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Title: Protecting Young Children Against Skin Cancer : Parental Beliefs, Roles, And Regret

Year: 2017

Version:

Please cite the original version:

Hamilton, K., Kirkpatrick, A., Rebar, A., White, K., & Hagger, M. (2017). Protecting Young Children Against Skin Cancer : Parental Beliefs, Roles, And Regret. *Psycho-Oncology*, 26(12), 2135-2141. <https://doi.org/10.1002/pon.4434>

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PARENTAL SUN PROTECTION DECISIONS

Protecting Young Children Against Skin Cancer: Parental Beliefs, Roles, And Regret

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Full citation: Hamilton, K., Kirkpatrick, A., Rebar, A., White, K.M. & Hagger, M.S. (2017).

Protecting young children against skin cancer: Parental beliefs, roles, and regret. *Psycho-Oncology*. Advanced online publication. doi:10.1002/pon.4434.

Abstract

Objective: To examine the role of parental beliefs, roles, and anticipated regret toward performing childhood sun-protective behaviours. Methods: Parents ($N = 230$; 174 mothers, 56 fathers), recruited using a non-random convenience sample, of at least one child aged between 2 and 5 years completed an initial questionnaire assessing demographics and past behaviour as well as theory of planned behaviour global (attitude, subjective norm, and perceived behavioural control) and belief-based (behavioural, normative, and control beliefs) measures, role construction, and anticipated regret regarding their intention and behaviour to protect their child from the sun. Two weeks later, participants completed a follow-up questionnaire assessing their sun protection of their child during the previous two weeks. Results: Hierarchical multiple regression analysis identified attitude, perceived behavioural control, role construction, anticipated regret, past behaviour, and a normative belief (“current partner/other family members”) as significant predictors of parents’ intention to participate in sun-protective behaviour for their child. Intention and past behaviour were significant predictors of parents’ follow-up sun-protective behaviour. The regression models explained 64% and 36% of the variance in intention and behaviour, respectively. Conclusions: The findings of this study highlight the importance of anticipated regret and role-related beliefs alongside personal, normative, and control beliefs in determining parents’ intentional sun-protective behaviour for their children. Findings may inform the development of parent- and community-based sun protection intervention programs to promote parents’ sun-safety behaviours for their children to prevent future skin cancer incidence.

Background

Globally, one in every three cancers diagnosed is a skin cancer [1], with Australia reported as having the world's highest age-standardised incidence rate of melanoma of the skin [2]. Particularly at risk are those with a family history of skin cancer (8% – 12% of melanoma patients have a family history; [3]) and with lighter skin tone (Caucasians are 80 times and 20 times more likely to develop non-melanoma and melanoma of the skin, respectively, than African-Americans; [4]). Even infrequent exposure to ultraviolet (UV) radiation in sunlight, which is sufficient to cause sunburn, has been shown to be associated with melanoma development [5]. Protection from the sun is therefore important, particularly in young children given an estimated 80% of the total lifetime UV radiation exposure and an estimated 50% of the lifetime skin damage occurs before the age of 21 years [6]. Targeting young children is important to establish good sun-safety habits, especially given sun-protective behaviours decline in adolescence [7]. As pre-school aged children often do not have the capacity or control to implement lifestyle behaviours like sun protection, they are highly dependent on their parents to implement and enforce such behaviours [8,9]. Understanding the decision making of parents around this important cancer-preventive behaviour is therefore important, especially given parents, in particular mothers, may hold false beliefs toward exposing their infants to the sun for therapeutic reasons [10].

The theory of planned behaviour (TPB) [11] is a prominent decision making model that has been applied to understand health behaviour. The TPB proposes intention as the proximal predictor of behaviour, with intention predicted by attitude (overall evaluations of the behaviour), subjective norm (perceived social pressure to perform the behaviour), and perceived behavioural control (perceived capacity to carry out the behaviour), with perceived behavioural control further hypothesised to predict behaviour. Past behaviour is often included as an additional predictor of intention and behaviour.

The TPB further suggests that the attitude, subjective norm, and perceived behavioural control constructs are underpinned by sets of salient behavioural (costs and benefits), normative (others' approval or disapproval), and control beliefs (motivating or inhibiting factors), respectively [11]. Although the elicitation of these beliefs is considered a strength of the TPB, previous research has often neglected this formative process and largely focused on global measures of attitude, subjective norm, and perceived behavioural control as antecedents of intention and behaviour [12,13]. However, the global measures are merely summative states of more fundamental lower-level elements (i.e., beliefs) and therefore the action of behaviour change tends to be at the belief, rather than summative, level.

