.B. Moyers, et al., 2007), 20% of the videos were also double-rated by a clinical psychology postdoctoral fellow who was also performing ratings with the doctoral student on another research project at the time.

Delivery of the Intervention Protocol—The raters rated the counselor as to frequency (adherence) and skill (competence) on the following five MI-oriented protocol-specific activities on a scale of 0 to 5: discussing personalized assessment feedback; complex reflections; conducting a decisional balance (pros/cons) exercise; discussing readiness to change; and discussion of behavioral goals/plans. Interclass correlations (used to measure inter-rater reliability for continuous variables) between the raters were at least moderate at 0.40 or higher (Montgomery, Graham, Evans, & Fahey, 2002) for all of these items.

A protocol adherence scale was created by summing the items, and a competence scale was created by averaging the items for the behaviors that occurred. Based on the criteria of Montgomery and colleagues (Montgomery, Graham, Evans, & Fahey, 2002), there was adequate inter-rater reliability between the raters for both scales (ICC = 0.69 for adherence, ICC = 0.47 for competence). The counselor also rated herself as to her perceived skill in performing the protocol-specific activities immediately after each session. The student rater and counselor competence ratings possessed an adequate overall interclass correlation (ICC=0.46). Thus, the average of the student and counselor ratings was used for analyses including the competence variable.

Therapeutic Alliance—We administered the Helping Alliance Questionnaire-II (HAQ-II; Luborsky, Barber, Siqueland, Johnson, & al., 1996), a 19-item Likert-type scale ($\alpha = .90$ to .93) that measures strength and quality of the therapeutic alliance. Internal reliability Cronbach's alphas for positive and negative alliance for the counselor were .99 and .91, respectively, and .95 and .71 for the participants, respectively. Helping alliance as rated by counselor and participant were not highly correlated (Pearson's correlations were 0.17 and 0.11 for negative and positive alliance, respectively). Thus, both the participant and counselor alliance ratings were included in subsequent analyses.

Treatment Credibility—A brief 5-item instrument (Cronbach's $\alpha = .95$; Weaver, 1998) asked whether the participant's assigned intervention made sense, was/will be helpful to them (three items), and the extent to which they would recommend the intervention to others. The items were summed (1=low, 10=high; Borkovec & Nau, 1972). This scale was administered immediately after receiving the intervention.

Analyses

We used separate Chi-square tests to compare SOC across each of the intervention conditions at each time-point. Then a mixed proportional odds model was used to explore the impact of intervention condition on SOC across time (Hedeker, Mermelstein, &

Demirtas, 2008). We used a cumulative logit link analysis (an extension of traditional logistic regression) because a simple multinomial regression analysis may not be able to account for the ordinal nature of SOC progression data (see Hedeker et al., 1994 for more information on cumulative logit link analyses). Follow-up time-point (season), baseline SOC, sex, race, and intervention condition were included in the model as covariates. A random intercept was used to account for within-subject clustering. Pair-wise differences in SOC between intervention conditions were estimated from the model and compared using a Wald test.

To examine intervention delivery and therapeutic process, each intervention condition was compared on mean treatment credibility as rated by the participant, therapeutic alliance as rated by both the participant and the counselor, adherence as rated by the rater, and competence scores averaged from the rater and counselor. These analyses were repeated controlling for session length using ANCOVA.

We also sought to identify generic therapeutic process variables across the intervention conditions that may have predicted SOC at follow-up. Another mixed proportional odds model was used with the process variables, follow-up time-point, and baseline SOC included in the model.

Results

Intervention Effects on Outcome

We will first describe the results in terms of intervention outcome, then intervention process, and finally intervention process variables that were associated with outcome. Across the conditions, approximately 45% of the sample was in the precontemplation/contemplation stage, 25% in the preparation stage, and 30% in the action/maintenance stage at baseline. Approximately 42% of participants advanced at least one stage in terms of skin protection, 42% maintained their stage, and 17% regressed in stage by one-year follow up (see Table 1). Our main effect mixed model, adjusted by baseline SOC, season of the assessment, gender, and race of the participant, indicated that SOC at follow up differed significantly by study condition. Pair-wise comparisons of the conditions were conducted to see which specific conditions differed from one another. We found that the photo condition was significantly more effective in improving stage of change than the education condition (odds ratio (OR)=2.58, 95% confidence interval (CI) = 1.06-6.28, $z=2.08$, $p=0.04$). Additionally, MI performed marginally better than education (OR=2.20, 95% CI=0.91-5.31, $z=1.74$, $p=0.08$). Differences between other intervention conditions were not statistically significant.

