Living life in the sun: Using the Prototype Willingness Model to explain incidental sun exposure in a high-risk environment.

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Ethics Declaration

This research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council (NHMRC) National Statement on Ethical Conduct in Human Research, 2007. The proposed research study received human research ethics approval from the JCU Human Research Ethics Committee, Approvals H4227; H4240; H5295.

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Abstract

Townsville, in Northern Australia, is the skin cancer capital of the world (Buettner & Raasch, 1998). The rates of skin cancer observed in this region is likely to be due to a combination of environmental, genetic, and lifestyle factors including an extreme ultra violet radiation (UVR) environment, a predominantly fair skinned population, and a climate that facilitates being outdoors (Xiang et al., 2015). Under these conditions, skin damage may be acquired in the course of daily activities via incidental sun exposure. Behavioural approaches to skin cancer prevention have largely focused on sun protection and deliberate sunbathing. In comparison, little attention has been paid to damage acquired via incidental sun exposure. In order to examine the psychosocial factors that relate to incidental sun exposure, an appropriate theoretical framework must be adopted. Chapter 1 provides an introduction to skin cancer risk factors, and an overview of research relating to sun related behaviours.

This thesis adopts the prototype willingness (PW) model (Gibbons, Gerrard, & Lane, 2003) as a framework for predicting incidental sun exposure in an extreme ultra-violet radiation (UVR) environment. Chapter 2 provides an overview of the PW model, and a discussion of the empirical evidence for the model. The PW model is a dual-process model of health behaviour that includes both reasoned and reactive processes to decision making. The decision making processes underlying reasoned behaviours, such as sunbathing, are deliberative and planned. On the other hand, reactive behaviours, such as incidental sun exposure, are influenced by social and situational cues. Given that incidental sun exposure is unplanned and non-deliberative, the social reactive pathway of the PW model may provide a useful framework for the examination of this behaviour.

Social images, or prototypes, are a crucial component in the social-reaction pathway of the PW model. The first study aimed to determine whether social images existed for sun-related behaviours. Chapter 3 reports on the first study of this research project. Using qualitative research methods, the aim of the first study was to examine whether definitive social images existed for each of the sun-related behaviours. Twenty-eight Townsville residents were recruited to participate in semi-structured interviews. Interviews were conducted to establish whether distinct prototypes existed for each of the sun-related behaviours, and to explore the nature of the characteristics associated with each of the prototypes. Results indicated that stable social images existed for all three sun-related behaviours (sun protector, sunbather, incidental exposer). Furthermore, the majority of participants reported that they felt most similar to the incidental exposer prototype.

Chapter 4 reports on the second study of this project. A cross-sectional survey was conducted to determine whether the social reactive pathway of the PW model could account for typical incidental sun exposure behaviour. In total, 204 participants from the Townsville region completed a survey about their typical incidental sun exposure, and the PW model variables. Analyses were conducted to determine whether reasoned or reactive decision-making processes were involved in the performance of incidental sun exposure. Results suggested that both intention and willingness contributed unique variance to the prediction of behaviour. Further analyses indicated that prototype perceptions were directly related to incidental sun exposure. These findings suggested that both reasoned and reactive processes contributed toward typical exposure behaviour, and that the prototypical incidental exposer influenced whether the individuals' tend to incidentally expose themselves to the sun.

Given that prototype perceptions were directly related to behaviour in Study 2, a third study, presented as Chapter 5, was conducted to examine whether prototype perceptions could be manipulated. A longitudinal prospective design was used to examine whether a brief intervention could change prototype perceptions, and whether such a manipulation impacted upon cognitive precursors to behaviour, or behaviour itself. Repeated-measures factorial analyses were undertaken to examine within- and between-group differences. Results suggested that the manipulation was successful for those in the Negative condition immediately following the intervention, but there were no changes observed for any cognitive variables, or for behaviour at the one-month follow-up. These findings suggested that prototype perceptions of the incidental sun exposer can be manipulated with a brief intervention.

Finally, path modelling was conducted to explore the pathways between the variables of the social reaction pathway and incidental behaviour. Chapter 6 presents this investigation. Using the prospective data from Study 3a, variables in the model included past behaviour, perceptions of the typical incidental exposer and the sun protector, and intentions and willingness to incidentally expose. Results indicated that willingness, but not intention, was related to incidental sun exposure. Furthermore, perceptions of the sun protector were more strongly related to willingness to incidentally expose, compared to the incidental exposer prototype. Again, these findings suggested that reactive processes to decision making may be more influential for incidental sun exposure. Furthermore, the results suggested that prototypes relating to the sun protector prototype influenced sun exposure behaviour. Chapter 7 provides a general discussion of this set of research studies, including implications for population-level health promotion strategies and future research.

Research Outputs

Morris, K.R., & Swinbourne, A.L. (2014). Identifying prototypes associated with sun-related behaviours in North Queensland. A*ustralian Journal of Psychology,* doi:10.1111/ajpy.12052.

Peer-reviewed Conference Publications

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Morris, K.R., Swinbourne, & A.L., Harrison, S.L. (2014). The exploration of prototype perceptions across a range of sun-related behaviours. *European Health Psychologist, 16*(S), p552.

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Morris, K.R., Swinbourne, A.L. & Harrison, S. (2012). Sun protection: Exploring prototype perceptions. *International Journal of Behavioural Medicine, 19*(S43). doi: 10.1007/s12529-012-9247-0.

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Introduction

Townsville, in North Queensland (NQ), has the highest incidence rates of skin cancer in the world (Buettner & Raasch, 1998). Northern Australia is an extreme ultraviolet radiation (UVR) environment where a predominantly fair skinned population live a sun-drenched lifestyle. Thus, the rates of skin cancer in this region are hypothesised to be due to a combination of risky environmental, individual, and lifestyle factors. In this region, individuals can acquire sun damage just by going about their daily lives. This type of sun exposure is incidental, and not planned or deliberate. While there has been considerable research examining deliberate sun exposure such as tanning, the psychosocial factors surrounding incidental sun exposure have not been examined in any great depth. These two behaviours are distinct, and must be treated accordingly in psychological research.

This thesis is an examination of the applicability of the Prototype Willingness (PW) model to the prediction of incidental sun exposure. The PW model is a dual-process model of health behaviour that accounts for both reasoned and reactive processes to decision making. It can be argued that he decision making processes underlying reasoned behaviours, such as sunbathing, are deliberative and planned. On the other hand, reactive behaviours, such as incidental sun exposure, are influenced by social and situational cues. Given the unplanned nature of incidental sun exposure, the social reactive pathway of the PW model may provide a useful framework for the exploration of this behaviour.

To test this hypothesis, a series of studies were conducted to determine whether the PW model was an appropriate framework for the examination of incidental sun exposure. Social images, or prototypes, are a crucial component in the social-reaction

pathway of the PW model, thus investigations centred on whether this component was related to incidental sun exposure. Using qualitative research methods, the aim of the first study was to examine whether definitive social images existed for each of the sun-related behaviours. Following this, a cross-sectional survey was conducted to determine whether the social reactive pathway of the PW model could account for typical incidental sun exposure behaviour. A third study aimed to manipulate the social images surrounding those who incidentally expose themselves to the sun, and investigated whether such a manipulation impacted upon cognitive precursors to behaviour, or behaviour itself. Finally, path modelling was conducted to investigate how social images associated with an alternate behaviour, sun protection, influenced prospective incidental sun exposure. Findings of this series of research studies are discussed in terms of implications for population-level health promotion strategies and future research.

Chapter 1

Skin Cancer in Australia

Skin cancer is often referred to as Australia's national cancer (Slevin, 2014). This is because two in three Australian adults will be diagnosed with non-melanoma skin cancer (NMSC; AIHW & AACR, 2014), and one in 14 will be diagnosed with Melanoma in their lifetime (Gies, Henderson, & King, 2014). The incidence of skin cancer in Australia is well above that of comparable countries (IARC, 2007), with age-standardised comparisons indicating that rates of diagnoses in Australia are 12 times the world average (AIHW & AACR, 2014). Within Australia, melanoma of the skin accounts for approximately 10% of all cancer diagnoses, and is the fourth most common cancer in both men and women (AIHW & AACR, 2014). These rates increase exponentially when NMSC subtypes are included in the estimates (Fransen et al., 2012; Lucas, McMichael, Smith, & Amstrong, 2006). The rate of skin cancer observed in Australia is largely due to a combination of risky environmental, individual, and lifestyle factors that all contribute toward an increased risk of developing the disease.

1.1 Skin Cancer Risk Factors

It is well documented that the single greatest risk factor for the development of skin cancer is exposure to ultra-violet radiation (UVR; Gallagher & Lee, 2006; IARC, 2007; Slevin, 2014). UVR consists of three ultraviolet wavelengths, of which two - UVA and UVB - are implicated in skin damage. There is sufficient evidence to indicate that UVB causes erythema (sunburn; Garibyan & Fisher, 2010), while UVA and UVB have been implicated in the development of both melanoma and NMSC (Balk, 2011). The relationship between UVR and the development of skin cancer is complex. The initiation and progression of skin cancer can include immunosuppressive,

inflammatory, and direct carcinogenic processes (Garibyan & Fisher, 2010; Juzeniene, Baturatie, & Moan, 2014). Furthermore, these processes are impacted upon by various environmental, individual, and lifestyle factors. Environmental factors can include geographical location of residence (Slevin, 2014), and pattern and intensity of UVR exposure across the lifespan (Armstrong & Kricker, 2001; Gandini et al., 2005). Individual factors can include number of naevi (Armstrong & English, 1992), phenotype (hair, eye, skin colour) and genetic susceptibility (Youl et al., 2002). Lifestyle includes cultural factors and sun-related behaviours.

1.1.1 The environment. With few exceptions (e.g. Northern Europe), there is a general latitude-skin cancer gradient such that greater rates of skin cancer are observed in lower latitudes (locations closer to the equator; Gies et al., 2014). This pattern is distinctly obvious for NMSC, but less so for melanoma (Rigel, 2008). This gradient is also observed within Australia, with a general trend of higher rates of skin cancer in northern areas, and lower rates in the south (IARC, 2007; Staples et al., 2006). This general pattern of incidence maps onto the UV-index gradient, depicted in Figure 1.1 below (Bureau of Meteorology, 2015). The figure represents the average annual solar noon UV-index. As shown in the figure, the UV-index is greater in the northern regions of Australia which are closest to the equator. Additionally, locations in the southern hemisphere average a higher UV-index than those at the equivalent latitude in the northern hemisphere, due to the earth's tilt (Lucas et al., 2006). This places Australia's population at even greater risk, and can begin to explain why Queensland, in Australia's North, has the greatest skin cancer incidence of any region in the world (Buettner & Raasch, 1998; Slevin, 2014). This is presumably due to a combination of individual and environmental factors, whereby a predominantly fair skinned population (of Northern European descent) is exposed to high to extreme ambient UVR all year round

(ARPNSA, 2007; Bernhard, Mayer, Seckmeyer, & Moise, 1997).

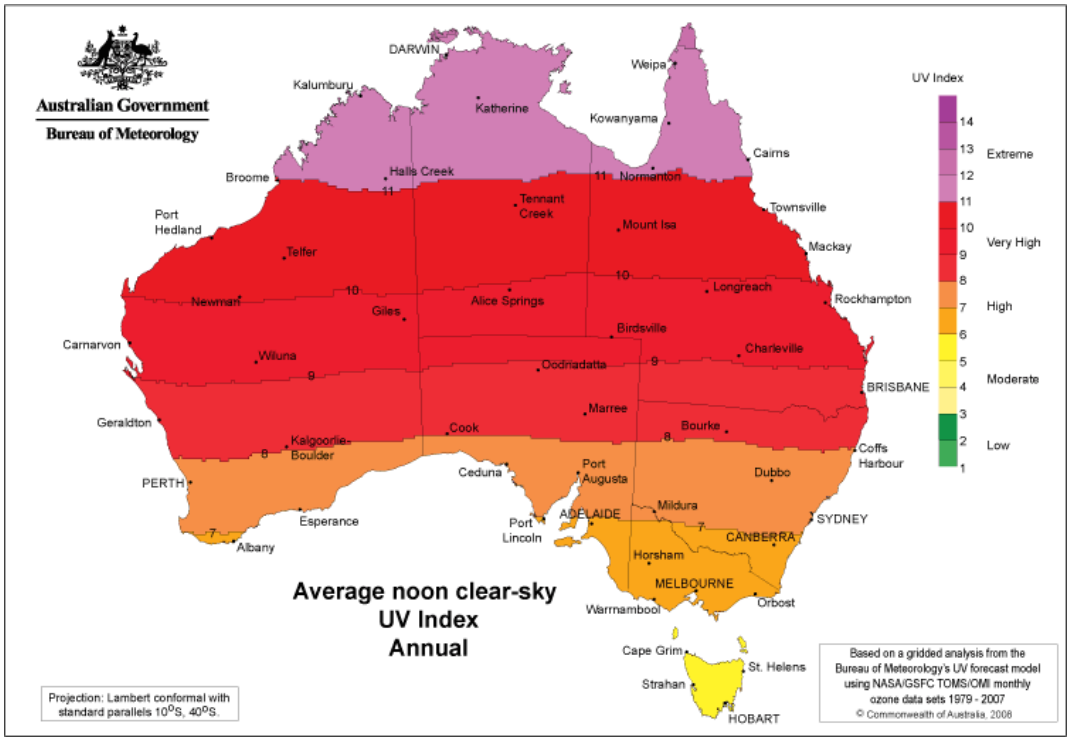

Figure 1.1. Average annual ultraviolet (UV) index for Australia (Bureau of Meteorology, 2015).

It has long been considered that childhood is a crucial period for acquiring skin damage (Whiteman, Whiteman, & Green, 2001). It is thought that this heightened risk may be due to both a physiological susceptibility of young skin cells (Balk, 2011), as well as the fact that approximately 25% of lifetime sun exposure occurs during childhood and adolescence (Whiteman et al., 2001). It is also now understood that UVR exposure during both childhood and adulthood increases the risk of developing skin cancer, although this risk is not additive (Pfahlberg, Kolmel, Ofefeller, & FEBIM Study Group, 2001). This relationship is also thought to differ for the development of NMSC and melanoma (Oliveria, Saraiya, Geller, Heneghan, & Jorgensen, 2006), and is further

complicated by the differential impact of UVA vs UVB. Therefore it is important that adequate sun protection practices are adhered to throughout the lifespan, and not just during childhood.

This will become increasingly important due to evidence that suggests that the ambient UVR is increasing in this high risk environment (P. Thomas, Swaminathan, & Lucas, 2012). Analysis of ozone depletion and clear-sky UV-index data for Australia over the 50-year period from 1959 to 2009 indicates that surface UVR has increased during this period (Lemus-Deschamps & Makin, 2012). In the 25-year period from 1982 to 2007, melanoma diagnoses in Australia had increased by approximately 50%, and NMSC rates from 1985 - 2002 also increased, particularly among those aged 60 years or older (AIHW & AACR, 2008; Lemus-Deschamps & Makin, 2012). Based on these trends, the incidence of skin cancer is expected to continue to increase until at least mid-century (Gies et al., 2004). After this point, ozone repair may lead to reductions in surface UVR, thus UVR related damage may also decrease. However, marked changes to the UVR environment are not expected until the next half of the century (Lemus-Deschamps & Makin, 2012). Ambient UVR levels are expected to continue to rise, as are rates of skin cancer. Therefore, continued efforts are needed to encourage individuals to reduce their exposure to the sun.

1.1.2 Individual factors. It has been estimated that between 95 and 99% of skin cancers are due to excessive exposure to UVR (Armstrong & Kricker, 1993, 2001; IARC, 1992; Juzeniene et al., 2014), but there are a number of personal factors that determine susceptibility to UVR damage. An individual's risk of acquiring sun damage varies based on host factors such as family history, phenotypic characteristics such as naevi count and other physical characteristics, as well as other underlying genetic factors. Individuals who have an immediate family member who has been diagnosed

with melanoma are also more likely (Ford et al., 1995; Siskind, Aitken, Green, & Martin, 2002) to be diagnosed than someone who does not have the same family history. A review conducted by Ford et al. (1995) found that family history predicted melanoma diagnosis independent of well-known risk factors including nevi count, hair and eye colour, and freckling. Therefore, the extent of the role of inherited traits is unclear. This is because the role of family history could be due to genetically determined risk factors, or shared exposure environments, or a combination of both.

Phenotypic features such as fair skin, light hair (blonde or red) and freckles are associated with greater risk of developing skin cancer (Armstrong & Kricker, 2001; Juzeniene et al., 2014). Susceptibility to this risk can be reliably measured using Fitzpatrick's (1988) skin type classification tool. The 10-item scale includes items about eye, hair and skin colour, as well as about the tendency to tan or burn. Skin type is then classified to one of six types according to item responses. Those with skin type I-III are those who tend to burn, rather than tan. These individuals are twice as likely to develop skin cancer (Slevin, 2014) than are those with skin types IV-VI. These more robust skin types are characterised by the tendency to tan rather than burn. Such skin type is generally darker, and contains greater amounts of melanin. This naturally occurring melanin offers some protection from the harms of UVR (Brenner & Hearing, 2008). Those who have fair skin have lower levels of melanin in their skin thus do not have this protection.