Accordingly, the optimal point for changing the global constructs is through the underpinning beliefs and have been identified as the key targets for behaviour-change interventions based on the TPB [12,14]. A growing number of studies have shown efficacy in applying a TPB belief-based approach to examine key beliefs underpinning parental behaviour for child health [15-19] and for sun-protective behaviours in general [9,20]. Identifying underlying beliefs guiding parental decision making in this context can be used to develop theoretically- and empirically-based health messages relevant to the target group [21,22].

In general, meta-analytic studies support the use of the TPB in predicting behaviour [e.g., 23], including sun-protective behaviours [24]. In a meta-analysis of TPB studies applied to sun-safety behaviours[24], the sample-weighted average effects were moderate-to-strong with attitude showing the strongest association with intention ($r_+ = .49$), followed by perceived behavioural control ($r_+ = .45$), and subjective norm ($r_+ = .42$). Intention showed a stronger association with prospective behaviour ($r_+ = .49$) compared to perceived behavioural control ($r_+ = .31$). The analysis accounted for 39% and 25% of variance in intention and behaviour, respectively. Although the TPB has shortcomings, particularly its focus on static prediction rather than dynamic change in behaviour [see 25], the model has been proposed as

a useful framework to adopt as a starting point in the development of more comprehensive, integrated theories toward a better understanding of human behaviour [26]. Specifically, it might be useful to investigate other important constructs that may lead to more effective behavioural explanation in specific contexts, such as role construction and anticipated regret in the context of sun-protective behaviours by parents for their young children.

Hoover-Dempsey and Sandler's model of parental involvement offers insight into the influence of parental roles on parent and child behaviour [27]. Role construction regarding parental involvement for childhood behaviour is thought to be created in the interaction of beliefs about desired child outcomes, responsibility for these outcomes, perceptions of important others, and parental behaviours related to those beliefs and expectations [27]. In contrast to subjective norm in the TPB where the motivational orientation for action is derived out of significant others' approval [11], the motivational roots of role construction derives from parents considering the relevant responsibilities and activities of being involved with their child. This motivation arises from both self and social verifications to affirm their role as a parent and behave accordingly to fulfil these obligations and remain consistent with the standards attached to the role. Role construction should therefore have a direct, independent influence on parents' intention above the components of the TPB. Emerging literature investigating health behaviour decisions for young children has shown support for the effect of role construction on parental decision making [8,15].

Anticipated regret refers to beliefs about whether or not regret will follow from performing or not performing a certain behaviour (i.e., considering the possibility of regret before making a decision) [28,29]. Conceptually, anticipated regret should motivate behaviour because regret is a pervasive, powerful, and unpleasant emotion that people wish to avoid [30]. A previous meta-analysis provided support for the inclusion of anticipated regret to the TPB [31] with a large, statistically significant effect size of anticipated regret on

intention ($r_+ = .50$), and anticipated regret added significantly to the prediction of intention independent of the other TPB constructs. A medium-sized direct effect of anticipated regret on behaviour was also observed ($r_+ = .29$) was also observed. Parents, in general, are aware that failing to provide sun protection has potentially negative short- and long-term health repercussions for their children [32], and thus, not providing sun protection for their children may result in parents experiencing negative emotions associated with anticipated regret. Anticipated regret should therefore have a direct, independent influence on parents' intentions above the components of the TPB.

The Current Study and Hypotheses

We aimed to examine the role of parental beliefs, roles, and anticipated regret toward performing childhood sun-protective behaviours using a TPB-based approach. This study builds on previous work that has provided preliminary evidence of factors that may influence parents' decisions about their children's sun-protective behaviours [8-10]. We expected attitude, subjective norm, and perceived behavioural control would predict parents' intention (Hypothesis 1); and intention and perceived behavioural control would predict parents' behaviour (Hypothesis 2). Further, we predicted that parents with a stronger sense of parental role (role construction) related to their child's sun-safety (Hypothesis 3), and parents who perceived greater levels of anticipated regret for not performing sun protection for their child (Hypothesis 4), would report greater intention to sun-protect their child. We also expected parents' past sun-protective behaviour would predict greater intention (Hypothesis 5) and follow-up behaviour (Hypothesis 6) (see Figure 1). In addition, we sought to investigate the beliefs that underpin parental decision making in this context, which can form potential targets for future intervention studies.