We did not find significant differences in intervention effects on SOC by baseline SOC (data not shown). Our sample size calculation was based on the main effect model; thus, our power was limited to detect such interaction effects. However, a trend emerged suggesting the potential for the MI condition to have a greater impact on stage progression than the education condition for individuals who were precontemplators or contemplators at baseline (OR = 2.03, $z=1.47$, $p = 0.07$).

Intervention Fidelity and Process

Based on the competence criteria for MI global ratings described in the MITI-3 manual (T.B. Moyers, et al., 2007), the counselor was rated as having conducted competent MI in 95% of the MI sessions and 93% of the combined sessions. The combined and MI conditions were rated highly on all MITI-3 behavioral counts including open and closed questions as well as simple and complex reflections (See Table 2). As expected, the MI and combined conditions did not differ significantly on MI adherence (effect size=0.02, $t(1)=0.07$, $p=0.95$), competence (effect size=0.19, $t(1)=0.11$, $p=0.40$), or MI globals (effect

size=0.27, $t(1)=1.21$, $p=0.23$). Contrary to expectations, the four intervention conditions did not differ significantly on treatment credibility or on negative or positive alliance as rated by either the participant or the counselor (See Table 2). Overall, these findings suggest that MI was delivered competently and that the intervention conditions did not differ on generic treatment credibility or therapeutic alliance.

Intervention Process Variables Affecting Outcome

We also examined whether any of the intervention process variables were associated with SOC across conditions. Using another mixed proportional odds model, treatment credibility as rated by the participant and positive alliance as rated by the counselor were significantly associated with advances in SOC over time. Higher ratings of intervention credibility by the participant and higher ratings by the counselor of positive alliance were associated with greater advances in SOC (credibility: OR=1.03, $Z=2.20$, $p=0.03$; positive alliance: OR=1.03, $Z=2.07$, $p=0.04$).

Discussion

This study involved a randomized factorial longitudinal trial comparing the effect of motivational interviewing, viewing UV-filtered photos, the combination of MI and UV photos, and education on skin protection stage of change among young adults. Approximately 42% of participants increased from baseline on SOC for skin protection across all intervention conditions. Our main effect model showed that SOC was more likely to improve in the photo condition compared to the education condition.

In terms of MI global “spirit”, the MI and combined sessions were conducted competently according to the MITI-3 ratings. Positive and negative alliance as rated by both the participants and the counselor as well as treatment credibility rated by the participant did not differ across intervention conditions. Across intervention conditions, we found that treatment credibility as rated by the participant and positive alliance as rated by the counselor were associated with greater likelihood of SOC progression.

In the current study, approximately 42% of participants advanced in terms of skin protection SOC. Contrary to our hypotheses, combining the MI and photo interventions did not result in a benefit over either of the interventions alone. It is unclear why the effects of the combined intervention did not differ from the education condition since it was rated higher on MI spirit, adherence, competence, and MI skills than the other conditions. Additionally, the combined condition was rated similarly in terms of treatment credibility and therapeutic alliance. Given that the MI (Turrise, et al., 2008) and photo interventions (H. I. Mahler, et al., 2008; H. I. Mahler, et al., 2007, 2010; H. I. Mahler, et al., 2005) alone have shown some promise in the area of skin cancer risk reduction behaviors, the impact of the combined interventions and their mechanisms could warrant further research. This study demonstrated some advantage of the MI and photo interventions over education alone. One of the reasons for the minimal differences may be that the educational intervention condition was too active. The UV photo intervention is certainly a more time- and cost-effective intervention than MI counseling after the up-front cost of the specialized camera is taken into consideration. Whereas the MI condition showed some advantage over the education condition for SOC, participants were less likely to attend follow-up sessions in the MI group. Perhaps a longer or repeated MI intervention may have been able to produce better outcomes in terms of rapport and SOC. However, two recent meta-analyses of MI for tobacco cessation found conflicting results regarding whether the length and number of MI sessions determine outcome (Heckman, et al., 2010; Lai, Cahill, Qin, & Tang, 2010).

There was also a trend toward MI being more effective in increasing SOC for individuals in the pre-contemplation or contemplation stages at baseline. Because more participants (45%) were in the precontemplation/contemplation stages than the other stages at baseline, MI had the potential of improving the skin protection of a greater number of individuals.

Some of the more interesting study findings pertain to treatment credibility and positive alliance. Across conditions, treatment credibility rated by the participant and positive alliance rated by the counselor were associated with higher SOC. In the current study, positive alliance as rated by the counselor rather than by the participant was associated with higher SOC. Prior studies have been equivocal in terms of whose perceptions (i.e., the therapist, patient, or observer) are most highly correlated with intervention outcomes (Langhoff, Baer, Zubaegel, & Linden, 2008; Marziali, 1984).