The risk of developing skin cancer is also greater for those who have a high naevi (mole) count. Those with more than 100 naevi are more than 10 times as likely to develop melanoma as those who have few naevi (Slevin, 2014; Tucker & Goldstein, 2003). The development of naevi can be related to both a genetic susceptibility, as well as due to childhood sun exposure, which is another risk factor for the development of

skin cancer. The development of naevi is also related to childhood sun exposure, which has also been identified as a risk factor for the development of skin cancer.

As well as the role of expressed traits, there are also a number of genes that have been identified as a precursor to susceptibility of developing melanoma. Studies looking at high risk families have identified at least two sets of susceptibility genes (Tucker & Goldstein, 2003; Whiteman, Pavan, & Bastian, 2011). Without thorough genetic testing for all high-risk families, it is difficult to ascertain the true rate of skin cancer caused by genetic mutation on the few susceptibility genes. Best estimates place this figure around 5% of all diagnosed melanomas (Juzeniene et al., 2014), while the vast majority of skin cancer (approximately 95%) is due to exposure to UVR (Armstrong & Kricker, 1993, 2001). Although there is a positive relationship between UVR exposure and risk of skin cancer, this relationship varies based on the interaction between the aforementioned personal risk factors, and the pattern and intensity of exposure to UVR (Balk, 2011; Whiteman, 2010). Personal risk factors are largely non-modifiable, and ambient UVR is dependent on location of residence. In terms of prevention, the most effective point of intervention is likely to be individuals' behavioural choices because this is what determines the extent of their exposure to risk.

1.1.3 Lifestyle & sun-behaviours. Australia is renowned for its beach culture. This culture perpetuates a long-standing sun-worshiping tradition, and a pervasive desire for tanned skin among Australians (Broadstock, Borland, & Gason, 1992; Broadstock, Borland, & Hill, 1996; Hutchinson, Prichard, Ettridge, & Wilson, 2015; Montague, Borland, & Sinclair, 2001; Prichard, Kneebone, Hutchinson, & Wilson, 2014). This, coupled with the tendency for individuals in some regions to spend more time outdoors when it is warm (Dixon, Dobbinson, Wakefield, Jamsen, & McLeod, 2008), and to wear brief clothing when the UVR is greater (Xiang et al., 2015)

contributes toward a hazardous lifestyle for those in extreme UVR regions. Therefore, understanding sun-related behaviours in such regions is an important part of skin cancer prevention.

A considerable amount of research has investigated the psychosocial factors that contribute toward the performance of sun protection and sun bathing behaviours around the world. This research has been guided by a small number of health behaviour models, and their components. These models mostly originate from an expectancy-value tradition, and include the Theory of Reasoned Action (TRA; Ajzen & Fishbein, 1980) and its successor, the Theory of Planned Behaviour (TPB; Ajzen, 1991), the Health Belief Model (HBM; Rosenstock, 1974), and Social Cognitive Theory (Bandura, 1991) to name a few (for a review, see: Arthey & Clarke, 1995; Day, Wilson, Hutchinson, & Roberts, 2013). Broadly, the aforementioned models share an underlying assumption whereby behavioural decisions are determined by an individual's attitudes and beliefs about behavioural outcomes. With regard to health behaviours, such outcomes are usually socially and/or personally desirable. Expectancy-value models are particularly adept at explaining behaviours that are oriented toward goal-based outcomes. As such, investigations using these frameworks have provided a rich understanding of the psychosocial factors that are involved in the performance of both sun protection and sun bathing behaviours. Overall, the body of research indicates that the leading psychosocial predictors of sunbathing include having pro-tan attitudes, desiring to have a tan, and perceiving the existence of positive normative influences (Branstrom, Ullen, & Brandberg, 2004; Keesling & Friedman, 1987; Livingston, White, Hayman, & Dobbinson, 2007; Robinson et al., 2008). Those same factors are also related to a lower likelihood of adopting sun protective practices (Livingston et al., 2007). Psychosocial factors that are positively related to sun protection include sun

safety knowledge (Berwick, Fine, & Bolognia, 1992; Day et al., 2013), perceptions that skin cancer is risky (Jackson & Aiken, 2000), strong behavioural efficacy (Martin, Jacobsen, Lucas, Branch, & Ferron, 1999), positive normative beliefs (Cokkinides et al., 2001; Hamilton et al., 2012; White et al., 2008), and greater intentions to use sun protection (Bodimeade et al., 2014; Craciun, Schuz, Lippke, & Schwarzer, 2012; Livingston, White, Ugoni, & Borland, 2001).

It has also been widely reported that a number of personal demographic factors are related to the uptake of sun protective behaviours, and the performance of sunbathing. As is generally found with a variety of health behaviours (Kandrack, Grant, & Segall, 1991; Macintyre, Hunt, & Sweeting, 1996), males and females report differential uptake of sun-related behaviours. These differences are observed with relation to knowledge, health beliefs, and attitudes associated with the behaviours, as well as level of engagement in these behaviours. Overall, females are more likely to sunbathe than are males (Broadstock et al., 1996; Pratt & Borland, 1994). Interestingly, females report greater levels of knowledge about skin cancer and sun protection practices (Mermelstein & Riesenberg, 1992; Miles, Waller, Hiom, & Swanston, 2005), and have greater perceptions of the dangers associated with having a tan, compared to males (Mermelstein & Riesenberg, 1992; Sjöberg, Holm, Ullén, & Brandberg, 2004). Females are also more likely than males to adopt sun-safe behaviours such as sunscreen use (Dobbinson, Wakefield, Hill, et al., 2008; Keesling & Friedman, 1987). The tendency for females, compared to males, to report greater levels of sunbathing then could be attributable to females placing a greater emphasis on appearance-based motives for sun exposure (Broadstock et al., 1996; Livingston et al., 2001; Wichstrom, 1994). These findings also suggest that each behaviour is not exclusive of the other. It could be that women are engaging in some sun protective behaviours to mitigate their risk, but still

persist with deliberate tanning to reach their tan ideal. Despite female pro-tan attitudes and greater engagement in sunbathing, males are at greater risk of developing some types of skin cancer (NMSC), with rates nearly twice that of females (AIHW & AACR, 2014). Males' heightened risk for skin cancer is likely the result of spending more time outdoors than females, coupled with perceptions of low severity of skin cancer, and a lower likelihood of adopting sun safe practices (Mermelstein & Riesenberg, 1992).

Skin type is another personal factor that has been found to be related to sun behaviours (Broadstock et al., 1996). Unsurprisingly, those with more sensitive skin types tend to abstain from deliberate sunbathing, and adopt greater sun protective behaviours than those with less reactive skin types (Broadstock et al., 1996; Mermelstein & Riesenberg, 1992; Wichstrom, 1994). It has also been found that individuals with highly-sensitive skin reported significantly more favourable attitudes toward sun protection than did those with moderately-sensitive or non-sensitive skin. Furthermore, those with highly sensitive skin were more likely to sun protect (by wearing sunscreen and a hat) than were those with moderately or highly sensitive skin (Berwick et al., 1992; Broadstock et al., 1996). These findings provide encouraging evidence that those at greatest risk are engaging in protective behaviours that mitigate their risk of sun damage.

There is a curvilinear relationship between age and sun protective practices. When examining patterns of behaviour starting at childhood through to adulthood, there is a tendency for sun protection practices to peak during early adolescence and then decline again until adulthood (Arthey & Clarke, 1995; Dobbinson, Wakefield, Hill, et al., 2008; Hill, White, Marks, & Borland, 1993; Lowe et al., 2000; Makin, Warne, Dobbinson, Wakefield, & Hill, 2013). Research has also demonstrated a negative relationship

between age and sunbathing (Branstrom et al., 2004). This is presumably due to the effects of sun damage accrued earlier in life becoming visible during early adult hood.

While there is a rich depth of understanding of the psychosocial factors surrounding deliberate sunbathing and sun protection, there are very few studies that have examined the psychosocial correlates of general, or incidental sun exposure. Berwick et al. (1992) conducted one of the few investigations of the psychosocial factors relating to 'general' sun exposure, where general sun exposure refers to total sun exposure. In their study, conducted in Connecticut, participants retrospectively reported sun exposure and sunscreen use for the summer. Results of their study suggested that skin cancer knowledge was positively associated with sunscreen use, but not with behaviour. This same conclusion was drawn by Day et al. (2013) in their systematic review. Unfortunately, Berwick et al. (1992) did not investigate or report on the relationship between any other psychosocial variables and general sun exposure.

One other study that incorporated a measure of 'general' exposure was conducted by Branstrom et al. (2004) in Sweden. Their research explored the relationship between total hours spent in the sun and factors such as gender, age, and skin type, pro-tan attitudes, and subjective norms. Branstrom et al. (2004) reported that those with moderately sensitive skin, pro-tan attitudes, and perception of positive norms were more likely to spend time in the sun during peak UVR hours. Research conducted by Mahler, Kulik, Gerrard, and Gibbons (2010), as well as Mahler, Kulik, Butler, Gerrard, and Gibbons (2008) also included assessments of incidental sun exposure as an outcome measure for their intervention studies. However, incidental exposure was then combined with time spent sunbathing for use in the analyses.

In research, estimations of total sun exposure are often conflated with measures of deliberate sunbathing, sunburn history, and tan level. Thus, the heterogeneity in the assessment of general or incidental sun exposure makes it difficult to draw any sensible conclusions about the psychosocial factors related to incidental sun exposure. Furthermore, neither the Branstrom et al. (2004) or Berwick et al. (1992) studies were conducted in a high UVR environment. It is likely that behaviours, including choice of clothing, sunscreen use, and amount of time spent outdoors will be different in a high UVR environment compared to a low UVR environment (Xiang et al., 2015), thus research into incidental sun exposure should be conducted in both high and low UVR regions. As outlined earlier, there are a number of personal factors that can contribute toward an individual's risk of developing skin cancer, but this potential is realised by exposure to UVR. Thus, just as UVR varies widely based on geographical location, so too should the focus of research and skin cancer prevention strategies.

1.2 Skin Cancer Prevention in Australia There has been a sustained commitment to reducing sun exposure behaviour and promoting sun safe behaviours at the population level in Australia (for an overview see: Sinclair, 2009). The leading organisation for skin cancer prevention in Australia is the Cancer Council of Victoria (formerly, Anti-Cancer Council of Victoria). This organisation is responsible for the 'Slip, Slop, Slap' (1980-1988) mass-media campaign, as well as the nation-wide SunSmart (1988 – current) program (Heward & Makin, 2013). The SunSmart program has been instrumental in promoting sun safety in Australia by advocating and driving sun-safe policy, and delivering mass media and social marketing campaigns (Sinclair, 2009).

To achieve this, one of the key strategies has been to increase community awareness about the importance of sun protection. The early SunSmart campaigns such as 'Slip, Slop, Slap' and 'Leave your hat on' aimed to achieve this by presenting various

methods of protection such as sunscreen, long-sleeved clothing and hats. Other programs have aimed to showcase the medical risks associated with excessive UVR exposure. Mass media campaigns such as ‘Timebomb’ and ‘Tattoo’, both focused on the medical risks and pain associated with the development and treatment of skin cancer. Other campaigns, including the ‘Dark side of tanning’ campaign (Dessaix et al., 2008) aimed to challenge the perception that a tan is healthy. This was achieved by highlighting the negative consequences of having a tan. This same message has been delivered as testimonials by individuals who have been diagnosed with cancer. Such mass media campaigns include SunSmart’s ‘Claire Oliver: No tan is worth dying for’, ‘Farmers’ Campaign’, and ‘Wes Bonny Testimonial’. Each of these campaigns provides the real-life story of a person who has been diagnosed with melanoma and the impact this diagnosis has had on their life, and the lives of their loved-ones. In each case, the central message is that tanning is dangerous, and sun protection is necessary in order to prevent a potentially fatal diagnosis of melanoma.

Overall, mass media campaigns have been quite successful at reaching their target audience. The majority of people surveyed after exposure to various campaigns have reported remembering the campaign, recalling the advertisement, and reciting the central message (Perez et al., 2015; Sinclair, 2009). With regard to message uptake, an evaluation of 20 years of skin cancer prevention in Australia (Sinclair, 2009) indicated that the cumulative health promotion efforts in Australia have resulted in changes to attitudes about tanning, as well as to adoption of sun protective behaviours. This means that, overall, fewer individuals desire a tan, and more individuals are adopting sun protective practices (Dixon, Lagerlund, et al., 2008; Sinclair, 2009; Volkov, Dobbinson, Wakefield, & Slevin, 2013) than had been previously recorded. This is why Australia’s

SunSmart campaign has been heralded as one of the most successful health promotion campaigns in the world.

In terms of application to extreme UVR climates such as north Queensland, past approaches have two major limitations. First, there has been a substantial emphasis on reducing *deliberate* sun exposure such as sunbathing. Research and health promotion strategies have focused on the factors that are related to deliberate sun exposure, with very little research considering alternate patterns of sun exposure. Secondly, sun protection messages have had too great of an emphasis on enhancing sun safe behaviours around water-based activities such as swimming, and going to the beach (Dixon, Lagerlund, et al., 2008; Sinclair, 2013), to the exclusion of other outdoor-based activities. Very recent research has indicated that the risk of sunburn at the beach is equal to that of being at sporting grounds, for example (Cancer Council Australia, 2013; Sinclair, 2013), and there has been a realisation that incidental sun exposure must be addressed (Dobbinson & Slevin, 2014). This suggests that both the UVR environment and the type of behaviours and activities undertaken whilst outdoors need to be considered, and messages tailored to suit various environments.

1.2.1 Prevention in high UVR environments. The incidence rates of skin cancer in Townsville are greater than anywhere else in the world (Buettner & Raasch, 1998). Given that the monthly average UV-index is high to extreme all year around (ARPNSA, 2007), it is likely that damage caused by UVR exposure may happen whilst going about normal daily activities, or by *incidental* exposure. Incidental exposure is not planned or deliberate. This type of sun exposure, which is vastly different to sunbathing, is yet to be explored.

Sun exposure patterns have been described in various ways including intermittent and chronic. A review conducted by Gandini et al. (2005) outlines the definition of 'intermittent' sun exposure to be episodic sun exposure resulting from recreational activities such as sunbathing, water sports or vacations in sunny places. In research, recreational or intermittent sun exposure is often assessed by asking about number and severity of lifetime sunburns (Balk, 2011). On the other hand, 'chronic' sun exposure is defined as cumulative exposure, and is often synonymous with occupational sun exposure. This distinction has been made in order to determine how patterns of sun exposure impact upon the development of various types of skin cancer. While there is some conflicting evidence (Siskind et al., 2002), it has been suggested that BCC and melanoma have been associated with recreational or 'intermittent' UVR exposure whereas SCC is associated with occupational or 'chronic' UVR exposure, (Armstrong & Kricker, 2001; Gandini et al., 2005). This is why health messages to reduce melanoma have focused on the dangers associated with sunburn. However, S. Byrne (2014) has suggested that the amount of sunlight required to induce DNA damage is less than that required to induce sunburn. This means that in some cases, damage is occurring without an individual feeling the effects of sunburn. Therefore, a fair skinned individual in a high UVR environment may be at risk each time they step into the sun without protection for just a few minutes. Conversely, that same individual could be in a low UVR environment, and not be at risk of sun damage. Analyses conducted by Chang et al. (2009) supports this, whereby total sun exposure was related to risk of melanoma, but only in low latitude locations (those close to the equator). This suggests that in extreme UVR environments, cumulative UVR exposure could be contributing toward rates of melanoma.

There has been an assumption that sun exposure is homogenous despite environmental differences in Australia, and an endless list of activities that are enjoyed in the sun. This is an erroneous assumption to make. Behaviour on a beach in a low or moderate UVR environment, such as southern Victoria may be very different to that observed in in an extreme UVR environment such as north Queensland. Furthermore, preparing to take a trip to the beach is quite different to preparations undertaken to go outside to perform household chores for example. In an extreme UVR environment, being outdoors for mere minutes may be enough to induce sun damage (S. Byrne, 2014; Samanek et al., 2006), but health promotion messages have not targeted this type of sun exposure, and research has not explored its determinants. Adopting research outcomes and paradigms that are specifically targeting those who deliberately sunbathe is not likely to significantly reduce the prevalence of skin cancer in Townsville or in similar climates. Thus, there is a compelling rationale for region-specific investigations that consider various types of sun-exposure behaviour.

1.3 Conclusion

Skin cancer is one of the few cancers with a clear link between any modifiable risk factor, and development of the disease (Balk, 2011; Lucas et al., 2006; Slevin, 2014). Reducing exposure to UVR is the best way to mitigate this risk, and to do this requires behavioural intervention. There is a strong history of skin cancer prevention in Australia, and research suggests that these prevention efforts have increased the performance of sun protective behaviours, and reduced deliberate sunbathing behaviours. Unfortunately, to date there has been limited focus on incidental sun exposure. Although the physiological outcome of sunbathing and incidental exposure might be the same, the psychological processes involved in achieving this outcome

appear to be very different. This has important implications for behaviour change strategies.

The expectancy-value health behaviour models that have been adopted for use in past research have successfully accounted for deliberative behaviours such as sun protection and sunbathing (Arthey & Clarke, 1995; Branstrom et al., 2004; Broadstock et al., 1996; Hillhouse, Adler, Drinnon, & Turrisi, 1997; Jackson & Aiken, 2000; Keesling & Friedman, 1987; Robinson et al., 2008; White et al., 2008), but to date there has been little to no theorising around correlates and predictors of incidental sun exposure. This is yet to be explored in the psychological literature. To do so, research must shift focus to consider the psychosocial influences on incidental exposure and to explore the various ways in which tanned skin is attained in high risk environments. The current set of studies aims to address this, by having a specific focus on the prediction of incidental sun exposure, and by adopting theoretical frameworks that are appropriate to do so.