[Insert Figure here]

Methods

Participants

Participants were parents ($N = 230$; 174 mothers, 56 fathers; $Mean_{age} = 36.82$ years, $SD_{age} = 4.71$, range = 23 to 51) with at least one child aged 2 to 5 years and recruited using a non-random convenience sample. Parents were independent of each other (i.e. only one parent from a couple relationship was invited to participate); residents of Greater Brisbane, Queensland, Australia; mostly Caucasian ($n = 202$, 87.8%); and married ($n = 196$, 86.1%). Participants completed an initial survey either face-to-face ($n=168$) or online ($n=62$) containing study measures (T1), with no differences observed on the psychological and behavioural variables between the two survey methods. Two weeks later (T2), 153 participants (66.5%) completed a follow-up telephone survey. Of the 230 participants at T1, 61 did not provide details to be contacted at T2, with the main reasons given being time and going on school holidays. Of those that provided contact details ($n = 169$), 16 were unable to be contacted and deemed dropouts. Attrition analyses indicated that there were no significant differences in age ($t(225) = 1.63$, $p = .105$), gender ($\chi^2(1) = 2.83$, $p = .09$), or marital status ($\chi^2(1) = 3.13$, $p = .58$). There was a difference in ethnic distribution ($\chi^2(1) = 6.61$, $p = .01$), with a greater number of non-Caucasians among participants that dropped out relative to those that remained in the study. Further, a significant multivariate effect (Wilks' Lambda = .930, $F(9,352) = 2.352$, $p = .03$) was identified between participants that dropped out of the study and those who completed the T2 assessment for the psychological and behavioural variables (attitude, subjective norm, perceived behavioural control, role construction, anticipated regret, intention, and past behaviour), with dropouts reporting marginally lower levels of subjective norm than those that remained ($Mean = 5.91$ and $Mean = 6.28$, respectively). Participants were recruited via online advertising (e.g., parenting forums, social media such as "Facebook") and face-to-face contact (four indoor swim schools, one dance school).

Design and Procedure

The Griffith University Human Research Ethics Committee (ref # PSY/C1/14/HREC) approved the study. Data were collected between October and December 2014 (Australian spring/summer), with recorded UV index values ranging between 6-12, indicative of a UV exposure category of “moderate” to “extreme” [33]. Sun protection is highly recommended for UV index values of three or higher [34]. The study used a prospective-correlational design with a two week follow-up. At T1, participants completed global (intention, attitude, subjective norm, and perceived behavioural control) and belief-based (behavioural, normative, and control beliefs) measures of the TPB and measures of role construction, anticipated regret, and past behaviour. Demographic details were also collected at T1. Participants received an information sheet outlining the details of the study, and consent was assumed by completing and submitting the questionnaire. At the end of the T1 questionnaire, parents were asked to provide contact details if they agreed to participate in the T2 follow-up questionnaire. At T2, participants self-reported their sun-protective behaviours for their child over the preceding two weeks. Data were de-identified and matched using a unique code identifier created by the participant.

Measures

The Cancer Council Australia definition of *sun-protective behaviours* was used as the target behaviour [34]; defined as i) applying SPF 30+ sunscreen; ii) wearing sun-protective clothing such as a hat, long-sleeved shirt, and sunglasses; and iii) seeking shade between 10am and 3pm. The target behaviour was to be adopted every time the child was outdoors in direct sunlight for more than 10 minutes. When answering questions, parents were asked to think about their youngest child aged 2 to 5 years. Given that adequate sun protection may not require performing all sun-protective behaviours simultaneously (e.g., if someone has a hat, seeks shade, and applies sunscreen, long-sleeved clothing may not be necessary), separate

measures of individual sun-protective behaviours could be assumed as potentially not essential to reflect adequate protection [9,35]. This approach of investigating a category of behaviours as an outcome measure in the TPB is deemed acceptable by Ajzen [11]. Thus, examples of sun-protective measures were provided to parents and they then decided whether the measures they had undertaken for their child provided sufficient sun protection.

Psychological constructs were developed using standardised guidelines and validated in previous studies and adapted for use with the target behaviour in the current study. Details of study measures are presented in supplementary Table 1.

TPB global measures. Multi-item psychometric measures of intention (three items), attitude (five items), subjective norms (five items), and perceived behavioural control (four items) with respect to the target behaviour were developed based on Ajzen's guidelines [11].

Role construction. Role construction was assessed using two items adapted from Hamilton et al. [15].

Anticipated regret. Anticipated regret was assessed using three items adapted from Abraham and Sheeran [29].