Strengths of the current study include its randomized factorial longitudinal design and its in-depth measurement of counselor behaviors and treatment process. One limitation of the study was that it was not powered to detect differences in intervention outcome by baseline stage of change, thus we controlled for baseline stage of change in the analyses. We did note a trend toward MI being more effective for earlier stage participants, however. Future studies might benefit from exploring this topic further. Other limitations include a sample that was self-selected and the use of a self-report measure as an outcome. The sample differed from the general student body in terms of having a higher proportion of female and Caucasian students. Regarding self-report, most skin cancer risk reduction studies use self-report measures as outcomes, and several studies have demonstrated the reliability and validity of self-report of UV exposure and protection behavior compared to observation and objective measures with no systematic bias identified among various populations (Glanz & Mayer, 2005; Glanz et al., 2008; O'Riordan, Glanz, Gies, & Elliott, 2008). Additionally, our attempt to decrease counselor bias by randomizing participants one at a time at each session rather than for the entire study at the beginning resulted in unequal group size. Finally, it is sometimes difficult to replicate MI studies because MI is individualized to participants in part based on their SOC.

Identifying intervention approaches that can improve skin protection among young adults at risk for development of skin cancer is a cancer prevention and control priority. Findings regarding the UV photo and MI interventions are consistent with prior research showing that they can be helpful in improving skin protection. However, the MI intervention may be more effective for individuals at specific SOC. These interventions for skin protection among young adults may warrant further research.

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List of abbreviations

UV	ultraviolet radiation
MI	Motivational Interviewing
TTM	Transtheoretical Model
SOC	stage of change
ICC	intraclass correlation

Figure 1. Study Flow Chart

Table 1
Percentage of Individuals at each SOC at Follow-Up (by Baseline SOC)

Change in SOC	Baseline SOC	% at 3 month FU	% at 12 month FU
Maintained	Pre/Cont	58.14	47.50
	Preparation	52.27	48.78
	Act/Maint	47.37	25.81
Progressed	Pre/Cont	30.23	40.00
	Preparation	29.55	29.27
	Act/Maint	42.11	51.61
Regressed	Pre/Cont	11.63	12.50
	Preparation	18.18	21.95
	Act/Maint	10.53	22.58

Note: Pre/Cont = precontemplation/contemplation, Act/Maint = action/maintenance

Table 2

Treatment Process Variables by Intervention Condition

	INTERVENTION CONDITION Mean(SD)					F	df	P-value
	Combined	Education	MI	Photo				
MI Fidelity								
MI Adherence (C,R Ave)	11.45(4.27)	0.87(1.80)	11.41(2.87)	2.06(1.97)	182.83	3,175	<.0001	
MI Competence (C,R Ave)	3.58(0.65)	1.09(0.73)	3.47(0.48)	1.91(0.46)	186.99	3,175	<.0001	
MITI-3								
MI GlobalsR	5.02(0.87)	3.27(0.65)	4.83(0.65)	3.71(0.65)	63.73	3,175	<.0001	
Information	22.14(6.24)	18.56(6.41)	16.62(5.85)	13.66(4.22)	18.32	3,175	<.0001	
Open Questions	10.07(5.08)	5.64(2.29)	7.44(4.06)	3.79(1.47)	28.49	3,175	<.0001	
Closed Questions	13.9(7.01)	7.49(2.5)	11.33(4.61)	5.91(2.8)	30.12	3,175	<.0001	
Simple Reflections	9.5(4.91)	1.98(2.11)	9.49(3.93)	2.94(2.61)	60.25	3,175	<.0001	
Complex Reflections	10.29(5.76)	0.64(1.21)	9.33(3.96)	2.26(1.71)	84.40	3,175	<.0001	
Therapeutic Process								
Positive AllianceP	72.19(8.92)	67.31(12.06)	69.36(11.36)	67.45(11.87)	2.03	3,193	0.11	
Positive AllianceC	62.28(8.07)	59.94(7.2)	59.2(7.9)	60.64(8.61)	1.24	3,193	0.30	
Negative AllianceP	9.32(3.58)	10.09(4.39)	9.90(4.64)	9.36(3.26)	0.21	3,186	0.89	
Negative AllianceC	6.36(2.77)	6.27(2.57)	7.56(2.99)	6.35(2.59)	2.11	3,191	0.10	
Treatment CredibilityP	38.62(7.82)	36.02(9.05)	37.82(8.49)	38.48(7.24)	1.06	3,193	0.37	

Note: MITI 3 = Motivational Interviewing Treatment Integrity scale (version 3), R = rater, C = counselor, P = participant.