Chapter 2

The Prototype Willingness Model

The health behaviour models (e.g. Theory of Planned Behaviour, Health Belief Model; Ajzen, 1991; Rosenstock, 1974) that have been adopted for use in past research successfully account for deliberative behaviours such as sun protection and deliberate tanning (Conner & Sparks, 2005). However, these models are not suited to predicting behaviour that is more reflexive, such as incidental sun exposure. In order to investigate the psychosocial predictors of incidental sun exposure, an appropriate theoretical framework is required. Gibbons and Gerrard (1995) argue that the consideration of the social context is particularly important for the prediction of the performance, or not, of some health risk behaviours. To compensate for the lack of inclusion of social factors in previous health behaviour models, Gibbons and Gerrard (1995) developed the Prototype Willingness (PW) Model, a social-reaction model of health behaviour. The PW model has been described as a *modified* dual-processing theory (Gibbons, Kingsbury, Gerrard, & Wills, 2011), largely because compared with traditional dual-systems frameworks, it focuses less on cognitive strategies and more on social cognition factors that influence behavioural decisions.

Various dual-processing theories have been developed to explain human reasoning, judgment, and decision making. The PW model is not unlike previous theories which argue for two cognitive systems of information-processing. The first of these pathways, most frequently referred to as System 1 (Stanovich, 1999), is where fast, unconscious, and automatic information-processing is hypothesised to occur. This system is also referred to as being reflexive, intuitive, or heuristic (Evans, 2008). The second pathway, System 2, is characterised by information-processing that is conscious, slow, and

deliberative. This system is often referred to as being reflective, rational, or analytic (Stanovich, 1999). There is ongoing debate regarding whether these two systems cooperate or conflict in the course of decision making. However, there is a general consensus that information processing occurs via two systems that differ in analytic style, as well as in their speed of processing (Evans, 2008).

Consistent with the other dual-processing frameworks, the dual pathways of the PW model aim to account for both 'reasoned' and 'reactive' decision-making processes that are involved in health risk behaviour. A diagram of the PW model is presented as Figure 2.1 below. The 'Reasoned Action' pathway comprises the top half of the model, and is hypothesised to account for deliberative decision making processes, including the influences of behavioural attitudes, subjective norms, and intentions to perform any given behaviour. The 'Social Reactive' pathway is the lower half of the model, and outlines a type of decision making process that is non-deliberative and opportunistic in nature (Gibbons et al., 2003). In this pathway, social images, or prototype perceptions, are hypothesised to influence an individual's willingness to engage in any given behaviour. Each of the components of the PW model are discussed in detail below.

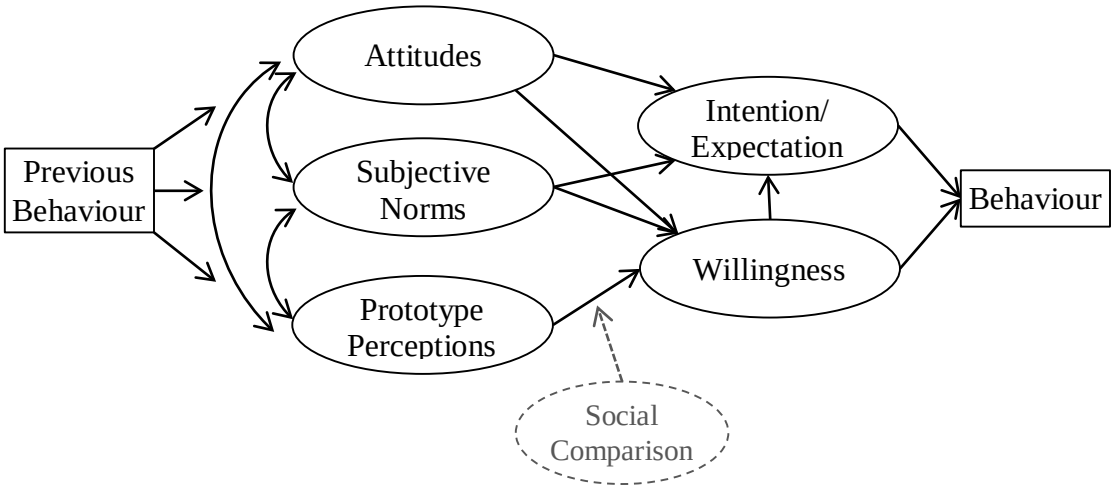

Figure 2.1. PW model, adapted from Gibbons, Gerrard & Lane (2003).

2.1 Reasoned Action Pathway to Behaviour

The components of the reasoned action pathway to behaviour were first outlined by Ajzen & Fishbein (1980) in their Theory of Reasoned Action (TRA), and later in the Theory of Planned Behaviour (Ajzen, 1991). Each of these models outline a decision-making process that is deliberative, and includes an evaluation of the consequences associated with the performance of any given behaviour. This evaluation is influenced by an individual's beliefs and attitudes surrounding behaviour, as well as normative forces operating on that individual. These factors determine the individual's motivation to participate, and either facilitate or inhibit intention to perform the behaviour. It is worth noting that the TPB includes a variable that encapsulates perceptions of self-efficacy and external or instrumental control factors (Ajzen, 1991). This variable, labelled perceived behavioural control (PBC), is hypothesised to have a direct impact on behaviour, as well as an indirect effect on behaviour via intention. The PW model does not include PBC in its reasoned action pathway, therefore this construct is not included in any further discussions.

2.1.1 Behavioural Intention. The reasoned action pathway of the PW model accounts for the deliberative decision-making processes described above. As can be seen in Figure 2.1, in this pathway, intention is the proximal antecedent to behaviour and is hypothesised to capture motivational factors surrounding the desire to perform a given behaviour (Ajzen, 1991; Armitage & Conner, 2001). Intention refers to a formal commitment to perform any given behaviour, and is assessed with a direct statement about future plans (e.g. "I intend to wear sunscreen"). Intention is influenced by beliefs and attitudes toward the behaviour, and the subjective norms operating on that individual (Ajzen & Fishbein, 1980; Ajzen & Madden, 1986). In general, favourable behavioural beliefs and attitudes, and positive normative influence lead to stronger intentions to engage in behaviour. This in turn leads to a greater likelihood of the behaviour occurring (for a review, see: Armitage & Conner, 2001; McEachan, Conner, Taylor, & Lawton, 2011).

2.1.1.1 ***Behavioural Expectation*** At least conceptually, expectation is a derivative of intention as it is the result of similar deliberative processes and motivational forces. However, expectation differs from intention in that expectation is not goal-oriented (Warshaw & Davis, 1984). Expectation is defined as an estimation of the likelihood of a behaviour occurring. Expectation is assessed with a statement about the likelihood of the behaviour occurring in the future (e.g. It is likely I will wear sunscreen; Warshaw & Davis, 1984). This estimation is hypothesised to account for subjective factors that may affect the performance of behaviour (e.g. situational factors, or anticipated changes to cognitive determinants of behaviour). Often, researchers have used measures of intention and expectation interchangeably with little regard for the impact that this has on the prediction of behaviour. However, findings of meta-analytic reviews suggest that intention and expectation are distinct constructs, thus should be treated as such in

research (Armitage & Conner, 2001; Sheppard, Hartwick, & Warshaw, 1988).

A meta-analysis conducted by Sheppard et al. (1988) suggested that compared to intentions, expectations more reliably predict behaviour. The most recent research to compare the predictive power of intentions and expectations was conducted by Armitage, Norman, Alganem, and Conner (2015). The authors present two prospective studies that separately examined alcohol consumption, and weight loss management. In both studies, behavioural expectation predicted health behaviour over and above baseline behaviour and intentions, while controlling for self-efficacy. These findings are the most convincing to date that suggest that behavioural expectations may be a more reliable predictor of behaviour than intentions. This may be because measures of expectation engage a more reflective style of processing that includes an evaluation of factors that may facilitate or inhibit the behaviour. However, other reviews have shown little difference in the predictive power of the two constructs (Armitage & Conner, 2001; Webb & Sheeran, 2006). The inconsistency across these meta-analyses is likely due to conflation of intention and expectation in the studies included in these earlier meta-analyses. As a result, measurement of each construct has not been adequate. Furthermore, it is also likely that type of behaviour will influence whether intention or expectation is a better indicator of behaviour, however further empirical testing is needed to determine this (Webb & Sheeran, 2006).

2.1.2 Behavioural Attitudes. Behavioural attitudes are defined as an overall evaluation of behaviour. In the TRA (Ajzen & Fishbein, 1980) and TPB (Ajzen, 1991), attitudes are conceptualised as salient beliefs surrounding the performance of any given behaviour. Attitudes are hypothesised to influence behaviour indirectly via intentions, where positive evaluations or attitudes toward any given behaviour are associated with stronger intentions to perform that behaviour (Ajzen, 1991).

The PW model is oriented toward the prediction of risk behaviours which, by nature, are associated with negative consequences. As a result, salient beliefs (attitudes) surrounding risk behaviour are likely to be negative so are not likely to be predictive of performance of that behaviour (Gibbons et al., 2003). Gibbons et al. (2003) argue that rather than measuring perceptions of whether a behavioural outcome is positive or negative, it is more pertinent to determine the individual's perceptions of the likelihood of them experiencing the negative outcomes associated with risk behaviour. Thus, in the PW model, behavioural attitudes are conceptualised as a perceived vulnerability to the outcome of performing any given behaviour. Targeting perceived vulnerability to the consequences of behaviour, rather than focusing solely on salient behavioural beliefs is thought to be more appropriate for the prediction of risk behaviours (Gibbons et al., 2003; Gibbons, Gerrard, Ouellette, & Burzette, 1998).

2.1.3 Subjective Norms. In its most general sense, the term 'subjective norms' refers to perceived social pressures to engage in a particular behaviour. In the TRA and TPB (Ajzen, 1991; Ajzen & Fishbein, 1980), such social pressures have been conceptualised as an individual's beliefs about what important others want him or her to do (e.g. what do important others think I should do). This type of normative influence is *injunctive.* Injunctive norms are assessed with items that aim to determine whether important others approve or disapprove of performance of any given behaviour. In the PW model, the subjective norms construct focuses upon *descriptive* sources of normative influence (e.g. what do important others do). Assessment of this construct aims to capture perceptions of peer behaviour as an indicator of normative influence (e.g. most of my friends sunbathe regularly). Findings of meta-analytic reviews suggest that descriptive norms add to the prediction of behaviour above the traditional measurement of injunctive norms prescribed in the TPB (Rivis & Sheeran, 2003).

2.1.4 Empirical evidence for the Reasoned Action Pathway. Most of the research relating to the variables within the reasoned action pathway has been conducted within the context of the TPB. Since its inception, the TPB has dominated research pertaining to the prediction of health and social behaviours (Nosek et al., 2010). This list of behaviours includes a wide variety of both health risk and health protective behaviours including substance use, physical activity, dietary behaviours, sexual behaviours, speeding, and cancer screening behaviours to name a few (for a review see: Conner & Sparks, 2005). This framework has also been widely used in research examining sun related behaviours. The variables within the reasoned action pathway, including attitudes, subjective norms, and intentions have all been found to be predictive of both sun protection and sunbathing behaviours (Allom, Mullan, & Sebastian, 2013; Araujo-Soares, Rodrigues, Presseau, & Sniehotta, 2012; Arthey & Clarke, 1995; Branstrom et al., 2004; Hamilton et al., 2012; Jackson & Aiken, 2000; Mermelstein & Riesenberg, 1992; Terry & Hogg, 1996).

Various reviews of the expansive TPB literature have been conducted to determine the predictive validity of the model components (Armitage & Conner, 2001; Conner & Armitage, 1998). Results of these reviews indicated that the TPB explains between 30% and 44% of the variance in intention (Ajzen, 2011; Armitage & Conner, 2001; McEachan et al., 2011). Intention then accounts for between 19% and 27% of variance in behaviour (Armitage & Conner, 2001; McEachan et al., 2011). These results suggest that while intention is considerably well accounted for, there is still a large proportion of variability in behaviour unaccounted for by the variables of the TPB.

A recent meta-analysis of 237 studies aimed to explore the predictive validity of the TPB in prospective studies, while also examining potential factors that moderate the efficacy of the model (McEachan et al., 2011). These moderating factors included type

of behaviour, age of sample, length of follow-up, and type of behavioural measure (self-report vs observed behaviour) used in research (McEachan et al., 2011). In the first meta-analysis to consider factors that moderate the efficacy of the TPB, McEachan et al. (2011) concluded that the model was better able to predict health-promoting behaviours, compared to health risk and abstinence behaviours. The unaccounted variance in behaviour indicates that intention alone cannot sufficiently explain health-related decision making processes. This pattern of results could be due to the unplanned nature of health risk behaviours. Intention is a formal plan to engage in a behaviour, however risk behaviours are often opportunistic, and unplanned. From a dual-systems perspective, the TPB includes System 2 decision-making process, but does not have the provision for System 1 processes. In an attempt to provide a more comprehensive model of health behaviour, Gibbons and Gerrard (1995) propose a second pathway to behaviour in their PW model, and a second proximal antecedent to behaviour. The inclusion of this second pathway provides a model that can account for both reasoned and reactive decision-making processes to behaviour.

2.2 Social Reaction Pathway to Behaviour

Individuals often engage in risky behaviour despite having knowledge of the risks involved, and reporting no intention to engage in the behaviour (Gibbons, Gerrard, Blanton, & Russell, 1998). In an attempt to explain this, Gibbons and Gerrard (1995) developed the PW model which accepts that not all behaviour is determined by intention. Instead, behaviour can be the result of subjective, reactive, and non-deliberative decisions that are reactions to the social environment (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008). To explain this decision-making process, Gibbons and Gerrard (1995) proposed a new pathway to behaviour that incorporates social images associated with risk behaviours. These social images, or prototypes, are

hypothesised to influence an individual's openness to engaging in behaviour under risk-conducive circumstances.

An important inclusion to the PW model is previous behaviour. Gibbons et al. (2003) argue that the inclusion of previous behaviour can provide the opportunity to evaluate whether the cognitive factors within the model mediate behavioural change. A subsequent meta-analytic review by McEachan et al. (2011) found that previous behaviour is the leading predictor of future risk behaviour. Thus, it is important to measure and control for the influence of previous behaviour when examining health risk behaviour. Together, the components of the reasoned action and the social reaction pathways combine to form the PW model.

2.2.1 Behavioural Willingness. Behavioural willingness is an integral component of the PW model and is the direct antecedent of behaviour in the social reaction pathway. Willingness is defined by Gibbons and Gerrard (1995) as the openness to engaging in a risk behaviour if given the opportunity. Like intention in the reasoned action pathway, willingness to engage in any given behaviour is hypothesised to be influenced by subjective norms and attitudes towards the behaviour. However, willingness to engage in risk behaviour is also influenced by perceptions of the prototypical person who engages in that behaviour. It is hypothesised that holding positive perceptions of the prototypical person who engages in any given behaviour increases that individual's willingness to participate, and so increases the likelihood of the behaviour occurring (Gibbons, Gerrard, & McCoy, 1995; Hukkelberg & Dykstra, 2009; Myklestad & Rise, 2007; Whitaker, Long, Petróczi, & Backhouse, 2014).

Intention is goal-oriented, but willingness on the other hand, is an acknowledgment that behaviour may or may not occur under certain circumstances (Gibbons et al.,

2003). In order to reflect the opportunistic nature of risk behaviour, willingness is typically assessed by asking participants to imagine themselves in a risk-conducive setting. Participants are then presented with a set of behavioural responses, which vary in degree of risk, and are required to indicate their likelihood of engaging in each behavioural option on Likert-scales (Gibbons, Gerrard, Ouellette, et al., 1998). Gibbons, Gerrard, Blanton, et al. (1998) argue that assessing willingness in this way places a focus on the situational influences on behaviour, thus removing responsibility for the behaviour away from the individual.

Conceptually, it makes sense that intention and willingness are related constructs. Intention to perform a behaviour implies a willingness to also engage in that behaviour, but the reverse is not necessarily true (Gibbons, Gerrard, Blanton, et al., 1998; Gibbons, Gerrard, Ouellette, et al., 1998). For example, an individual may be *willing* to acquire a tan, but they may not *intend* to deliberately sunbathe. Research has demonstrated that willingness and intention do share common variance, but also predict unique variability in behaviour (Dohnke, Steinhilber, & Fuchs, 2014; Gibbons, Gerrard, Blanton, et al., 1998; Gibbons, Gerrard, Ouellette, et al., 1998; Pomery, Gibbons, Reis-Bergan, & Gerrard, 2009; Todd, Kothe, Mullan, & Monds, 2014). As will be discussed below, this is an important distinction with implications for the prediction of various behaviours.

2.2.2 Prototype Perceptions. The concept of 'prototypes' has its basis in Leventhal and Cleary's (1980) seminal work on images associated with cigarette smoking, and later in Abrams and Hogg's (1990) social identity theory. Abrams and Hogg (1990) argued that the way in which individuals view themselves is partially derived from their memberships in societal groups. This evaluation includes two processes, categorisation and self-enhancement. The process of categorisation includes the accentuation of similarities with in-group members, and differences to out-group members. On the

other hand, self-enhancement is the tendency to favour shared in-group characteristics over out-group characteristics (Abrams & Hogg, 1990). These processes serve to enhance identification with, and favourability of, societal groups.