TPB belief-based measures. All belief-based items were elicited from a previous qualitative study [9]. Items were scored on a 7-point Likert scale (1 = *extremely unlikely* to 7 = *extremely likely*). Refer to supplementary Table 2 for details of the beliefs. For *behavioural beliefs*, participants rated how likely four benefits (e.g., "protect skin and eyes") and seven costs (e.g., "cause discomfort for child") would be if they performed the target behaviour over the next two weeks. For *normative beliefs*, participants rated how likely seven salient individuals/groups (e.g., "friends") were to think they should perform the target behaviour over the next two weeks. For *control beliefs*, participants rated how likely seven factors would prevent (e.g., "child resistance") and four factors would motivate (e.g., "lack of accessibility") them to perform the target behaviour over the next two weeks.

Past and Follow-up behaviour. Two items adapted from Thomson et al. [8] assessed past (T1) and follow-up (T2) sun-protective behaviour performed by the parent for their child in the previous two weeks.

Data Analysis

Descriptive analyses were used to describe sample characteristics and summarise responses to the study questions. Based on previous approaches [36], semi-partial correlations were used to identify the beliefs that were independently associated with the global, direct measures of the TPB constructs of attitude, subjective norm, and perceived behavioural control. The purpose of this preliminary analysis was to identify the beliefs that accounted for unique variance in the direct TPB measures and were, therefore, likely to be most salient when predicting parents' sun-protective behaviours for their children. Specifically, we conducted semi-partial correlations between each TPB global construct (attitude, subjective norm, and perceived behavioural control) and their respective individual beliefs (behavioural, normative, and control beliefs). Those with statistically significant semi-partial correlations with the global construct were selected for inclusion in subsequent analyses. Once the beliefs had been identified, we assessed the predictors of parents' intention using hierarchical multiple regression analysis. In step 1 we included the TPB beliefs identified in the semi-partial correlation analysis (see supplementary Table 2). This step was essential to identify which of the beliefs uniquely predict intentions. In step 2 we included the global, direct TPB constructs of attitude, subjective norm, and perceived behavioural control. This step was to identify the extent to which the global measures accounted for the specific beliefs in predicting intention. In step 3 we included the additional constructs of role construction and anticipated regret to identify their unique contribution in predicting intention beyond the TPB constructs. Finally, we included past behaviour in step 4 of the analysis. A second hierarchical multiple regression analysis examined the predictors of parents' sun-protective behaviour. We

included intention and perceived behavioural control in step 1, followed by past behaviour in step 2. Analyses were conducted using SPSS version 22 and p -values of $< .05$ were considered statistically significant.

Results

Descriptive Statistics

Means, standard deviations, and bivariate correlations for study variables are presented in supplementary Table 3. Parents reported high intention ($M = 6.35$, $SD = 0.78$) and behaviour ($M = 5.98$, $SD = 1.07$) to sun-protect their child. Intention and behaviour were significantly correlated with all variables.

Predicting Parents' Intention

The beliefs entered in step 1 of the hierarchical regression analysis resulted in a statistically significant model and explained 51% of the variance. The beliefs “provide peace of mind”, “use up time and energy to enforce”, “current partner/other family members”, “friends”, “other parents”, “lack of accessibility”, and “have a rule in place” were significant predictors. Attitude, subjective norm, and perceived behavioural control were entered in step 2 and explained an additional 4% of the variance ($p < .001$); the constructs attitude and perceived behavioural control and the beliefs “provide peace of mind”, “current partner/other family members”, “friends”, “lack of accessibility”, and “have a rule in place” were significant predictors. Role construction and anticipated regret in step 3 resulted in a statistically significant increment in variance explained (6%, $p < .001$); the constructs attitude, perceived behavioural control, role construction and anticipated regret and the normative beliefs “current partner/other family members” and “friends” were significant predictors. Past behaviour in step 4 resulted in a significant increase in variance explained (3%, $p < .001$). In the final model, attitude, perceived behavioural control, role construction, anticipated regret, past behaviour, and the normative belief “current partner/other family members” were

significant predictors. The model accounted for 64% of the variance in intentions ($p < .001$; supplementary Table 4).

Predicting Parents' Behaviour

Intention and perceived behavioural control in step 1 resulted in a statistically significant model and explained 19% of the variance. Intention was the only significant predictor in the model. Past behaviour in step 2 resulted in a significant increase in variance explained, with the model accounting for 36% of the variance. In the final model, intention and past behaviour were significant predictors. Refer to supplementary Table 4.

