Effect of Patient Behavior and Affect on Mobile Health Technology Use

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Introduction

With the increasing push on patients to adopt Internet and mobile health technology, more investigation into the factors that may affect their willingness to use this technology is needed. This is especially important as more mobile applications are developed for patient use. One area of healthcare that is moving to mobile is dermatology.

Over 40 direct-to-patient dermatology mobile phone applications exist that offer a range of services (e.g., examinations, cancer screenings). Researchers (Esteva et al., 2017; Haenssle et al., 2018) have also recently trained a form of artificial intelligence called a "deep neural algorithm" to detect cancer from photos of skin lesions, without human help. Studies showed AI was as accurate or better than dermatologists at diagnosing cancer. AI hints at a future of more accessible care, where patients can initiate screenings with smartphones. As this technology becomes more sophisticated, the need for in-person dermatology visits may decrease, thereby increasing access to care, while reducing patient costs and wait times. Such advantages are suggested by mobile health, but are people willing to replace a doctor with an app?

With the increasing campaigns directed at reducing indoor tanning, most people who engage in the behavior also know it produces negative effects on health. Therefore, we tested whether increased UV exposure from indoor tanning is related to greater negative emotion about cancer. In turn, we expected more negative emotions to be positively related to people's overall use of mobile health technology.

Methods

We examined how patient *behavior* and *affect* (i.e., emotion) influence overall use of mobile health technology:

- First, created a dichotomous Indoor Tanning Usage variable. We excluded those who had never used indoor tanning; we dummy coded this variable:
    - 0 = ten times or less
    - 1 = eleven times or more

- We created an index of *Internet/mobile health technology use (IMHT)* by summing 16 items from the Internet information seeking section of HINTs. High scores indicate greater use of mobile technology.

- We then created an index of *negative cancer affect* by averaging 8 items from the "Beliefs about Cancer" (Section N) of the HINTS data set. Higher scores indicate greater negative affect.

- Using this as the final outcome, we examined whether people's UV exposure via indoor tanning beds increased their worry about cancer, and if this increasing negative affect led to greater IMHT use.

- After controlling for patient age, we tested predicted linkages in the conceptual model using *conditional process modeling* (Hayes, 2017), with 10,000 resamples with a final *N* = 84. All analyses were conducted with SPSS version 25.

Measures

Variables created using the HINTS-5 data:

IV: UV Exposure from Tanning Beds
- TanningBed: I4. How many times in the past 12 months have you used a tanning bed or booth?

Mediator: Negative Cancer Affect
- ChanceGetCancer: N1
- EverythingCauseCancer: N2a
- PreventNotPossible: N2b
- TooManyRecommendations: N2c
- CancerMoreCommon: N2d
- CancerFatal: N2e RatherNotKnowChance: N3
- FreqWorryCancer: N4

DV: Mobile Health Technology Use
- TrustInternet: A6e
- InternetCancerInfoSelf: A9
- TabletHealthWellnessApps: B6
- SharedHealthDeviceInfo: B9
- Tablet_DiscussionsHCP: B7c
- Tablet_AchieveGoal: B7a
- Tablet_MakeDecision: B7
- IntRsn_SharedSocNet: B10b
- IntRsn_SupportGroup: B10d
- IntRsn_YouTube: B10e
- TextFromDoctor: B11
- Electronic_SelfHealthInfo: B4
- Electronic_HCPSearch: B4d
- Electronic_TalkDoctor: B4e
- Electronic_TrackedHealthCosts: B4
- Electronic_TestResults: B4i

Results

Antecedent		Negative Cancer Affect (M)				Mobile Health Technology Use (Y)		
		Coeff	*SE*	*p*		Coeff.	*SE*	*p*
Tanning Bed Use (X)	a	6.09	2.82	.034	c'	9.30	1.12	.915
Negative Cancer Affect (M)					b	0.08	0.03	.036
Constant	i_M	15.92	2.85	< .001	i_Y	9.30	1.13	<.001
Full Model Summary		$R^2 = .059$ $F(2, 81) = 2.54, p = .05$				$R^2 = .14$ $F(3, 81) = 4.37, p = .006$		

No direct effect of tanning bed use on mobile health technology was found. Results showed **a significant mediation effect of tanning behavior on IMHT use through cancer worry**, b = .49, 95%CI (.01; 1.04).