Gibbons and Gerrard (1995) have taken the concept of self-evaluation based on societal groups, but have instead considered how engaging in health risk behaviour may contribute toward an individual's self-evaluation. Thus, in the PW model, prototype perceptions refer to the typical person who engages in a specific *behaviour*. Similar to Abrams and Hogg (1990) social identity theory, two domains contribute toward identification with the prototype. These include an overall evaluation based on favourability of the prototype (categorisation), and perceived similarity to the prototype (self-enhancement). In the PW model, positive evaluations of the prototype and greater perceived similarity to the prototype result in greater willingness to engage in behaviour (Gibbons & Eggleston, 1996; Gibbons & Gerrard, 1995; Gibbons, Gerrard, Lando, & McGovern, 1991). The extent to which prototype perceptions influence an individual's willingness to engage in behaviour is somewhat reliant on the social circumstances surrounding that individual.

There are two assumptions underlying how prototype perceptions influence behaviour both directly, and indirectly via willingness in the PW model (Todd et al., 2014). The first of these is that prototype images are vivid and stable mental representations of the type of person who engages in any given behaviour. Therefore, individuals within the target population should report the prototype to have similar characteristics, as has been found in past research (van Lettow, Vermunt, de Vries, Burdorf, & van Empelen, 2012; Zimmermann & Sieverding, 2011). The second assumption is that prototypes are social images with social consequences. This means that those who engage in any given behaviour are aware that others will assign the

characteristics of the relevant prototype to them. There is now considerable evidence supporting the role of prototype perceptions in behaviour (Gerrard et al., 2002; Gerrits, de Ridder, de Wit, & Kuijer, 2009; Gibbons, Gerrard, et al., 1995; Hyde & White, 2009; Lane & Gibbons, 2007; Norman, Armitage, & Quigley, 2007; Piko, Bak, & Gibbons, 2007; Rivis, Sheeran, & Armitage, 2006; Zimmermann & Sierverding, 2010). Prototype perceptions are the key social element of the PW model. The way in which these social images influence behaviour is driven by social comparison processes (Gibbons & Gerrard, 1995).

2.2.3 Social Comparison. The concept of social comparison stems from early social cognition literature (Festinger, 1954). Social comparison refers to the tendency to compare oneself to others in order to deduce meaning about oneself. The tendency to compare to others is most prevalent during adolescence, but does not completely disappear after this time (Buunk & Gibbons, 2007). In the PW model, social comparison processes moderate the impact that prototype perceptions have on willingness (Lane, Gibbons, O'Hara, & Gerrard, 2011) such that the influence of prototype perceptions is greatest for those who frequently compare themselves to others in their social context (Gerrard, Gibbons, Lane, & Stock, 2005; Gibbons & Gerrard, 1995; Gibbons et al., 1991; Ouellette, Hessling, Gibbons, Reis-Bergan, & Gerrard, 2005).

2.2.4 Empirical evidence for the PW model. ***Predictive validity of Willingness vs. Intention/Expectation.*** Intention has long been considered the sole proximal antecedent to behaviour. Given that the PW model proposes that willingness is also a proximal antecedent to behaviour, initial investigations of the model were aimed at examining whether willingness could add to the prediction of behaviour over and above that already explained by intention. One of the earliest studies to test this was a

longitudinal study of adolescent cigarette smoking by Gibbons, Gerrard, Blanton, et al. (1998). The authors examined adolescent smoking behaviour at three waves of recruitment to determine whether willingness could predict smoking behaviour over and above behavioural expectation at the follow-up period. Smoking status was assessed at baseline (T1), and again two years later (T3). Measures of behavioural willingness and expectation were captured one year after baseline (T2). Gibbons, Gerrard, Blanton, et al. (1998) found that both willingness and expectation, reported at the second wave of recruitment (T2), predicted unique variance in cigarette smoking at the final follow-up (T3). Further analyses indicated that willingness explained a significantly greater unique proportion of variance in cigarette smoking than did expectation. This finding implicates both reasoned and reactive processes in adolescent cigarette smoking, but the finding that willingness accounted for a greater amount of unique variance suggests that the social reactive route to decision making may play a particularly important role in determining such behaviour. Other research (Pomery et al., 2009; Zimmermann & Sierverding, 2010) has also presented prospective and cross-sectional data suggesting that intention and willingness predict unique variance in health risk behaviour. In some cases, willingness has emerged as a more reliable predictor of risk behaviour, compared to intentions (Gibbons, Gerrard, Blanton, et al., 1998; Hukkelberg & Dykstra, 2009; Litchfield & White, 2006).

As mentioned earlier, high levels of intention to engage in behaviour also implies high levels of willingness to engage. However, in some cases intention and willingness may be inversely related. For example, an individual may have low or no intentions to engage in risk behaviour but may report high levels of willingness to do so. It is under these conditions that willingness may be a more reliable predictor of subsequent behaviour. Evidence of this comes from a study by Roberts, Gibbons, Kingsbury, and

Gerrard (2013) where the authors examined why those with low intentions to engage in risk behaviour subsequently go on to engage in that behaviour. In two studies, Roberts et al. (2013) investigated the impact of risk conducive cues on willingness to engage in risky sexual behaviours. In the first study, provocative images of women in bikinis were subliminally delivered to a male sample during a cognitive task. In this study, willingness to engage in casual sex was measured using the standard format (Gibbons, Gerrard, Ouellette, et al., 1998; Litchfield & White, 2006) where a scenario with responses of varying riskiness was described, and participants rated their likelihood of engaging in each scenario on a Likert scale. Willingness was assessed immediately pre- and post-test. Comparisons were made to a control group who viewed non-sexual, but arousing images such as a lightning bolt. Results of this study indicated that exposure to the sexual images led to a significant increase in willingness to engage in casual sex, but only for those who had low intentions to have casual sex at baseline. There was no change in willingness for the low intention individuals in the control condition.

Roberts et al. (2013) then replicated these findings in a second study with a community sample of male adults. In this second study, participants were told the purpose of the study was to rate pairs of images for use in advertisements. Those in the sexual prime condition viewed provocative images of attractive women whereas those in the control condition viewed arousing images that had previously been rated as pleasant and exciting. Again, results showed that viewing provocative sexual images increased willingness for risky sexual behaviour at post-test, but only for those who had no intentions for risky sex at baseline.

In each study, those who initially had low intentions to have casual sex were more susceptible to the risk-conducive cues than those who had pre-existing intentions to engage in casual sex. This can explain why in some circumstances, intention does not

predict future behaviour, and individuals with low intentions sometimes go on to engage in risky behaviours (Gibbons, Gerrard, Reimer, & Pomery, 2006). This is because holding an intention to engage in behaviour indicates that the individual has considered the behaviour, and has made at least informal plans to engage in the behaviour. Low, or no, intentions could reflect either a careful decision to not engage, or could merely mean that the individual has given no consideration to the behaviour at all.

This pattern of findings may have important implications for the prediction of incidental sun exposure. The very nature of incidental sun exposure is that it is unplanned, therefore individuals are likely to report low intentions to engage in the behaviour. Thus, it is not likely that an individual will have made plans on how to avoid the risk. Therefore, the absence of any formal plan, or intention may result in switching to more reactive, System 1 type decision making processes. Alternatively, intention could reflect prior experience with that behaviour. Unfortunately, Roberts et al. (2013) did not report data on the sexual history of their participants, but it would be interesting to know whether ratings of intention and willingness were associated with prior experience with risky sexual behaviours and how this impacted on the findings. Regardless, these findings suggest that willingness may be more malleable, and predictive of behaviour for those with no or low intentions to engage in risk behaviour. This could be because reactive decision-making processes are most important for those who have given little or no thought to engaging in the risk behaviour. The research discussed above, as well as a number other studies support the addition of willingness for the prediction of behaviour (Gibbons, Gerrard, Ouellette, et al., 1998; Gibbons, Houlihan, & Gerrard, 2009; Todd et al., 2014). Subsequent research has since moved on to determine the conditions under which willingness predicts health risk behaviour.

Age and experience. There is an assumption that the PW model will be more effective at predicting adolescent risk behaviour, as opposed to adult health risk behaviour (Gibbons & Gerrard, 1995; Gibbons et al., 2003). The authors argue that this is because adolescents are more likely to act on impulse, and are most vulnerable to social pressures to engage in risky behaviour. In line with this, it has been hypothesised that reactive processes often drive adolescent decision making, whereas more reasoned or deliberative processes that include an evaluation of benefit versus risk are employed once an individual reaches adulthood. Pomery et al. (2009) presented a series of studies that aimed to explore the nature of decision making across age groups. In their studies, Pomery et al. (2009) adopted prospective longitudinal designs to examine future adolescent substance use including alcohol consumption, cigarette smoking, and marijuana use. The ability of intention versus willingness to predict future risk behaviour was compared at each recruitment wave. Consistent with their expectations, results of their first study indicated that both previous behaviour and willingness were predictive of substance use during mid-adolescence (mean age 15.5 years), whereas previous behaviour and intentions predicted substance use in late adolescence (mean age 18.7 years).

In a second study, Pomery et al. (2009; Study 2a) only examined smoking behaviour. In this study, behavioural expectation was assessed in replacement of intention. Results indicated that willingness was the primary predictor of smoking during earlier adolescence. However, during mid adolescence, the pattern of results changed such that expectation became predictive of cigarette smoking. In late adolescence, both expectation and willingness dropped out as significant predictors, leaving previous behaviour as the only significant predictor of cigarette smoking.

It is well documented that past behaviour is the best predictor of future behaviour (e.g. McEachan et al., 2011). A way around the issue of the role of past behaviour, is to consider predictors of smoking initiation. To do so allows for direct inferences to be made about the prediction of engagement in risk behaviour, as opposed to maintenance of risk behaviour. This is particularly pertinent given the addictive nature of cigarette smoking. In the same study, Pomery et al. (2009; Study 2a) performed logistic regression analyses where cigarette smoking was coded as either yes or no. Analyses were conducted to determine whether willingness or expectation was the best predictor of whether an individual smoked or not. Results indicated that willingness was predictive of whether or not individuals smoked cigarettes across all ages, whereas both expectation and willingness predicted cigarette smoking during mid-adolescence only. This finding contrasts with that outlined earlier, and may suggest that reactive processes are implicated in risk behaviour, regardless of age. It may also indicate that it is experience with behaviour, and not age, that is driving the shift from reactive to reasoned decision making processes. It may also be that individuals come to more accurately predict their behaviour based on their previous behaviour, and this is why intention more accurately predicts behaviour with increased experience. On the other hand, willingness may be more appropriate for the prediction of initiation, as opposed to maintenance of risky behaviour.

In their final study, Pomery et al. (2009; Study 3) investigated willingness, intentions, and expectations for class-skipping behaviour among university students. The authors found that intentions were predictive of class-skipping behaviour for those who had greater experience with the behaviour. On the other hand, willingness was predictive of class-skipping among students who had less experience with the behaviour. Interestingly, expectation was predictive of behaviour for all participants,

thus level of experience had no impact on its predictive power. This pattern of findings suggests that initiation of the behaviour was associated with reactive type decision making processes, and then became more reasoned over time. Based on this, Pomery et al. (2009) argues that it is experience with a behaviour that moderates the shift from reactive to more reasoned decision making processes, and not age.

The enhanced accuracy of intentions may be due to the strong relationship between past behaviour and intentions (McEachan et al., 2011). Individuals may be recalling on their past behaviour to provide an estimate of future plans. This could explain why the aforementioned research found that where behavioural experience is low, such as in young persons, intention to engage in the behaviour in the future is also low (Gibbons et al., 2006). As outlined earlier, susceptibility to risk conducive cues is highest in situations of low intention. Under these conditions, willingness has been found to be the most reliable predictor of behaviour (Pomery et al., 2009). Importantly, although a developmental shift may occur, it appears that the absolute value of willingness does not change (Pomery et al., 2009), but that intention merely becomes a more accurate predictor of behaviour over time.

In a meta-analyses, Todd et al. (2014) investigated the effect of participants' age on the predictive validity of the PW model across a range of health-related behaviours. In their review, age was categorised as pre-adolescent (<13 years), adolescent (13-17 years) and adult (>18 years). The 90 studies included in Todd et al.'s (2014) analyses examined behaviours such as sexual behaviours, substance use, unhealthy eating, exercise, and risky driving. Their findings indicate that age of the sample does moderate the predictive validity of the PW model, but not as originally assumed. This is not unlike the findings of the TPB meta-analysis reported earlier (McEachan et al., 2011) where age moderated the efficacy of the model to predict behaviour.

Importantly, Todd et al. (2014) report that the PW model is an effective framework for the prediction of health risk behaviour across various age groups. In fact, the total amount of variance accounted for in adolescent (R^2 = .33) versus adult behaviour (R^2 = .29) was comparable, as was the predictive strength of willingness for behaviour (β=.287 and β=.212 for adolescents and adults, respectively). Perhaps surprisingly, the meta-analyses indicated that the PW model was least effective for predicting health risk behaviour among pre-adolescent samples with very little variance accounted for (R^2 = .08). While the review does not specifically evaluate the hypothesised developmental shift from a within-subjects perspective, it does provide evidence for the efficacy of the PW model in adult samples. In fact, these results suggest that the overall efficacy of the PW model to predict health risk behaviour in adults is on par with that for adolescents.

2.2.4.2 ***Prototype Perceptions.*** *The nature of prototype perceptions.* Prototype perceptions are hypothesised to impact upon behavioural willingness in the social-reaction pathway, thus it is important to have an understanding of how these social images influence willingness, and subsequent behaviour. Though the PW model was developed for the prediction of health risk behaviour, it has since been suggested that the model could also be useful for the prediction of abstinence and health protective behaviours. As a result, research has begun to consider how prototype perceptions relate to each of these domains of behaviour.

A risk prototype is that which is associated with the actor of health risk behaviour (i.e. smoker or drinker), whereas the non-risk prototype is that which is associated with the abstainer (i.e. non-smoker, non-drinker). Gerrard et al. (2002) argued that risk prototypes influence behaviour via non-deliberative pathways to behaviour whereas non-risk images represent goal states that involve contemplation and premeditation. To test this hypothesis, the authors evaluated perceptions of risk and non-risk prototypes,

alongside participants' ratings of their current self-image, and ideal self-image. Comparisons were made between those who did and did not report drinking alcohol in the three months leading up to the first recruitment wave of the study. Alcohol consumption was assessed at pre-test and once again one year after the second recruitment phase. Cognitive variables including willingness to drink alcohol, prototype perceptions, and self-images were measured at the second wave of recruitment. Each recruitment wave was approximately one year apart. The authors hypothesised that the non-drinker image would represent a goal state for those who abstain from consuming alcohol. This would be evidenced by higher ratings of favourability for the non-drinker image compared to the drinker image, and the ideal self-image. Furthermore, the authors expected that the non-drinker image would be thought about (contemplated) significantly more often than the drinker image.

In Gerrard, et al.'s (2002) study, the drinker prototype was described as the 'typical person your age who drinks alcohol frequently' whereas the non-drinker prototype was described as the 'typical person your age who does not drink'. Prototype perceptions were measured whereby participants were asked to indicate whether a set of adjectives (e.g. smart, cool, popular, and sophisticated) described each of the prototypes on a 7-point Likert scale. Perceptions of current and ideal self-images were measured on the same scale as that used for the prototypes. As an indication of contemplation, participants were asked to indicate how often they had thought about each 'type of person'. Results of their study indicated that the non-drinker prototype was significantly more favourable than the drinker prototype among both drinkers and non-drinkers. Furthermore, the non-drinker prototype was also found to be rated as significantly more favourable than all participants' self-images. Gerrard et al. (2002) also found that non-drinkers thought about the non-drinker prototype significantly more than the drinkers

did. Furthermore, deliberation of the non-drinker image was associated with lower levels of drinking. That the non-drinker image is favoured, and contemplated by non-drinkers aligned with the author's hypotheses, and suggested that the non-risk image may represent a goal state which is processed via deliberative processes.

Structural equation modelling (SEM) analyses were then conducted to determine the effect that these processes have on behaviour. The results of Gerrard et al.'s (2002) modelling indicated that risk prototypes had a significant indirect effect on prospective alcohol consumption via willingness. This indicates that the drinker prototype is processed via the social-reactive route to behaviour, as the PW model would predict (Gibbons et al., 2003). In the modelling, the non-drinker prototype had a direct negative effect on alcohol consumption, as well as an indirect negative effect via contemplation and willingness. This suggested that a positive perception of the non-drinker image was associated with lower alcohol consumption. This would suggest that the non-drinker prototype impacts on behaviour both directly, as well as indirectly via contemplative processes. Importantly, this contemplative process did not appear to exist for the risk image. This pattern of findings suggested that risk images influence behaviour via automatic, or non-deliberative processes. This contrasts with non-risk (healthy) images, which are processed via deliberative or contemplative processes, and may represent a goal state.

These findings also provide further support for the PW model whereby the relationship between prototype perceptions and drinking behaviour was mediated by behavioural willingness. However, there are a number of omissions from this study. The role of the reasoned action pathway in this decision-making process has been ignored. The inclusion of intention as another antecedent to behaviour could address this deficit and provide further insight into whether the contemplation of the non-risk

image was processed via the deliberative pathway. Additionally, the second element of prototype perceptions, similarity, has also been omitted from this study. Only prototype favourability was assessed in this study.