Conclusions

The aim of the current study was to examine the role of parental beliefs, roles, and anticipated regret toward performing childhood sun-protective behaviours using a TPB-based approach. A number of TPB behavioural, normative, and control beliefs were significantly associated with parents' intention. In the final model, attitude, perceived behavioural control, role construction, and anticipated regret were associated with parents' intention; and parents' intention was associated with self-reported behaviour at follow-up. Subjective norm was not significantly associated with parents' intentions. However, parents' belief that their current partner or other family members wanted them to participate in the behaviour was a statistically significant predictor of intention. Importantly, the inclusion of past behaviour did not extinguish effects of the predictors.

This study has a number of important theoretical and practical implications. From a theoretical perspective, the findings support the efficacy of the TPB in explaining parents' sun-protective decisions for their young children and contribute to existing research and arguments in support of the TPB's utility for predicting health behaviours [26]. Importantly, the TPB has predominately been used to understand individuals' decisions for their own health. Our findings make a useful contribution to the emerging literature that supports the

utility of social cognitive models in predicting individuals' decisions for others' health, including parental decisions for childhood health [8, 37-39]. In addition, the inclusion of role construction and anticipated regret as predictors of intention within the TPB was supported. Including these key variables in the TPB provides preliminary evidence for the importance of social roles and anticipated emotions in determining decisions to engage in actions that will promote the health of others, such as parental engagement in childhood sun-protective behaviours. From a practical perspective, the findings have implications for future childhood sun-protective strategies. Given that attitude, perceived behavioural control, role construction, and anticipated regret were shown to be important in this context, future interventions could consider targeting these factors using a multi-faceted approach to improve childhood sun protection. Such interventions could adopt specific behaviour change techniques (BCTs) that map onto these theoretical constructs [40], thus developing interventions that are based on theory and provide a scientific base for effective design and implementation.

Clinical Implications

The current study also identified specific beliefs that were associated with parents' intentions to sun-protect their young children. These beliefs could inform the development of persuasive messages that may help to change parents' intention and, thus, future behaviour. For example, parents indicated that use of sun-protective behaviours provided them with "peace of mind" regarding protection from risks of sun exposure. This indicates parents' recognition of their responsibility for their children's sun-protection and their role in prevention of sun exposure. It also suggests that parents may want to avoid the anticipated negative emotions attached to not performing sun-protective behaviours for their child. As attitude, role construction, and anticipated regret have positive effects on parental decisions in this context, including BCTs such as weighing-up the pros and cons (targeting change in attitude), highlighting the value of self-identity (targeting role construction), and providing

information about emotional consequences (targeting anticipated regret) in future sun-protective interventions may prove useful. Further, beliefs that sun-protective behaviours would “use up time and energy to enforce” was identified as a negative consequence to providing child sun protection and undermine participation in sun-protective behaviours. Future intervention strategies could draw on BCTs such as addressing the salience of consequences and demonstrate how child sun protection can be achieved with minimal effort (e.g., seeking shade instead of using sunscreen).

Normative influences were also identified as being associated with parents’ intention, and suggest that using BCTs such as providing information about others’ approval may be useful to address subjective norm change. Beliefs that current partner or other family members and friends would want them to participate in sun-protective behaviours for their children were influential in determining their intentions to do so. This finding corroborates research that has found social influences and pressure from others to be important for parental decisions related to childhood health [8,15]. The positive relationship between proximal groups (e.g., partners, friends) indicates these close connections are potentially important influences on parental decisions for children’s sun protection, and is consistent with previous studies investigating influences on childhood health [15].

Parental ability and control over decisions to ensure their child is sun safe also emerged as potentially important set of beliefs. Specifically, “lack of accessibility” and “having a rule in place” about sun-safety were identified as influential in this context. Having a rule in place may imply that parents are attempting to apply effective practices from schools, such as the “no hat, no play” rule advocated in Australian schools. Rule setting has been successfully implemented in schools and draws on BCTs such as behavioural consistency and monitoring. Parents believing that they have a lack of access to resources necessary to engage in sun-safety behaviours for their children implies increasing parents’

perception of available resources may decrease perceived difficulties and increase their self-efficacy with respect to the behaviour. Environmental restructuring could be a BCT employed to ensure availability of sun protection. For example, sunscreen dispensers installed at popular public places such as parks, which could also act as a cue to action, a BCT often used to help individuals' action their intentions.