Specifically greater tanning bed usage throughout the year was associated with greater negative emotion about cancer, b = 6.09, p = .03. This negative emotion was also linked to greater use of mobile technology for health purposes, b = 0.08, p = .036. These associations were found after controlling for respondent age.

Conclusion

Results indicated that people who engage in indoor tanning feel more strongly about cancer. More artificial UV exposure is associated with more cancer worry and negative thoughts about cancer.
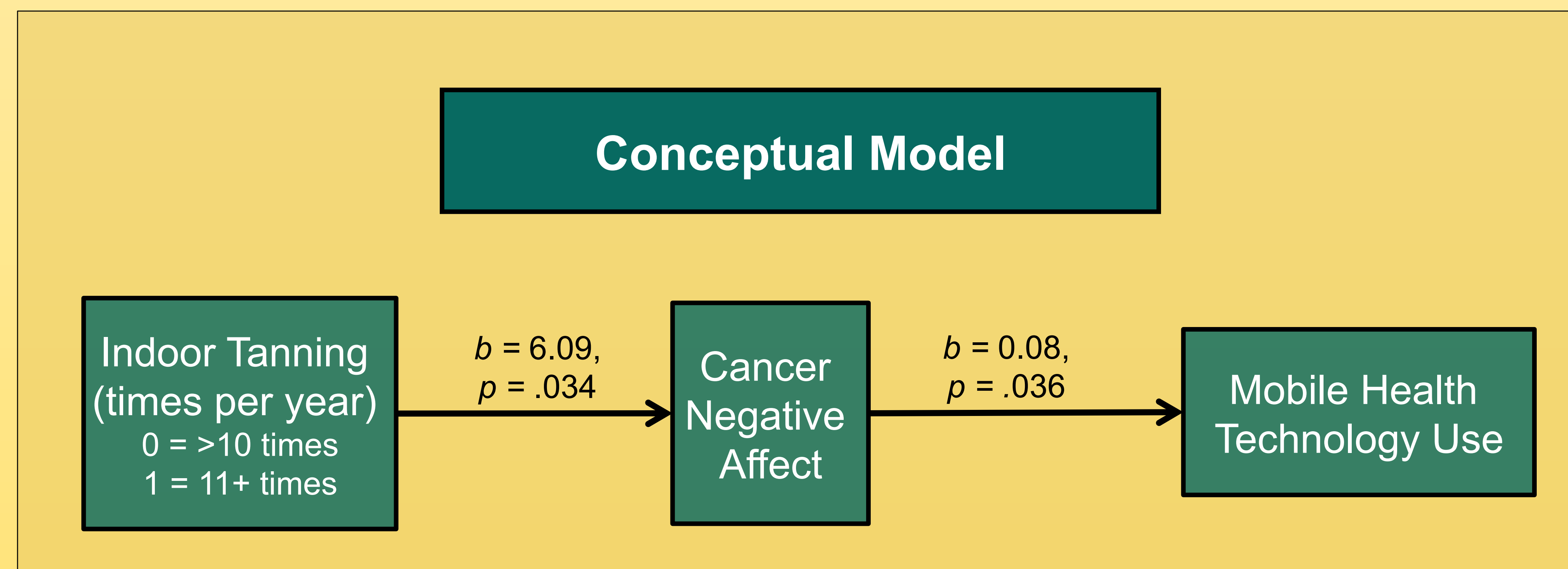
In turn, this increased negative emotion about cancer was associated with use of mobile technology for health purposes. We believe that these results indicate that those who engage in indoor tanning would be open to autonomous AI dermatological screening technology; our results could be used to design future health campaigns designed to increase people's acceptance of AI-driven dermatological screening technology.

References

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Conceptual Model

Indoor Tanning (times per year)
0 = >10 times
1 = 11+ times

b = 6.09, p = .034

Cancer Negative Affect

b = 0.08, p = .036

Mobile Health Technology Use