A prospective study of Spring-time sunscreen use in Portuguese adolescents is the only predictive, prospective study to date which examines sun-related behaviours including prototype perceptions (Araujo-Soares et al., 2012; Study 2). Portuguese students were recruited from local high schools to participate in a 2-month prospective study of sunscreen use which aimed to compare the predictive utility of the TPB variables, descriptive norms, prototype perceptions, and planning cognitions. A description of adequate sun protection in accordance with the World Health Organisation (WHO; 2002, 2003) guidelines was provided to participants at the beginning of the questionnaire. The sun protection guidelines were described as "applying sunscreen with a SPF $\geq$ 15 on your face, as well as on all exposed body parts at least 15 min before being exposed to the sun and reapplying it every 2 h" (Araujo-Soares et al., 2012; p. 113). In their study, prototype favourability was measured with a global evaluation of "the kind of person of your age and gender who regularly uses SPF>15 sunscreen in accordance to WHO recommendations" (Araujo-Soares et al., 2012; p. 113) on a scale of 0 – 100. Participants were also instructed to write down characteristics that describe this prototype. Similarity to the same prototype description was measured on a 5 point scale. Higher scores indicated greater favourability of, and similarity to the sun protection prototype. Sun protection behaviour, assessed only by sunscreen use in their sample of 177 adolescents, was measured at baseline, and at 2-month follow-up. Approximately 88% of the sample was retained for follow-up assessment. Approximately 15% of their sample had very sensitive skin, 44% had moderately sensitive skin, and 41% of participants had non-sensitive skin. Furthermore,

approximately 5% experienced sunburn during the previous spring, and only 2% reported a family history of skin cancer. Compared to Australian data (Makin et al., 2013; Volkov et al., 2013), the rates of skin sensitivity, sunburn, and family history of skin cancer is quite low in this Portuguese sample. Similarly, sunscreen use was also quite low with only 13.5% of the sample reporting frequent application of sunscreen. Hierarchical linear regressions were conducted to determine which PW model variables predicted intention to use sunscreen, as well as self-reported sunscreen use, while controlling for gender and skin type.

Results indicated that prototype favourability did not predict intentions to use sunscreen, but did predict sunscreen use. However, the direction of this prediction was negative, such that greater favourability of the prototype was associated with lower levels of sunscreen use. This unexpected finding may indicate that while some characteristics associated with the typical sun protector prototype (e.g. responsible, smart) are generally positive, they may not be socially desirable. The fact that prototype similarity was not a significant predictor of sunscreen use also supports this argument. Further to this, the description of the sun protector prototype in this study included specific information about adhering to World Health Organisation (WHO) sun protection guidelines. This description may have elicited an 'extreme' protector image, and characteristics that go beyond healthy caution, and into hypervigilance. An analysis of the characteristics recorded by participants could potentially determine whether this was the case, however results of the descriptions provided have not been reported. Other research with alcohol-related prototypes (van Lettow, de Vries, Burdorf, Norman, & van Empelen, 2013; Zimmermann & Sierverding, 2010) has suggested that it is important to consider the relative favourability of risk and abstainer prototypes.

Zimmermann and Sierverding (2010) conducted a prospective study to examine the role of drinker and non-drinker prototype perceptions, including the influence of both favourability and similarity, on drinking behaviour. The study was conducted as an evaluation of an augmented TPB where the authors set out to determine whether the predictive validity of the TPB could be improved by including the social reaction pathway variables from the PW model. As a result, each variable in both the reasoned action and social reaction pathways are represented in this study. Zimmermann and Sierverding (2010) recruited young German adults to participate in their two-part prospective study. The initial phase of research included a questionnaire that was administered in a University cafeteria on either a Friday or Saturday. The questionnaire assessed past drinking behaviour, willingness and intentions to drink that weekend, as well as the relevant cognitive variables. Follow-up was conducted after the weekend in the format of either a telephone or email interview. Zimmermann and Sierverding (2010) found significant differences between men and women for drinking behaviour, intentions and willingness to drink alcohol, and for prototype favourability and similarity ratings. As a result, subsequent analyses were conducted separately for males and females. Similar to the findings reported by Gerrard et al. (2002), the females in this study favoured and felt most similar to the non-drinker image. However, the males favoured and felt most similar to the drinker image. Preference for the risk image in this sample contrasts with previous research, which suggests strong identification with the risk prototype among the male participants in the sample. This finding could be the result of cultural differences surrounding alcohol consumption among young adults in the United States of America (Gerrard et al., 2002) versus those in Germany (Zimmermann & Sierverding, 2010), particularly given that males and females have been separated for analyses in the latter.

With regard to the impact of prototype perceptions on behaviour, Zimmermann and Sierverding (2010) conducted multi-group path analyses separately for females and males. The results indicated that the social reaction variables were not predictive of female's alcohol consumption in this sample. In contrast, inclusion of the social reaction pathway accounted for variance in male's alcohol consumption above the reasoned action variables. These findings suggested that social influences surrounding alcohol consumption may be more influential for males, than for females. Upon closer inspection of the pathways, intention mediated the relationship between the drinker prototype and alcohol consumption for males. While this finding does contrast with that found by Gerrard, et al. (2002), it is consistent with research that suggests deliberative processes become more predictive of behaviour in early adulthood as the result of greater experience with the behaviour (Pomery et al., 2009). Furthermore, for males, the influence of the non-drinker prototype on alcohol consumption was mediated by willingness. More specifically, dis-similarity to the non-drinker prototype was associated with greater willingness to drink but favourability of the non-drinker prototype was not directly related to willingness. However the favourability x willingness interaction term was predictive of males' drinking behaviour. A simple slopes analysis examined the impact of this interaction on alcohol consumption where alcohol consumption was examined as a function of willingness at positive versus negative levels of non-drinker favourability. Results suggested that those with high willingness and positive perceptions of the non-drinker prototype drank less alcohol than those with high willingness and negative perceptions of the non-drinker prototype. When willingness was held constant, those with negative perceptions of the non-drinker prototype consumed more alcohol than those with positive perceptions.

Zimmerman and Sierverding's (2010) findings suggested that prototype perceptions influenced behaviour via dual-processes, though not in the way suggested by previous research (Blanton et al., 2001; Gerrard et al., 2002). The non-risk prototype may only operate as a goal state when that prototype is favoured above the risk prototype. Other research which has argued for a 'negativity bias' in prototype perceptions would suggest that individuals are more likely to distance themselves from an image they perceive as negative, compared to assimilating to an image they see as positive (Blanton et al., 2001). Thus, the way in which the non-risk prototype influences behaviour may be dependent on the relative favourability and similarity of the risk versus non-risk image.

The findings outlined above suggested that both risk and non-risk images influence health related behaviours. Furthermore, these findings highlight the importance of considering prototypes associated with alternate behaviours, and not only that associated with engaging in the risk behaviour. To date, research with prototypes has been limited in that only those associated with engaging in or abstaining from risk behaviour have been examined. Recent research has begun to consider various levels of engagement in risk behaviour with the inclusion of 'moderate' prototypes. One examination of this was a study of alcohol-related behaviour conducted by van Lettow et al. (2013).

In a set of studies conducted by van Lettow et al. (2013), prototype perceptions were examined across the continuum of alcohol consumption. This included the usual risk and abstainer prototypes, as well as the 'moderate drinker' prototype. This study may be particularly relevant to the investigation of incidental sun exposure because incidental sun exposure could be conceptualised as a 'moderate' level of engagement in sun exposure. The abstainer, moderate, and risk prototype may mirror a sun protector,

incidental exposer, and sunbather, respectively. The authors set out to examine how each prototype related to drinking behaviour, specifically whether including the 'moderate' drinker prototype assisted in the prediction of alcohol consumption in a young adult sample. In their cross-sectional study (van Lettow, et al., 2013; Study 1) ratings of favourability of, and similarity to, each of the prototypes were compared to participants' self-reported alcohol consumption. Those who reported abstinence from alcohol in the 12 months leading up to the study were categorised as abstainers, whereas those who reported drinking alcohol in the same 12-month period were categorised as either moderate or heavy drinkers according to Dutch national alcohol guidelines.

van Lettow et al. (2013) expected prototype perceptions to vary according to level of drinking behaviour. Prototype perceptions were assessed with participant's overall evaluation of their favourability of the prototype (very negative to very positive), and their similarity to the prototype (certainly similar to certainly not similar). Findings indicated that the moderate drinker prototype was evaluated most favourably, followed by the abstainer, and heavy drinker prototypes. The same pattern of results emerged for similarity ratings. As expected, those who abstained from drinking reported greater favourability of, and similarity to, the abstainer prototype. However, those who were categorised as both moderate and heavy drinkers reported greater favourability of, and similarity to, the moderate prototype. Overall, the moderate drinker prototype was rated most favourably, regardless of drinker classification, and was considered most similar to the self for all who drank any alcohol. Earlier work by van Lettow et al. (2012) suggested that a distinct prototype existed for the moderate drinker. These findings (van Lettow et al., 2013) add to this, and provide evidence that perceptions of each prototype

differ according to level of engagement with drinking alcohol. The same authors then set out to replicate their findings in a prospective study of alcohol consumption.

In their second study, van Lettow, et al. (2013; Study 2) assessed prospective drinking behaviour at a one-month follow up. Participants completed an online questionnaire measuring cognitive variables, as well as drinking behaviour in the week leading up to participation. Drinking behaviour was assessed again one month later. Findings of Study 2 were almost identical to that found in Study 1, with the notable exception that moderate drinkers rated the abstainer prototype as most favourable. Of most interest, those who were drinking at 'heavy' levels favoured, and perceived themselves to be, most similar to the moderate drinker prototype. This is in spite of a significant difference in the average number of alcoholic drinks consumed between the two groups (3.2 versus 14.1 glasses for moderate and heavy drinkers, respectively). These findings suggest that heavy drinkers do not align themselves with the prototype appropriate to their behaviour. Instead, heavy drinkers perceived themselves to be most similar to the favoured moderate drinker prototype. With regard to sun-related prototypes, it may be important to compare the relative favourability of each of the prototypes as this may impact upon behaviour.

The findings presented earlier support previous research that suggests that risk images are generally viewed negatively, and that cognitive alignment with an unfavourable risk prototype may be avoided (Gerrard et al., 2002). However, there is some disparity in the results. Gerrard et al. (2002) and van Lettow et al. (2013; Study 2) found that the abstainer prototype was preferred, whereas the moderate (van Lettow, et al., 2013; Study 1) and heavy drinker prototypes (Zimmermann & Sieverding, 2010) were favoured in other samples. Cultural differences in alcohol-related perceptions could account for the disparity in results across these studies. However, more

information is needed about the characteristics associated with each of the prototypes to make this conclusion.

The characteristics associated with alcohol-related prototypes in each of the above studies were not explored. Prototype favourability was measured against a pre-determined set of adjectives (Gerrard et al., 2002; Zimmermann & Sierverding, 2010) or a global evaluation of favourability (van Lettow et al., 2013). In their meta-analysis, van Lettow, de Vries, Burdorf, and van Empelen (2014) compared the predictive utility of direct and indirect measures of prototype favourability. In their analysis, global assessments of favourability (e.g. evaluation thermometer) were considered to be direct, whereas ratings against adjectives were considered indirect assessments of favourability. The authors concluded that direct measures of prototype favourability produced larger effect sizes for the prediction of behaviour and intentions, compared to indirect measures. This suggests that direct measures of prototype favourability should be adopted in research, compared to rating lists of adjectives. In their study, van Lettow, de Vries, Burdorf, and van Empelen (2014) were unable to compare the effectiveness of direct and indirect assessments of prototype similarity as most studies had used direct assessments. While both direct and indirect assessments of prototypes have been used in previous research, neither approach provides insight about the defining characteristics of each prototype in each sample. Indeed, other research has highlighted the advantages of eliciting a list of characteristics from participants in prototype research (van Lettow et al., 2012; Zimmermann & Sieverding, 2011). Examining the list of characteristics provided by participants may be particularly useful when novel health behaviours are under investigation.

The findings from van Lettow et al.'s (2013) study extends on those discussed above (Gerrard, et al. 2002; Zimmermann & Sierverding, 2010) whereby prototype

perceptions have been compared across individuals engaging in various levels of the risk behaviour, namely alcohol consumption. In van Lettow, et al.'s (2013) study, those who drank heavily favoured, and felt more similar to the moderate drinker prototype. An important implication of this finding is that perceptions of the moderate prototype may be a more reliable predictor of risk behaviour than are perceptions of the risk prototype. This provides insight about an individual's perceived alignment with each prototype at various levels of the risk behaviour. With respect to sun-related behaviours, this would include assessing perceptions of the prototypical person who abstains from the risk behaviour (sun protectors), engages in the risk behaviour (sunbathers), and those who moderately engage in the risk behaviour (incidental exposers). Such investigations have important implications for intervention strategies in that misalignment with a moderate prototype could be corrected through education surrounding the inconsistency between the individual's perceptions and actual behaviour.

The role of prototype perceptions. The PW model specifies that there is a relationship from prototype perceptions to behavioural willingness that is moderated by social comparison (Gibbons et al., 2003). Furthermore, behavioural willingness mediates the relationship between prototype perceptions and behaviour, as has been demonstrated in a number of studies (for a review, see: Todd et al., 2014). More recently, a meta-analysis by van Lettow, de Vries, Burdorf, and van Empelen (2014) concluded that both prototype favourability and similarity have a direct impact on behaviour, a pathway not originally specified by the PW model. Todd, et al. (2014) also reported similar findings in their meta-analysis where the suggestion was made to include a direct pathway between prototype perceptions and behaviour in order to increase the predictive utility of the PW model. Norman et al. (2007) and Rivis and

Sheeran (2003) also demonstrated that augmenting the TPB to include prototype perceptions improved the predictive power of the model.

Research with prototypes has included investigations of perceptions of favourability and similarity as separate variables (Gibbons, Gerrard, et al., 1995; Hyde & White, 2009; Lane & Gibbons, 2007), and as a combined prototype perception index (Gibbons, Helweg-Larson, & Gerrard, 1995). More recently, research has begun to compare the relative predictive utility of favourability versus similarity for a range of behaviours. Hyde and White (2009) conducted one of the earliest studies to determine whether favourability or similarity was a better predictor of willingness. The authors examined willingness to donate an organ to a partner or family member among young adults. The results of the study suggested that similarity to the typical living donor, but not favourability, was significantly predictive of willingness to do the same. Subsequently, a meta-analysis of 80 studies by van Lettow, de Vries, Burdorf, and van Empelen (2014) confirms this finding. The results of van Lettow et al.'s (2014) analysis suggested that both health risk and health protective behaviours were better explained by similarity than favourability. The same pattern of results was found for willingness, such that similarity was a better predictor of both health risk and health protective behaviours. Importantly, for both behaviour and willingness, the combined similarity x favourability effect was greater than either similarity or favourability separately. Furthermore, effect sizes were greater for health risk behaviours than for health protective behaviours. These findings suggest that although similarity may be a stronger predictor of health related willingness and behaviour when examined separately, prototype favourability still adds to this prediction. Although the similarity x favourability interaction is often used in research with the PW model van Lettow et al. (2014) state that more research is needed to determine whether the multiplicative effect

of favourability x similarity is due to an interaction, or an additive effect. As such, it is important to continue to examine the separate role of prototype favourability and similarity. This may be particularly important for understanding the relative contribution of favourability versus similarity in the investigating of novel health behaviours, as is being done in this research.

2.3 The PW Model Applied to Incidental Sun Exposure

Incidental sun exposure, by its very nature, is unplanned and non-deliberative. Therefore, it is not likely that traditional expectancy-value models of health behaviour can account for the psychosocial processes that contribute toward the performance of the behaviour. On the other hand, the PW model, with the inclusion of the social reaction pathway, provides a route to behaviour that accounts for automatic and spontaneous behaviours. There has been some research which has applied the PW model to sun-related behaviours (Araujo-Soares et al., 2012; Gibbons, Gerrard, Lane, Mahler, & Kulik, 2005; Ratliff & Howell, 2014; L. A. Walsh & Stock, 2012), but none of these have focused specifically on incidental sun exposure. Because of its dual pathways to behaviour, the PW model has been selected as a framework for the exploration of incidental sun exposure in a high risk environment. Past research has indicated that the reasoned action pathway is implicated in the performance of sun protective and sunbathing behaviour (e.g. Arthey & Clarke, 1995; Branstrom et al., 2004; Jackson & Aiken, 2000). Recent research also suggests that variables within the social reactive pathway can add to the prediction of sun protective behaviours (Araujo-Soares et al., 2012). This thesis will provide the first investigation into whether the PW model can explain incidental sun exposure.

Chapter 3: Study 1

Exploring Sun-related Prototypes

Study published as:
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3.1 Rationale

As has been described earlier, one of the underlying assumptions of the PW model is that health risk behaviours are social events that have definitive associated prototypes (Gibbons et al., 2003; Gibbons et al., 2009). Research has found that favourable perceptions of, and perceived similarity to a prototype are associated with an increased likelihood of engaging in the associated behaviour (Gerrard et al., 2002; Gibbons et al., 1991; Ouellette et al., 2005). This indicates that behaviour is more likely to occur if the individual positively evaluates and perceives themselves to be similar to the prototype. As an example, consider a person who regularly sunbathes in order to have tanned skin. An individual who holds positive perceptions and considers themselves to be similar to the prototypical sunbather is hypothesised to be more likely to sunbathe than the individual who holds negative perceptions and considers themselves to be dissimilar to the typical person who sunbathes on a regular basis.