Study Limitations

This study is not without limitations. As is the case with most correlational research designs, current results do not permit the inference of causality on the basis of the data, only theory. The majority of the sample consisted of married Caucasian mothers; thus, results may not generalise across family structures and cultural groups, especially given a greater number of non-Caucasians dropped out relative to those that remained in the study. The sample size may have limited the statistical power of the study to detect effects for some of the belief-based analyses, and the participants were recruited from sources which promote health enhancing behaviours (e.g., swim schools) which may have yielded a sample who were aware of health messages. Further, the item stems of the TPB measures were devised specifically for the target behaviour (albeit adapted from established TPB guidelines and similar TPB studies). Ideally, some preliminary pilot testing of these measures would have ensured that the scales were valid and reliable prior to their use in the current investigation. In addition, the study's findings may be limited by behaviour being measured via self-report and across all sun-protective behaviours. However, previous research has demonstrated good concurrent validity for self-report measures with objective measures of sun exposure and sun-protective behaviours [41] and suggested clustering of different types of sun-protective behaviours such that differentiating between specific sun-protective behaviours in behavioural measures is potentially not necessary [9,35]. Nevertheless, it is acknowledged that validated measures of sun protection are available [see 42] which recognise the distinct decisional and preparatory

processes (e.g., sunscreen use, sun exposure avoidance etc.). The use of a standardised measure of sun protection practices is important to allow for comparisons between populations and is advised for future studies. Further, differential assessment of specific sun-protective behaviour in different situations may be useful as it allows an analysis to identify if different relationships exist depending on the specific behaviour/situation. It is therefore also advised that future research examine each of the sun-protective behaviours separately so that the specific actions which are employed by individuals can be more readily identified. Finally, given mothers may hold false beliefs toward exposing their infants to the sun for therapeutic reasons [10] and education interventions have been successful in reducing myths that could result in mothers intentionally sunning their babies [43], it is important for future research to continue to investigate sun-protective beliefs of parents for very young children.

While national recommendations are provided to guide parents in performing adequate child sun protection, the findings of this study show the importance of going beyond simple knowledge transmission to support and enhance parents' ability to improve this important cancer-preventive behaviour. Given Australia has the highest incidence of skin cancer in the world, encouraging parents to ensure their child engages in sun-protective behaviours at a young age is imperative in an attempt to increase Australian children's adoption of sun-safety behaviours and reduce future incidence of skin cancer among this high-risk population.

References

- [1] World Health Organisation. (2015). Ultraviolet radiation and the INTERSUN Programme. Retrieved 29/03/15, from <http://www.who.int/uv/en/>
- [2] Australian Institute of Health and Welfare & Australasian Association of Cancer Registries. (2012). *Cancer in Australia: an overview, 2012* (Cancer series no. 74. Cat no. CAN 70). Canberra, Australian Institute of Health and Welfare.
- [3] Gandini, S., Sera, F., Cattaruzza, M. S., Pasquini, P., Zanetti, R., Masini, C., . . . Melchi, C. F. (2005). Meta-analysis of risk factors for cutaneous melanoma: III. Family history, actinic damage and phenotypic factors. *European Journal of Cancer*, *41*, 2040-2059. Doi:10.1016/j.ejca.2005.03.034
- [4] Saraiya, M., Glanz, K., Briss, P. A., Nichols, P., White, C., Das, D., . . . Rochester, P. (2004). Interventions to prevent skin cancer by reducing exposure to ultraviolet radiation: A systematic review. *American Journal of Preventive Medicine*, *27*, 422-466. Doi:10.1016/s0749-3797(04)00205-3
- [5] Stanton, W. R., Chakma, B., O'Riordan, D. L., & Eyeson-Annan, M. (2000). Sun exposure and primary prevention of skin cancer for infants and young children during autumn/winter. *Australian and New Zealand Journal of Public Health*, *24*, 178-184. Doi:10.1111/j.1467-842X.2000.tb00139.x
- [6] Green, A. C., Wallingford, S. C., & McBride, P. (2011). Childhood exposure to ultraviolet radiation and harmful skin effects: Epidemiological evidence. *Progress in Biophysics and Molecular Biology*, *107*, 349-355. Doi:10.1016/j.pbiomolbio.2011.08.010
- [7] White, K. M., Robinson, N. G., Young, R. M., Anderson, P. J., Hyde, M., Greenbank, S., . . . Baskerville, D. (2008). Testing an extended theory of planned behaviour to predict young people's sun safety in a high risk area. *British Journal of Health Psychology*, *13*, 435-448. Doi:10.1348/135910707X210004