Research to date has identified that social images are associated with both positive (Ouellette et al., 2005) and negative health behaviours (Gerrard et al., 2008; Gerrard et al., 2005; Gerrard et al., 2002; Gibbons et al., 2004; Piko et al., 2007). For example, Gibbons, Gerrard, Blanton, et al. (1998) found that those who engaged in reckless driving, smoking, alcohol consumption or unprotected sex reported more favourable perceptions of the relevant prototype than individuals who did not engage in such behaviours. Furthermore, in a sample of adults who were quitting cigarette smoking

Gibbons et al. (1991) found that as time progressed since the date of smoking cessation, perceptions of the prototypical smoker became increasingly negative. This research demonstrates that prototype perceptions are associated with behaviour and that perceptions may change alongside changes in behaviour.

In the context of sun-related behaviour, only one study has examined the role of prototype perceptions in relation to sunscreen use (Araujo-Soares et al., 2012). To date there is no research which explores the role of prototype perceptions in other sun-related behaviours including deliberate tanning and incidental sun exposure. To understand the role of prototype perceptions in sun-related behaviours, specific characteristics of each of the sun-related prototypes must be explored. The measurement of prototype perceptions has most frequently required that participants rate their perceptions of the prototype against a prescribed set of characteristics (Gibbons & Gerrard, 1995), or provide an overall evaluation of the favorability of the prototype (Blanton et al., 2001; Hyde & White, 2009). In either case, there has been little attention paid to the substance of prototype characteristics. While distinct prototypes have been identified for other health behaviours, no other research has reported on the characteristics of sun-related prototypes. Given this, the current study aims to establish whether distinct prototypes exist for each of the sun-related behaviours. Furthermore, this study aims to explore the nature of the characteristics associated with each of the prototypes.

A qualitative approach will be taken to explore perceptions surrounding deliberate and artificial tanning, sun protection, and incidental sun exposure. More specifically, the current study aims to identify the characteristics associated with the prototypical person who engages in each of the sun-related behaviours, and to explore the nature of the characteristics associated with each prototype. It is hypothesised that distinct

prototypes will exist for each of the four sun-related prototypes. This will be demonstrated by consistency in reporting of characteristics for each prototype.

Australia has a long-standing history of sun-worshiping and pro-tan attitudes (Broadstock et al., 1996; Dixon, Dobbinson, et al., 2008), and this is expected to influence the nature of characteristics reported about those who have tanned skin. However, given the history of sun protection messages in Australia, it is expected that the deliberate tanner prototype will also be viewed quite negatively. Similar findings are expected for perceptions about the typical person who incidentally exposes themselves to the sun. The pervasive desire for a tan in Australian culture (Broadstock et al., 1996; Prichard et al., 2014) is expected to result in positive perceptions of the typical person who exposes themselves incidentally. Furthermore, it is expected that the incidental exposer prototype will be viewed more positively than the deliberate tanner prototype. This is because incidental exposure is expected to be viewed as an unavoidable risk as compared to intentionally exposing oneself to the harms of excessive UVR exposure. Previous research would suggest that characteristics reported about the sun protector prototype will be mixed. Araujo-Soares et al. (2012) found that greater prototype favourability was associated with lower levels of sunscreen use. This suggests that while there are favourable aspects of the typical sunscreen user, there may also be other characteristics of this prototype that are influencing behavioural decisions.

3.2 Method

3.2.1 Participants. Twenty-eight participants were interviewed about their perceptions surrounding four sun-related behaviours. These behaviours included deliberate tanning, artificial tanning, sun protecting and incidental UVR exposure. There were 19 female and 9 male participants ranging in age from 17 to 77 years (M= 27, SD= 13). Of these, 13 were undergraduate students who were recruited via an

online research sign-up tool. The remaining 15 participants were members of the general community who were recruited via public notices and snowball recruitment methods. No further interviews were conducted once saturation of responses was reached (Seidman, 2013). The interviews were conducted over a three week period during August – September, 2011 in Townsville, North Queensland. Of the 23 Australian-born participants, 10 reported North Queensland as their place of birth, 3 reported other areas of Queensland, and 10 were born in another Australian state. The remaining 5 participants were born in New Zealand (1), Europe (3), and North America (1).

Participants were asked to select one of either 'fair', 'olive', 'light brown', or 'dark brown' to indicate their natural skin colour. Of the 28 participants, 20 indicated their natural skin colour was 'fair', 6 as 'olive' skin tone and 2 as having 'light brown' skin. Skin type was assessed with the question "If your skin was exposed to 30-minutes of strong sunshine at the beginning of summer, would your skin: 'just burn, and not tan at all' (highly sensitive), 'burn first, and then tan' (moderately sensitive), 'just tan, and not burn' (not sensitive). This is in line with the Fitzpatrick (1988) classification of skin types as has been used in previous research (Hill et al., 1993). Ten of the 28 participants reported that their skin was highly sensitive, 16 had moderately sensitive skin, one participant had non-sensitive skin and one participant did not record their skin type.

Personal history, as well as family history, of skin cancer was assessed with two separate questions. Participants were asked to indicate the extent of their experience with skin cancer. The available responses were 'No', Yes, melanoma', 'Yes, non-melanoma', and 'Yes, but not sure'. While only two participants indicated having personally had skin cancer (1 non-melanoma, 1 not sure which type of skin cancer), 18 participants indicated that a family member had previously had skin cancer. Of these

18 cases, 9 were melanoma type skin cancer, 3 were non-melanoma type skin cancer and 6 were unsure which type of skin cancer their family member had in the past.

3.2.2 Interview schedule. The list of questions asked during the semi-structured interviews is presented in Appendix A. The interviews commenced with a general discussion of participants' history of sun-related behaviours. This included questions relating to history of sunburn, as well as typical sun protective and exposing behaviours. More specific questions were then asked regarding sun exposure and protection at the weekend prior to the interview. Participants were then asked to provide their perceptions of the typical person who engages in each of the following behaviours 1) someone who deliberately lies in the sun to get a tan (deliberate tanning), 2) someone who uses tanning lotions or sprays in order to acquire a tan (artificial tanning), 3) someone who acquires a 'bit of colour' during their day-to-day activities without necessarily meaning to (incidental sun exposure), and 4) someone who protects their skin from the sun most of the time (sun protection). The description of a 'prototype' was given to participants as follows:

> "I am interested in your ideas about typical members of different groups. We all have ideas about what the typical movie star is like, or the typical grandmother. When asked we might say that the typical movie star is attractive, or wealthy, or that a typical grandmother is sweet and frail. This doesn't mean that all movie stars or grandmothers are like, but just that many share certain characteristics." Gibbons, Gerrard, et al. (1995; p. 87)

Participants were then asked to indicate which of the four prototypes best describes their typical behaviour.

3.2.3 Procedure & Analysis. Ethical approval was obtained from the James Cook University Human Research Ethics Committee (HREC), approval H4227 attached as Appendix B. Participants were recruited and interviewed one on one. Prior to being interviewed, participants completed a short survey assessing demographics, natural skin colour, skin type, and history of skin cancer. The pre-interview questionnaire is attached as Appendix C. The semi-structured interviews were conducted during autumn months in Townsville, north Queensland and lasted 14 minutes, on average. Interviews were transcribed verbatim and analysed using NVivo, Version 9 (QSR, Melbourne; Australia).

Given that the main aim of the interviews was to explore the nature of perceptions surrounding the four sun-related prototypes, a thematic analysis approach was used to determine the themes and characteristics relating to each prototype. Characteristics for each prototype were identified and similar characteristics categorised. Themes across these categories were then identified. Characteristics that had similar meaning were grouped together into clusters. These clusters were then labelled according to the most frequently reported characteristic within the cluster. For example, the characteristics 'silly', 'dumb', foolish', and 'stupid' were reported for the deliberate tanner prototype. These four characteristics were grouped together as they were considered to have a similar underlying meaning. The most frequently occurring characteristic ('foolish') was then used as the cluster label. Data were analysed and coded for themes by a single coder, however the categories, as well as the placement of characteristics within categories were reviewed by an independent coder, and any discrepancies were discussed until resolved. The overall approach regarding the structure of the interviews, as well as the thematic analysis that followed was deductive rather than inductive (Braun & Clarke, 2006). While this may be considered to limit the potential of data

collection and analysis, this study was conducted with a specific research framework in mind, thus was considered an appropriate method in this case.

3.3 Results

In the initial stage of the interview, participants were asked general questions regarding their sun-related experiences including history of sunburn, typical sun protective behaviours, and sunbathing habits. This was conducted to encourage engagement with the topic and to explore perceptions surrounding the various sun-related behaviours. Part of this enquiry was to gauge a sense of barriers to, and motivators for sun protection. Participants reported a range of barriers to sun protective behaviours. Over one quarter (28%) of participants reported discomfort of sun protective methods as a barrier to becoming more sun safe. The most frequently reported barriers included the unpleasant and 'greasy' or 'oily' nature of sun screen. Protective clothing such as a long-sleeved shirt was also perceived to be uncomfortable in the Townsville climate. Forgetfulness and laziness were also frequently cited (25%) barriers to adopting more sun protective behaviours. Other less frequently reported barriers to sun protection included time constraints (10%); sun protection as a low priority (10%); the belief that sun protection is unnecessary (10%); desire to tan (7%); and the belief that sunscreen is dangerous (3.7%).

When asked about their rationale for sun protection, participants' responses could be grouped into one of five categories. The most frequently reported reason (38%) for sun protection was the expectation that a planned outdoor activity was to take place. For example:

> P26: If I'm outside playing sport or going fishing or something like that, that's when it (sun protection) is more important.

Other factors that contributed toward participants' rationales to adopt sun protective practices included duration of time spent outdoors; whether it was the weekend; and whether the temperature was hot on any particular day.

With regard to prototype perceptions, participants were asked to report the first thing that came to mind when thinking of the typical person who engages in each of the four sun-related behaviours. For each of the four behaviours, descriptors or personal characteristics were frequently reported. Table 3.1 provides a summary of the nature (positive, neutral, or negative) of the personal characteristics that were reported for each of the four prototypes.

Table 3.1
The nature of personality characteristics reported for each prototype

	N	Positive % (n)	Neutral % (n)	Negative % (n)
Deliberate Tanner	15	7 (1)	13 (2)	80 (12)
Artificial Tanner	20	25 (5)	5 (1)	70 (14)
Incidental Exposer	18	44 (8)	50 (9)	6 (1)
Sun Protector	26	69 (18)	8 (2)	23 (6)

Note: N/n = number of participants who reported a *personality characteristic* for each prototype.

The majority of the personal characteristics reported for both the deliberate (foolish, ignorant, silly) and artificial tanners (fake, desperate, vain) were negative. Conversely, the personality characteristics reported for the typical sun protector were mostly positive (smart, clever). Of most interest, the typical person who 'acquires a bit of colour without meaning to' (the incidental exposer) was most often described with neutral (normal, average, regular person) or positive (lucky, carefree, happy) characteristics.

A key aspect of a prototype is that it is a social image with clear and consistent characteristics. For this reason, characteristics that were reported most frequently were considered to be representative of the social image or prototype. As such, the three most frequently reported descriptors for each prototype are presented in Table 3.2 below.

Table 3.2
Most frequent characteristics reported for each prototype

Deliberate Tanner	Artificial Tanner	Sun Protector	Incidental Exposer
Image conscious	Vain	Pale	Normal
Blonde	Fake	Clever	Lucky
Foolish	Protective	Health conscious	Natural

In general, participants viewed both deliberate and artificial tanners negatively. Descriptions of the prototypical deliberate tanner were generally the most negative of the four. Deliberate tanners were viewed as “image conscious”, and “foolish” when considering the health risks.

> P19: “You have to go out in it (the sun), but lying in it in a bathing suit is just crazy in this climate.”

While those who deliberately tan were overwhelmingly described negatively, the majority (79%, n= 22) of participants still held positive attitudes toward tanned skin. These attitudes included the views that tanned skin is more desirable, more attractive, and ‘healthier’ looking than pale skin. This would suggest that while the *act* of deliberately tanning is viewed negatively, the *outcome* (tanned skin) is viewed positively. The prototypical artificial tanner was also described negatively with vain and fake being the most commonly reported descriptors. As shown in Table 3.1 however, there was a small proportion of participants who reported positive personality

characteristics about the prototypical artificial tanner. These participants felt artificial tanning to be the safest option for those wanting a tan. Thus, those who artificially tanned were generally considered to be balancing their options safely. An artificial tanner was described as follows:

> P6: "someone who is trying to hold on to a little bit of a healthy look, but foregoing the rays"

> P16: "obviously a little more skin conscious."

Perceptions of the prototypical sun protector, while mostly positive, also included negative descriptors. For example, while sun protectors were described as clever or smart, in some cases this was also perceived as paranoid or hyper-vigilant.

> P15: "If they knew they were going to be in the sun all day I would think they were smart, but if they were only in the sun for an hour or so on a Saturday, and they had to put some sunscreen on, I'd think that were a bit silly".

In order to elicit perceptions of the incidental prototype, participants were asked to provide their perceptions of those who incidentally expose by describing the typical person who acquires a bit of colour without really meaning to. Normal, natural, lucky and nonchalant were commonly reported characteristics.

> P20: "A regular person, I suppose natural. That's how I would probably describe them"

> P24: "probably aware of what the sun can do to them and the hazards, but they are just out in the sun and probably haven't taken as much care to cover up and

things like hat. If they haven't taken any steps to try and make themselves tanned, then I think that's ok. That's not too bad."

The prototypical incidental exposer was also described as a person who was outdoors a lot, fulfilling work roles or conducting other purposeful activities outdoors. Approximately 20% of participants described the prototypical incidental exposer as a person conducting purposeful activities outdoors.

P17: "A fishing, outdoors sort of person who is always outside, but not necessarily wearing sunscreen".

Surprisingly, only one interviewee described the prototypical incidental exposer as lazy.

P28: "They are lazy, just like me – not really concerned about their skin".

The reported prototype characteristics were also analysed for consistent themes across the four prototypes. When grouped together, there were two main clusters of characteristics reported. These were physical descriptors (eg. blonde, slim, pale, etc.) and personality characteristics (eg. smart, vain, normal, etc.). Interestingly, while the other three prototypes were described by a mixture of both physical and personality characteristics, there were no physical descriptors reported for the incidental exposer prototype. Another important aspect of prototype perceptions is that of prototype similarity. Participants were asked to indicate which of the four 'prototypes' were perceived to be most like themselves. The majority of participants (68%, n=19) believed themselves to fall into the incidental exposer category. The response from this

participant highlights the conceptual difference between ‘acquiring colour’ and ‘getting a tan’.

> P28: “I would say the acquiring a little bit of colour one. Only because I think it’s nice to have a little colour (…) but I wouldn’t go out of my way to get a tan”.

Comparatively few participants (18%, *n*=5) considered themselves to be a ‘sun protector’, while a number (10%, *n*=3) of participants considered themselves to belong to both the ‘protector’ and ‘incidental exposer’ categories.

> P25: I’m (*sic*) probably mixed between the person who doesn’t really care if they get colour or the person who goes over the top. I know I have days where I just don’t care, I just don’t put anything on. But if I feel particularly conscious of it then I’ll go out of my way to put extra sunscreen on, and an extra-large hat. So somewhere between the two of them.

Only one participant considered themselves as belonging to the ‘artificial tanner’ category, while no one declared that they were a ‘deliberate tanner’. Overall, both the deliberate and artificial tanner prototype were described using predominantly negative characteristics. As expected, the sun protector prototype was described using mostly positive characteristics, while the incidental exposer prototype was either neutral or positive. Despite the positive characteristics of the sun protector however, relatively few self-identified with the prototypical protector, with the majority of participants indicating being most similar to the incidental exposer.

3.4 Discussion

The current study found that while the personality characteristics used to describe deliberate and artificial tanners were negative (i.e. vain, foolish, fake), the physical

descriptors associated with these prototypes include positive or desirable attributes (i.e. physically fit, pretty, slim, healthy, attractive). In contrast, while the personal qualities ascribed to sun protectors tend to be positive (i.e. clever, happy, organised), the physical descriptors associated with sun protectors were viewed in a negative light (i.e. pastey, lots of moles). This presents a conflict which has not yet been explored in other research with any other health behaviours.

Until now, research with prototype perceptions have focused on perceptions based on a range of personality characteristics (smart, sociable, cool) as opposed to physical descriptors (pretty, handsome; Gibbons & Gerrard, 1995). This method has been used in investigations of a range of health risk behaviours including cigarette smoking and alcohol consumption (Gibbons et al., 2002), unprotected sexual behaviours (Gibbons, Gerrard, Blanton, et al., 1998), and reckless driving (Gibbons et al., 2009). While most research conducted on prototype perceptions has focused on personality characteristics (e.g. Gibbons et al., 2003) the current research suggests that physical descriptors may also need to be considered when dealing with sun related behaviours. This is also consistent with past research that indicates that key motivations for acquiring a tan are appearance-based (Hillhouse & Turrisi, 2002; Jones & Leary, 1994). Accordingly, skin cancer prevention strategies have already begun to challenge the perception that a tan is healthier and more attractive than fair skin (Dessaix et al., 2008). However, this approach has focused on the long-term health consequences of tanning and the long-term impact that this might have on appearance (i.e. surgical scars). More recent initiatives have begun to focus solely on the impact that deliberate tanning has on appearance (i.e. premature ageing) but the emphasis has solely been on increasing the risks associated with tanning in an attempt to decrease the favourability of tanned skin. There has been little or no attempt to increase the perceived attractiveness or

desirability of fair skin. Increasing the favourability of the physical characteristics associated with the protector prototype may result in more favourable evaluations of the prototype and a subsequent positive shift in sun protective behaviours. To this end, further research should investigate whether physical descriptors or personality characteristics play a larger role in contributing to sun related behaviours and whether this varies across the range of sun-related behaviours.

The reason for the apparent lack of physical descriptors for the incidental prototype is unclear. One possibility could be that the image had a low salience for respondents. The deliberate tanner and sun protector images are prevalent in skin cancer prevention campaigns, thus are likely to be salient images. Furthermore, both sun protection and tanning can be conceptualised as deliberate behaviours that require planning and conscious decision making, resulting in easier conceptualisation of those behaviours. The incidental exposer however was most often described as 'normal' or 'average'. This may be because incidental exposure is the 'default' behaviour without any clear characteristics to typify the image. An alternative explanation could be that incidental exposure is not conceptualised very well, or even considered at all. This is evidenced by the reporting of purposeful outdoor activities involving exposure rather than a broader description of any activities incurring exposure to UVR (i.e. driving in the car, walking between buildings).

Decades of skin cancer prevention campaigns have had a positive impact upon the performance of sun protective behaviours (Dobbinson, Wakefield, Jamsen, et al., 2008) and rates of skin cancer in parts of Australia (Heward & Makin, 2013; Montague et al., 2001). The general approach of these campaigns has been to highlight the risks of tanning in order to decrease the favourability of a tan, and increase motivation to sun protect (Dessaix et al., 2008; Montague et al., 2001). This is a relevant message in

environments where deliberate tanning is required in order to obtain a tan. However, in extreme UVR environments individuals can still 'get a bit of colour' without actively or deliberately seeking the sun. This may create the perception that so long as individuals are not deliberately performing a risky behaviour (i.e. deliberate tanning), then such 'colour' is 'normal', 'natural' and 'safe'. This perception, coupled with the tendency to underestimate the required level of sun protection (Stanton, Moffatt, & Clavarino, 2005) could be contributing toward the incidence of skin cancer in high risk environments. The level of ambient UVR in NQ means that residents must protect themselves from the sun at all times while outdoors (Armstrong & Kricker, 2001; Samanek et al., 2006). Thus perceptions of those who sun protect most of the time as 'paranoid' also indicates that there may be an underestimation of the need for sun protection. Furthermore, the 'normalising' of incidental exposure is also of concern. In this sample UVR exposure has been described as acceptable as long as there is no intent to deliberately tan. Having a tan has been described as acceptable and desirable but the act of deliberately tanning is viewed negatively and thus should be avoided. Given the finding that most participants perceived themselves to be most similar to the incidental exposer, future research should focus on the determinants of incidental sun exposure as a means of reducing the incidence of skin cancer. Future prevention strategies may need to highlight the dangers associated with all UVR exposure, not just the danger associated with deliberate tanning.

3.4.1 Conclusion. Research to date has focused on psychosocial variables impacting upon intentions to sun protect and sunbathe. Very little attention has been given to incidental exposure. Attitudes toward tanning and tanned skin may be influencing incidental exposure in a way that traditional models of health behaviour cannot explain. As shown by the current findings, positive attitudes toward tanned skin

do not necessarily indicate positive attitudes toward tanning behaviours. Future skin cancer prevention campaigns may need to highlight the danger of all UVR exposure and not only that related to purposeful outdoor activities or sunbathing. The current research supports the role of the PW model in identifying the psychosocial variables that contribute toward sun-related behaviours, particularly incidental UVR exposure. Future research should examine whether the variables of the PW model, particularly those in the social reaction route, are related to incidental sun exposure.

Chapter 4: Study 2

Incidental Sun Exposure: Reasoned or Reactive?

4.1 Rationale

As reviewed earlier (Chapter 2), there is growing evidence supporting the use of the PW model's dual pathways for the prediction of health-related behaviours. Within these pathways, willingness is hypothesised to be the proximal antecedent to behaviour in the social reaction route, whereas intention is the proximal antecedent in the reasoned action route (Gibbons et al., 2003). Willingness and intention are related constructs but with distinctly independent components (Gibbons, Gerrard, Blanton, et al., 1998; Gibbons, Gerrard, Ouellette, et al., 1998). The relationship between intention and willingness is due to the fact that holding an intention to perform a behaviour implies willingness to do the same, but the reverse is not always true. Therefore, an individual can be willing to engage in a behaviour, but have no formal plan or intention to do so.

A number of researchers have demonstrated that willingness adds predictive power over and above intention (Gibbons, Gerrard, Blanton, et al., 1998; Hukkelberg & Dykstra, 2009; Litchfield & White, 2006; Pomery et al., 2009). In fact, a meta-analysis conducted by Todd et al. (2014) indicated that on average, willingness explained an extra 4.9% of variance on top of intention across a range of health behaviours. Willingness has also been found to predict unique variance on top of behavioural expectation (Gibbons, Gerrard, Blanton, et al., 1998). These findings indicate that willingness can meaningfully add to the prediction of a range of health behaviours. However, the strength of the relationship is likely to be moderated by type of behaviour (Todd et al., 2014). There is limited research which examines the role of behavioural

willingness in sun-related behaviours. Most of the research in this context to date has only considered the role of prototypes, and only in relation to sun protection behaviours such as sunscreen use (Araujo-Soares et al., 2012). There has been one study examining behavioural willingness to sun protect, but the relationship between willingness and behaviour (L. A. Walsh & Stock, 2012) was not tested. One other study (L. A. Walsh, Stock, Peterson, & Gerrard, 2013) that examined willingness to engage in risky sun exposure reported that willingness to expose was negatively associated with self-reported sunscreen and protective clothing use, and positively associated with tanning behaviours. While these findings do suggest that the social reaction pathway of the PW model is implicated in sun-related behaviours, there is no research to date which has explored the relative predictive power of willingness versus intention for sun-related behaviours. Therefore, research is needed to determine whether intention or willingness is the best predictor of various sun related behaviours. The distinction between intention and willingness may be particularly pertinent for incidental sun exposure, which is an unplanned, non-deliberative behaviour.

The aim of the current study was to investigate whether the social reactive route of the PW model could predict incidental sun exposure. More specifically, the current study set out to investigate the relationships between prototype perceptions and willingness, intention, and behaviour. The social reactive pathway of the PW model has been demonstrated to predict a range of health-related behaviours. Given this, and the fact that clear prototype perceptions were reported in Study 1, it was expected that the social reactive pathway of the PW model would predict incidental sun exposure. Furthermore, this study aimed to quantify the findings of Study 1 regarding the characteristics associated with each of the sun-related behaviours.

4.2 Method

4.2.1 Participants. In total, 219 participants were recruited to the study. Initial data screening indicated that 6 participants were missing data on more than 90% of variables. Those 6 participants were excluded from the analyses. Those who indicated that they lived outside of North Queensland (*n*=8) were also excluded from the sample. Additionally, one participant's age was more than 3SD above the mean (80 years), and so that participant was also removed from the dataset. The final sample (*N*=204) consisted of 68 males and 136 females ranging in age from 17 to 63 years old (*M*= 29.713, SD = 11.68).

4.2.2 Materials. A questionnaire was developed to examine sun-related behaviours in north Queensland. A copy of the questionnaire is attached as Appendix D. Items were adapted from or informed by past research (Dobbinson et al., 2013; Dobbinson, Wakefield, Jamsen, et al., 2008; Hill et al., 1993) where possible, or were created based on theory (Gibbons et al., 2003) as well as findings of Study 1 (Morris & Swinbourne, 2014). Items aimed to assess demographic information, including phenotypic characteristics, sun-related behaviours, and PW model constructs.

4.2.2.1 ***Demographics & Phenotypic Characteristics.*** Participants were asked to answer demographic questions about gender, age, and ethnicity. Phenotypic characteristics such as skin type, hair colour, experiences with skin cancer, and skin cancer screening practices were also assessed. Skin type was assessed with the single item "If your skin was exposed to 30 minutes of strong sunshine at the beginning of summer, would your skin: 'just burn, and not tan at all' (highly sensitive), 'burn first, then tan' (moderately sensitive), 'just tan, and not burn' (not sensitive). This single item has been previously used as an indicator of skin type (Branstrom et al., 2004) which aligns with the Fitzpatrick (1988) skin classification tool.

Participants were also asked to respond to two items about both their personal and vicarious experiences with skin cancer, “Have you/has any of your family or friends ever had skin cancer? If so, what type?” response options included “No”, “Yes, Melanoma”, “Yes, Non-melanoma”, “Yes, but not sure which type”. Skin cancer screening practice was assessed with the single-item, “Do you get your skin checked by your Doctor for sun damage and skin cancer?” available responses included “No”, “Yes, regularly”, “Yes, but not regularly”.

4.2.2.1 ***Sun-related behaviours.*** Participants were asked to indicate how many hours they spent outdoors on the weekend prior to participation, and to indicate the types of activities undertaken whilst outdoors during this period. Further to this, participants responded to items about their typical exposure and protective behaviours.

4.2.2.2 ***Incidental sun exposure.*** For the current study, incidental sun exposure was defined as any time spent outside during daylight hours without sun protection, and operationalised as a *lack of* protective behaviours when outdoors on the weekend prior to participation. As previous research (Morris & Swinbourne, 2014) has indicated, incidental exposure is conceptualised poorly, thus it was not appropriate to ask participants to recall their unprotected incidental sun exposure. As a result, participants were asked to recall a) time spent outdoors on the weekend prior to participation; and b) their sun protective behaviours on that weekend.

Weekend time spent outdoors was assessed with the single item “How many hours did you spent outdoors last weekend? This includes time spent working, pegging out washing, gardening, etc.” As there are 12 daylight hours in Townsville each day during Spring/Summer on average (Geoscience Australia, 2014), possible responses to this item range from 0 hours to 24 hours. This was followed by an item that assessed

whether any sun protective behaviours were adopted on the weekend prior to participation in the study. Protective behaviours were defined based on the 'Protect Yourself in 5 Ways – Slip, Slop, Slap, Slide, Seek' guidelines (Cancer Council Australia, 2015). These 5 behaviours include using SPF 30+ sunscreen, wearing a long-sleeved shirt, a wide-brimmed hat, and sunglasses, and seeking shade when outdoors. Responses on these items were coded as either "yes=0" or "no=1" and then summed to provide a score ranging from 0 – 5. Scores were coded such that higher scores indicate greater amounts of exposure.

A single incidental exposure dependent variable (DV) was created using the exposure score, weighted by time spent outside. Initially, this dependent variable was created using continuous data (0 to 24 hours) about duration of time spent outside. However this resulted in a DV with scores ranging from 0 to 120 (*M*= 15.56, SD= 17.3) with unacceptable skew and kurtosis (Skew= 2.60, SE= .171; Kurtosis= 9.43, SE= .341), which would be problematic for conducting subsequent analyses (Field, 2009). As a result, hours spent outside was split into categories such that above zero but less than 3 hours was coded as 1, above 3 but less than 6 hours was coded as 2, and above 6 hours was coded as 3. Zero time in the sun was coded as zero. The new incidental score DV was calculated using the level of exposure variable, multiplied by the low, medium or high time spent in the sun. Scores on this variable were normally distributed (skew= .88, SE= .17; kurtosis= .54, SE= .34). Higher scores on the Incidental Exposure Score reflect greater levels of incidental exposure.

4.2.2.3 ***PW Model variables.*** *Behavioural intention (expectation).*Given that incidental sun exposure had been found to be poorly conceptualised (Morris & Swinbourne, 2014), behavioural expectation was assessed, rather than behavioural intention. Behavioural expectation has been found to be a more reliable predictor of

some health risk behaviours (Armitage et al., 2015), as it takes into account external forces or pressures on behaviour. Furthermore, given that incidental sun exposure can be difficult to define, expectations to incidentally expose was considered to be the inverse of expectations to sun protect. Behavioural expectation was assessed with the single item "In the next month, how likely is it that you will use sun protection (e.g. sunscreen, hat, and long-sleeved clothing) when out in the sun?" Responses were assessed on a 5-point Likert scale and reverse scored such that higher scores indicated greater expectations to engage in incidental exposure (1= *very unlikely*, 5= *very likely*).

Behavioural willingness. Consistent with prior research (Gibbons, Gerrard, Blanton, et al., 1998; Litchfield & White, 2006), willingness was assessed by asking participants to imagine a sun-related scenario. This scenario was followed by three options of varying riskiness where participants were asked to report how they would respond to all three options (Gibbons et al., 2003). The important part of this process is that the participant is aware that there is no assumption that they would ever be in this situation. For example, the participant may be asked "Imagine that it is a typical day and you are leaving home for the day." Participants are then asked to respond how likely they are to do each of the following on a 5-point Likert scale (1= *very likely*, 5= *very unlikely*) to a) protect yourself from the sun with four methods of sun protection including, a long-sleeved shirt, sunglasses, sunscreen, a wide-brimmed hat, or shade b) protect yourself from the sun with one or two methods of sun protection, or c) leave home without thinking about sun protection. All three options were then coded such that greater scores indicate greater willingness to incidentally expose, and averaged to create a single willingness score.

Prototypes. Participants were provided with a definition of a prototype as outlined in Gibbons, Gerrard, et al. (1995) and asked to describe each of the prototypes with at

least three characteristics. This step was included to encourage contemplation of the prototype, and to quantify findings of the previous study (see Chapter 3). Once characteristics had been recorded, participants were asked to indicate their overall favourability of each prototype on a 7-point Likert scale (1= *not at all favourable*, 4= *neutral*, 7= *extremely favourable*). Participants were also asked to indicate how similar they perceived themselves to be to the prototype on a 7-point Likert scale (1= *not at all similar*, 4= *neutral*, 7= *extremely similar*). Prototype favourability and similarity were each measured using one item for each of the three prototypes (incidental exposer, protector, and sunbather).

4.2.3 Procedure

Ethical approval for this study was granted by the James Cook University Human Research Ethics Committee (H4240; Approval Notice attached as Appendix E). The survey was created and data collected using Inquisit Web Edition 3.0. Participants were invited to participate via an online undergraduate psychology research participation sign up tool. Community members were recruited via Facebook, and snowball recruitment techniques. In all cases, participants were directed to the survey website and the survey was completed online anonymously. Recruitment took place September 2011 – May 2012 in Townsville, North Queensland.

4.3 Results

4.3.1 Treatment of Data & Analysis. The data were downloaded from Inquisit (Millisecond Software) version 3 and manually entered into SPSS version 22.0. Preliminary analyses were conducted to examine the relationships between sample characteristics and model variables. NVivo version 10.0 was used to organise and analyse qualitative data about prototype characteristics. Hierarchical Multiple Linear Regression was conducted to examine the relationships between variables in the social

reaction pathway and incidental sun exposure. Subsequently, a commonality analysis (Kraha, Turner, Nimon, Reichwein Zientek, & Henson, 2012) was conducted to examine the unique contribution of behavioural willingness and expectations to the prediction of incidental sun exposure. Commonality analyses partition variance into that which is shared between predictor variables, and that which is uniquely contributed by each of the predictors in the model (Lorenzo-Seva, Ferrando, & Chico, 2010; Nimon, 2010; Nimon & Reio, 2011). Therefore, the analysis provides insight into the relative contribution of each predictor variable, as well as their shared contribution. Conducting such an analysis is particularly important when predictor variables are highly correlated.

Amos version 22.0 was used to conduct path modelling. Model parameters were estimated using the Maximum Likelihood (ML) procedure. There have been a number of suggestions made regarding sample size adequacy in structural equation modelling (SEM). Kline (2011) suggests that to ensure stable parameter estimates, the ratio of cases to parameter estimates should be 10:1. However, Stevens (1986) as well as Bentler and Chou (1987) have stated that it is acceptable for this ratio to be as low as 5:1. Furthermore, there should be an absolute minimum of 100 cases for model estimation (Boomsma & Hoogland, 2011). Based on these recommendations, the current sample (n=204) was considered to be adequate, under the provision that absolutely no more than 40 parameters were estimated.

The model fit was considered acceptable as the χ^2 was non-significant, indicating no significant difference between the observed and expected underlying variance-covariance matrix. Other fit statistics examined include χ^2/DF (normed chi square), which should fall between 1 and 2, and Root Mean-Square Error of Approximation (RMSEA) which should be less than 0.05 (B. M. Byrne, 2010). Standardised Root Mean-square Residual (SRMR) was also examined to assess residual variance

unexplained by the model. SRMR less than 0.06 indicates an acceptable level of residual variance (Bentler, 1990). Incremental fit indices provide an indication of how well the hypothesised model accounts for variance in the data, in comparison to the null model. Incremental fit indices examined in order to determine model fit included the Adjusted Goodness of Fit Index (AGFI) and the Comparative Fit Index (CFI). Both indices should be greater than 0.95 (Bentler, 1990; Jöreskog & Sörbom, 1984) in a well-fitting model.