- [8] Thomson, C.E., White, K.M., Hamilton, K. (2012). Investigating mothers' decisions about their child's sun-protective behaviour using an extended Theory of Planned Behaviour. *Journal of Health Psychology, 17*, 1001-1010.
Doi:10.1177/1359105311433905.
- [9] Hamilton, K., Cleary, C., White, K.M., & Hawkes, A. (2016). Keeping kids sun safe: exploring parents' beliefs about their young child's sun-protective behaviours. *Psycho-Oncology, 25*, 158-163. Doi:10.1002/pon.3888.
- [10] Harrison, S., Buttner, P., & Nowak, M. (2005). Maternal beliefs about the reputed therapeutic uses of sun exposure in infancy and the postpartum period. *Australian Midwifery Journal, 18*, 22-28.
- [11] Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes, 50*, 179-211. Doi:10.1016/0749-5978(91)90020-T
- [12] Ajzen, I. (2015). The theory of planned behaviour is alive and well, and not ready to retire: a commentary on Sniehotta, Pesseau, and Araújo-Soares. *Health Psychology Review, 9*, 131-137. Doi:10.1080/17437199.2014.883474
- [13] Chan, D. K. C., Hardcastle, S., Dimmock, J. A., Lentillon-Kaestner, V., Donovan, R. J., Hagger, M. S. (2015). Modal salient belief and social cognitive variables of anti-doping behaviors in sport: Examining an extended model of the theory of planned behavior. *Psychology of Sport and Exercise, 16*, 164-174.
- [14] Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Kinmonth, A. L. (2002). Application of the theory of planned behaviour in behaviour change interventions: A systematic review. *Psychology and Health, 17*, 123-158.
Doi:10.1080/08870440290013644a
- [15] Hamilton, K., Spinks, T., White, K.M., Kavanagh, D.J., & Walsh, A.M. (2016). A psychosocial analysis of parents' decisions for limiting their young child's screen

- time: an examination of attitudes, social norms and roles, and control perceptions. *British Journal of Health Psychology*, 21, 285-301. Doi:10.1111/bjhp.12168.
- [16] Hamilton, K., Hatzis, D., Kavanagh, D. J., & White, K. M. (2015). Exploring parents' beliefs about their young child's physical activity and screen time behaviours. *Journal of Child and Family Studies*, 24, 2638-2652. Doi:10.1007/s10826-014-0066-6.
- [17] Spinks, T., & Hamilton, K. (2015). Investigating key beliefs guiding mothers' dietary decisions for their 2-3 year old. *Appetite*, 89, 167-174. Doi:10.1016/j.appet.2015.02.004.
- [18] Hamilton, K., Daniels, L., Murray, N., White, K.M., & Walsh, A. (2012). Mothers' perceptions about introducing complementary feeding at 6 months: identifying critical belief-based targets for promoting adherence to current infant feeding guidelines. *Journal of Health Psychology*, 17, 121-131. Doi:10.1177/1359105311409786.
- [19] Hamilton, K., & White, K.M. (2010). Identifying parents' perceptions about physical activity: a qualitative exploration of salient behavioural, normative, and control beliefs. *Journal of Health Psychology*, 15, 1157-1169. Doi:10.1177/1359105310364176.
- [20] Hamilton, K., White, K.M., Young, R., Hawkes, A., Starfelt, L.C., Leske, S. (2012). Identifying critical sun-protective beliefs among Australian adults. *Health Education Research*, 27, 834-843. Doi:10.1093/her/cys093.
- [21] Epton, T., Norman, P., Harris, P., Webb, T., Snowsill, F. A., & Sheeran, P. (2015). Development of theory-based health messages: three-phase programme of formative research. *Health Promotion International*, 30, 756-768. Doi:10.1093/heapro/dau005
- [22] von Haefen, I., Fishbein, M., Kasprzyk, D., & Montano, D. (2001). Analyzing data to obtain information to design targeted interventions. *Psychology, Health & Medicine*, 6, 151-164. Doi:10.1080/13548500125076.

- [23] McEachan, R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective predictions of health-related behaviours with the theory of planned behaviour: A meta-analysis. *Health Psychology Review*, 5, 97-144. Doi:10.1080/17437199.2010.521684
- [24] Starfelt Sutton, L. C., & White, K. M. (Epub ahead of print, 2016). Predicting sun-protective intentions and behaviours using the theory of planned behaviour: a systematic review and meta-analysis. *Psychology and Health*.
Doi:10.1080/08870446.2016.1204449
- [25] Sniehotta, F. F., Pesseau, J., & Araujo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review*, 8, 1-7.
Doi:10.1080/17437199.2013.869710
- [26] Hagger, M. S. (2015). Retire or not, the theory of planned behaviour will always be with us. *Health Psychology Review*, 9, 125-130. Doi:10.1080/17437199.2015.1034470
- [27] Hoover-Dempsey, K., & Sandler, H. (1997). Why do parents become involved in their children's education? *Review of Educational Research*, 67, 3-42.
Doi:10.2307/1170618
- [28] Zeelenberg, M. (1999). Anticipated regret, expected feedback and behavioural decision-making. *Journal of Behavioural Decision Making*, 12, 93-106.
Doi:10.1002/(SICI)1099-0771(199906)12:2<93::AID-BDM311>3.0.CO;2-S
- [29] Abraham, C., & Sheeran, P. (2004). Deciding to exercise: The role of anticipated regret. *British Journal of Health Psychology*, 9, 269-278. Doi:10.1348/135910704773891096
- [30] Sheeran, P., & Orbell, S. (1999). Augmenting the theory of planned behaviour: Roles for anticipated regret and descriptive norms. *Journal of Applied Social Psychology*, 29, 2107-2142. Doi:10.1111/j.1559-1816.1999.tb02298.x

- [31] Sandberg, T., & Conner, M. (2008). Anticipated regret as an additional predictor in the theory of planned behaviour: A meta-analysis. *The British Journal of Social Psychology, 47*, 589-606. Doi:10.1348/014466607x258704
- [32] Turner, L. R., & Mermelstein, R. J. (2005). Psychosocial characteristics associated with sun protection practices among parents of young children. *Journal of Behavioural Medicine, 28*, 77-90. Doi:10.1007/s10865-005-2565-9
- [33] ARPNSA (2017). *Australian UV index monthly summaries*. Retrieved 26/01/2017 from: <http://www.arpansa.gov.au/uvindex/monthly/ausmonthlyindex.htm>
- [34] Cancer Council Queensland. (2017). *Skin cancer prevention*. Retrieved 03/02/2017 from: <https://cancerqld.org.au/cancer-prevention/understanding-risk/being-sunsmart/#vitamind>
- [35] White, K. M., Starfelt, L. C., Young, R. M., Hawkes, A. L., Leske, S., & Hamilton, K. (2015). Predicting Australian adults' sun-safe behaviour: Examining the role of personal and social norms. *British Journal of Health Psychology, 20*, 396-412. Doi:10.1111/bjhp.12108
- [36] Armitage, C. J., Conner, M. (1999). Distinguishing perceptions of control from self-efficacy: Predicting consumption of a low-fat diet using the theory of planned behavior. *Journal of Applied Social Psychology, 29*, 72-90.
- [37] Walsh, A., Hamilton, K., White, K. M., & Hyde, M. (2015). Use of online health information to manage children's health care: a prospective study investigating parental decisions. *BMC Health Services Research, 15*:131. Doi:10.1186/s12913-015-0793-4.
- [38] Spinks, T., & Hamilton, K. (2016). Investigating mothers' decisions to give their 2-3 year old a nutritionally balanced diet. *Journal of Nutrition Education and Behavior, 48*, 250-257. Doi:10.1016/j.jneb.2016.02.002

- [39] Hamilton, K., Thomson, C., & White, K.M. (2013). Promoting active lifestyles in young children: investigating mothers' decisions about their child's physical activity and screen time behaviour. *Maternal and Child Health Journal*, *17*, 968-976.
Doi:10.1007/s10995-012-1081-0.
- [40] Abraham, C., & Michie, S. (2008). A taxonomy of behaviour change techniques used in interventions. *Health Psychology*, *27*, 379-387. Doi:10.1037/0278-6133.27.3.379
- [41] Hillhouse, J., Turrisi, R., Jaccard, J., & Robinson, J. (2012). Accuracy of self-reported sun exposure and sun protection behaviour. *Prevention Science: The Official Journal of the Society for Prevention Research*, *13*, 519-531. Doi:10.1007/s11121-012-0278-1
- [42] Glanz, K., Yaroch, A. L., Dancel, M., Saraiya, M., Crane, L. A., Buller, D. B., . . . Robinson, J. K. (2008). Measures of sun exposure and sun protection practices for behavioral and epidemiologic research. *Archives of Dermatology*, *144*, 217-222.
- [43] Harrison, S., Nowak, M., Devine, S., Saunders, V., Smith, A., & Buettner, P. (2013). An intervention to discourage Australian mothers from unnecessarily exposing their babies to the sun for therapeutic reasons. *Journal of Tropical Pediatrics*, *59*, 403-406.
Doi:10.1093/tropej/fmt042.

Figure 1. Sun-protective behaviours for young children: Hypothesised pathways among the extended theory of planned behaviour constructs.

Note. Broken paths between constructs indicate additional constructs added to the model.