4.3.2 Sample Characteristics. The majority of participants in the final sample did not identify with any ethnic groups, had moderately sensitive skin, and brown hair. Approximately one quarter of the sample had highly sensitive skin. While the sample tended to have high to moderate sensitivity to sun damage, the majority of participants had no personal experience with skin cancer. However, approximately one quarter of the sample had a family member or friend who had previously had melanoma. A summary of the sample characteristics are presented in Table 4.1 below.

Table 4.1
Sample Characteristics

		n (valid %)
Skin Type	Highly Sensitive	56 (27.5)
	Moderately sensitive	114 (55.9)
	Not sensitive	34 (16.7)
Hair Colour[a]	Blonde	30 (14.8)
	Light Brown	72 (35.5)
	Dark Brown	88 (43.3)
	Black	13 (6.4)
History of Skin Cancer		
- Personal	Melanoma	4 (2.0)
	Non-melanoma	17 (8.3)
	Yes, unsure what type	4 (2.0)
	No	179 (87.7)
- Vicarious[a]	Melanoma	52 (25.6)
	Non-melanoma	20 (9.9)
	Yes, unsure what type	46 (22.7)
	No	85 (41.9)
Skin check frequency[a]	Regularly	35 (17.6)
	Not regularly	65 (32.7)
	No	99 (49.7)

Note: N=204, [a]Total ≠204 due to missing data.

4.3.3 Preliminary Analyses. Prior to conducting the main analyses, a series of analyses were conducted to determine whether participants' scores on the dependent variable were associated with demographic variables such as age, gender, skin type, or experience with skin cancer. Descriptive statistics for demographic factors included in the analyses below can be found in Table 4.2. Bivariate correlations indicated that age was significantly negatively associated with Incidental Exposure (r= -.256, p=.000). This indicates that younger participants tended to expose themselves more than older individuals did. An independent samples *t*-test was conducted to determine whether incidental exposure scores varied based on gender. There was no significant difference between the average weekend incidental exposure score for males and females,

$t_{(200)} = 1.68$, $p = .10$. A one-way ANOVA indicated that there were no differences in incidental exposure scores based on skin type groupings, $F_{(2, 199)} = 1.86$, $p = .16$. Two separate one-way ANOVAs were conducted to determine whether incidental exposure scores differed based on either personal or vicarious experience with skin cancer. Results of the one-way ANOVA indicated that exposure scores varied based on whether or not individuals had a personal history of skin cancer, $F_{(3, 198)} = 3.25$, $p = .02$. Multiple comparisons with LSD corrections indicated that between-group differences existed only between those who had no experience with skin cancer, and those who were uncertain about the type of skin cancer they had previously had. Participants without a history of skin cancer reported significantly greater incidental exposure compared to those who had previously had skin cancer. No other significant group differences existed. With regard to vicarious experience with skin cancer, results of a one-way ANOVA indicated that there were no between-group differences in incidental exposure scores ($F_{(3, 197)} = .86$, $p = .46$) according to whether or not individuals had any vicarious experience with skin cancer.

Table 4.2
Mean Incidental Exposure Score by demographic factors

		n	Incidental Exposure Score *M*(SD)
Gender	Male	68	5.87 (3.69)
	Female	134	5.01 (3.27)
Skin Type	Sensitive	55	4.55 (3.07)
	Moderate	113	5.59 (3.75)
	Non-sensitive	34	5.30 (3.43)
History of Skin Cancer			
- Personal	Melanoma	4	3.50 (4.73)
	Non-melanoma	17	4.00 (1.90)
	Yes, unsure	4	1.50 (1.91)
	No	177	5.55 (3.47)
- Vicarious*	Melanoma	51	4.96 (3.04)
	Non-melanoma	19	4.68 (3.06)
	Yes, unsure	46	5.91 (3.81)
	No	85	5.34 (3.53)

Note: *data missing for *n*= 1

4.3.1 Model Variables. ***Behavioural Intention/Expectation.*** Behavioural expectation was assessed in this study on a 5-point Likert scale (1= *very unlikely*, 5= *very likely*) such that higher scores indicated greater expectations to engage in incidental sun exposure. Overall, expectations to engage in incidental sun exposure fell below the mid-point of the scale. On average, expectation to engage in incidental sun exposure in the future was 'unlikely' (*M*= 2.05, SD= 1.2).

4.3.1.2 ***Behavioural Willingness.*** Behavioural willingness was assessed with three items that were averaged to create an overall index of behavioural willingness. Scores ranged from 1 to 5, with higher scores indicating greater willingness to engage incidental exposure. On average, behavioural willingness for incidental exposure in this sample was close to the mid-point of the scale, indicating that willingness to

incidentally expose was neutral (*M*= 3.07, SD= .97).

4.3.1.3 ***Prototypes.*** Up to three characteristics were recorded for each of the prototypes. The reported characteristics for each prototype were analysed using NVivo v. 10. Characteristics were initially grouped for similarities. For example, reported characteristics such as 'good looking', 'pretty', 'beautiful' and 'attractive' were grouped under a single Node called 'physically attractive'. Following this, each Node was categorised as pertaining to either a personality or physical characteristic. These characteristics were then organised into positive or negative personality and physical characteristics, based on the findings of Study 1. Characteristics with ambiguous or ambivalent valence were left un-coded. This process was repeated for each of the three sun-related prototypes. Analyses of the characteristics indicated that personality characteristics were more frequently reported than physical characteristics for all three prototypes. Personality characteristics were most frequently positive for the prototypical sun-protector and incidental exposer, but negative personality characteristics were most frequently reported for the deliberate exposer. Frequency data for the reported characteristics, is presented in Table 4.3 below. Overall, the most frequently reported characteristics for the deliberate exposer prototype included 'vain' (23%), and 'foolish' (14%). The protector prototype was most frequently described as 'smart' (21%), 'cautious' (12%), 'healthy' (9%), and 'fair' (8%). Finally, the most frequently reported characteristics for the incidental exposer included 'normal' (17%), 'active' (9%) and 'healthy' (8%). A detailed list of frequencies data for characteristics reported for each prototype can be found as Appendix F.

Table 4.3
Frequencies of reported characteristics, by prototype.

		Personality *n*(%)			**Physical *n*(%)**			**Other**
	n	Positive	Negative	Ambiguous	Positive	Negative	Ambiguous	
Deliberate	573	11 (1.92)	336 (58.64)	71 (12.39)	51 (8.90)	35 (6.11)	13 (2.27)	56 (9.77)
Protector	565	360 (63.72)	41 (7.26)	51 (9.03)	6 (1.06)	2 (0.35)	49 (8.67)	56 (9.91)
Incidental	507	115 (22.68)	80 (15.79)	177 (34.91)	28 (5.52)	6 (1.18)	5 (0.99)	96 (18.93)

Note: n=total number of characteristics reported for each prototype.

Prototype favourability and similarity were both assessed on 7 point scales (1= *not at all favourable/similar,* 7= *extremely favourable/similar*). Favourability and similarity were assessed separately, and will be included separately in analyses (Hyde & White, 2009; Todd et al., 2014; van Lettow, de Vries, Burdorf, & van Empelen, 2014). Descriptive statistics for favourability and similarity ratings for the three sun-related prototypes are presented in Table 4.4 below. Inspection of the table reveals that the relative favourability and similarity of the protector and incidental prototypes are similar compared to the sunbather prototype. For favourability, a series of paired-samples t-tests indicated that the sun protector was significantly more favourable than both the incidental ($t_{(202)}$= 2.22, p= .03) and deliberate prototypes ($t_{(202)}$= 12.61, p= .00). The incidental prototype was also rated as significantly more favourable than the prototypical sunbather ($t_{(202)}$= -14.64, p= .00). With regard to prototype similarity, a series of paired samples t-tests indicated that on average, perceptions of similarity were equivalent for the protector and incidental exposer ($t_{(202)}$= -.18, p= .86). On average, perceptions of similarity to the deliberate tanner was significantly lower than both the incidental ($t_{(202)}$= -15.19, p= .00) and protector ($t_{(202)}$= 12.72, p= .00) prototypes.

Table 4.4
Descriptive statistics for prototype perceptions

	Mean (SD)
Prototype favourability	
Protector	5.20 (1.36)
Sunbather	3.01 (1.61)
Incidental	4.94 (1.10)
Prototype similarity	
Protector	4.60 (1.66)
Sunbather	2.25 (1.67)
Incidental	4.63 (1.57)

Note: n=203

4.3.1 Incidental Sun Exposure. As described earlier, the incidental exposure score was calculated by weighting sun exposure by time spent outdoors. This procedure resulted in scores ranging from 0 to 15 (*M*= 5.3, SD= 3.43), with higher scores indicating greater levels of incidental sun exposure.

4.3.1.1 ***Predicting incidental sun exposure.*** *Hierarchical regression.* Analyses were conducted to determine whether behavioural expectation or behavioural willingness was a greater predictor of incidental exposure. Bivariate correlations for model variables are provided in Table 4.5 below. Given the results of the preliminary analyses, personal experience with skin cancer was dummy coded and entered into the first block of the regression. Age was also controlled by entry into the first block of the regression analyses. Willingness and expectation were entered simultaneously into block 2 of the analyses.

Table 4.5
Bivariate correlations for model variables

	Pearson-*r* (*p*-value)			
	1.	2.	3.	4.
1. Incidental Exposure Score	1			
2. Age	-.256 (.000)	1		
3. Expectation	.359 (.000)	-.272 (.000)	1	
4. Willingness	.341 (.000)	-.239 (.001)	.501 (.000)	1

Note: *n*= 202

The incidental exposure score was regressed on age, personal history of skin cancer, willingness and expectation. Block 1 variables explained a significant 6.7% of the variance in incidental exposure, $F_{(4, 197)}$= 4.63, *p*= .001. Age was the only significant

predictor in this step of the analysis; personal history of skin cancer variables did not significantly add to the prediction of incidental exposure. With regard to Block 2 of the analysis, the inclusion of expectation and willingness explained a further 11.1% of the variance in incidental exposure $F_{(2, 195)}$= 13.52, p= .000. Detailed regression statistics can be found in Table 4.6 below.

Table 4.6
Statistics for incidental sun exposure regressed on age, history of skin cancer, expectation and willingness

	R^2	B (SE)	β
Block 1	.09**		
Constant		7.32 (.66)	
Age		-.06 (.02)	-.22**
No history vs. Yes, but not sure		3.29 (1.70)	-.13
No history vs. Non-melanoma		-.63 (.90)	-.05
No history vs. Melanoma		-1.30 (1.70)	-.05
Block 2	.20***		
Constant		3.07 (1.07)	
Age		-.04 (.02)	-.123
No history vs. Yes, but not sure		2.87 (1.61)	-.12
No history vs. Non-melanoma		-.42 (.85)	-.03
No history vs. Melanoma		-.94 (1.61)	-.07
Expectation		.58 (.22)	.201**
Willingness		.72 (.26)	.205**

Note: **p <.01, ***p <.001.

Commonality Analysis. In order to determine the unique contribution of each variable, a commonality analysis was conducted using the procedure described by (Kraha et al., 2012). Results of a commonality analysis provide insight into the relative

contribution of each predictor variable, as well as their shared contribution. This is particularly important when predictor variables are correlated, as they are in this case. The three variables that significantly predicted incidental exposure in the hierarchical regression (age, expectation, and willingness) were included in the analysis. Personal history of skin cancer was not included in the commonality analysis, as it did not provide any significant predictive power in the model, as indicated by the findings of the hierarchical regression reported above. As depicted in Figure 4.1 below, the results of the commonality analysis indicated that combined, expectation and willingness explained 5.5% of the variance in incidental exposure. Furthermore, this analysis also reveals that expectation explained a unique 3.5% of the variance, while willingness explained a unique 2.8% of the variance in incidental exposure. Details of unique and shared variance contributed by all predictor variables in the commonality matrix can be found in Table 4.7 below.

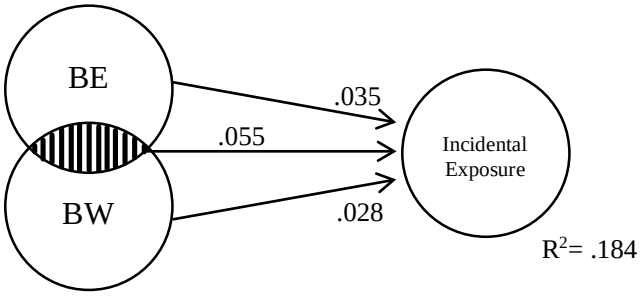

Figure 4.1. Venn diagram depicting shared and unique variance of behavioural expectation (BE) and behavioural willingness (BW) predicting incidental exposure.

Table 4.7
Commonality matrix for incidental exposure regressed on age, expectation, and willingness

Predictor Combinations	Unique R^2	Percent of total R^2
Age	.020	11.07
Expectation	.035	19.21
Willingness	.028	15.20
Age + Expectation	.012	6.49
Age + Willingness	.007	3.65
Expectation + Willingness	.055	29.96
Age + Expectation + Willingness	.027	14.42
Total	.184	100.00

*Path Analysis.*A path analysis was conducted using AMOS v 22.0 to determine whether the more distal variables of the social reaction pathway were predictive of expectation, willingness, and behaviour. Expectation was included in this analyses as previous research had suggested that prototype favourability and similarity impact on behaviour via both willingness and expectation. Given its relationship with incidental exposure and other predictor variables, age was included in the model with pathways to exposure, expectation, and willingness. The hypothesised model is provided as Figure 4.2 below. All variables in the model are manifest variables. As described earlier, similarity, favourability, expectations, willingness, and age were all assessed using single-items. Behaviour (incidental exposure) was calculated using 5 dichotomous items assessing typical sun protective that were reverse scored and combined to create the incidental exposure score.

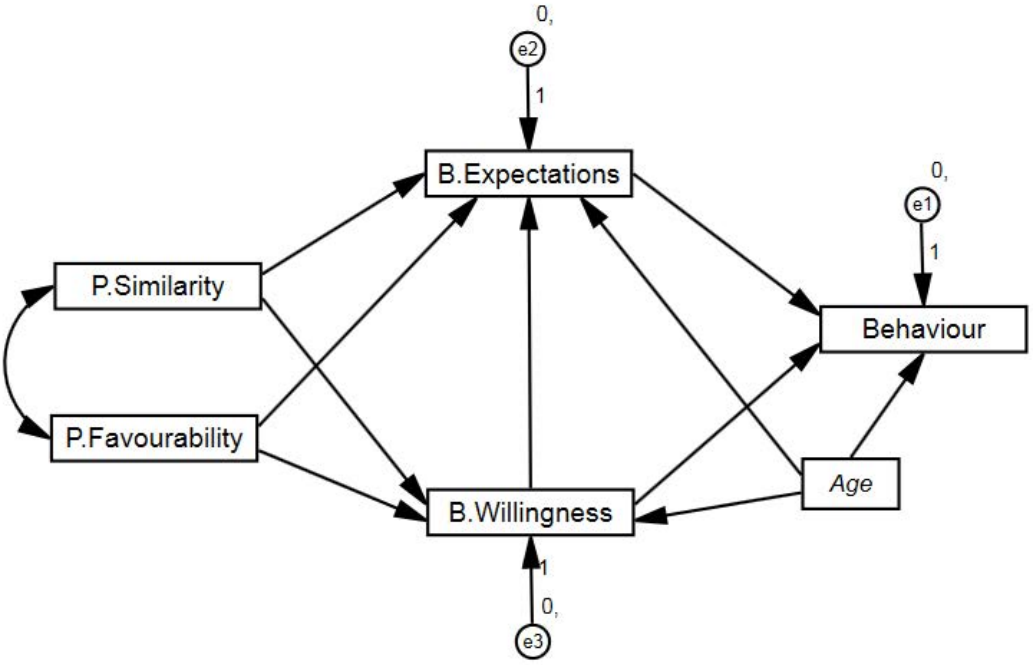

Figure 4.2. Hypothesised path model

The original hypothesised model demonstrated poor model fit on all indices (χ^2=.18.10, df=4, *p*=.001, χ^2/df=4.52, RMSEA=0.133, SRMR=.07, AGFI=0.85, CFI=0.91). Inspection of the residual variance-covariance matrix and modification indices suggested that model fit would significantly improve if parameters were freed between age and prototype favourability, and between prototype similarity and behaviour. As a result, age and prototype favourability were covaried, and a pathway was included from prototype similarity to behaviour. The analysis was then re-run. The final model, annotated with standardised pathway coefficients and squared multiple correlation coefficients, is presented as Figure 4.3 below.

The final model demonstrated good fit to the data as indicated by a non-significant chi statistic, (χ^2=2.51, df=2, *p*=.29, χ^2/df=1.25) and fit indices all within acceptable

bounds (RMSEA=0.00, SRMR=0.02, AGFI=0.96, CFI=0.99). Overall, 23% (R^2 = .23) of the variance in typical incidental sun exposure behaviour was accounted for by the model. The findings of the path analysis supported the findings of the previous multiple regression and commonality analysis in that both expectation and willingness significantly predicted incidental exposure. In contrast, neither prototype favourability nor similarity had a significant effect on either expectation or willingness. However, there was a direct effect of prototype similarity on incidental exposure. The standardised total effects for all predictive pathways are included in Table 4.8 below. Inspection of this table indicates that behavioural willingness had the greatest effect on typical incidental exposure, followed by age, behavioural expectation, and prototype similarity.

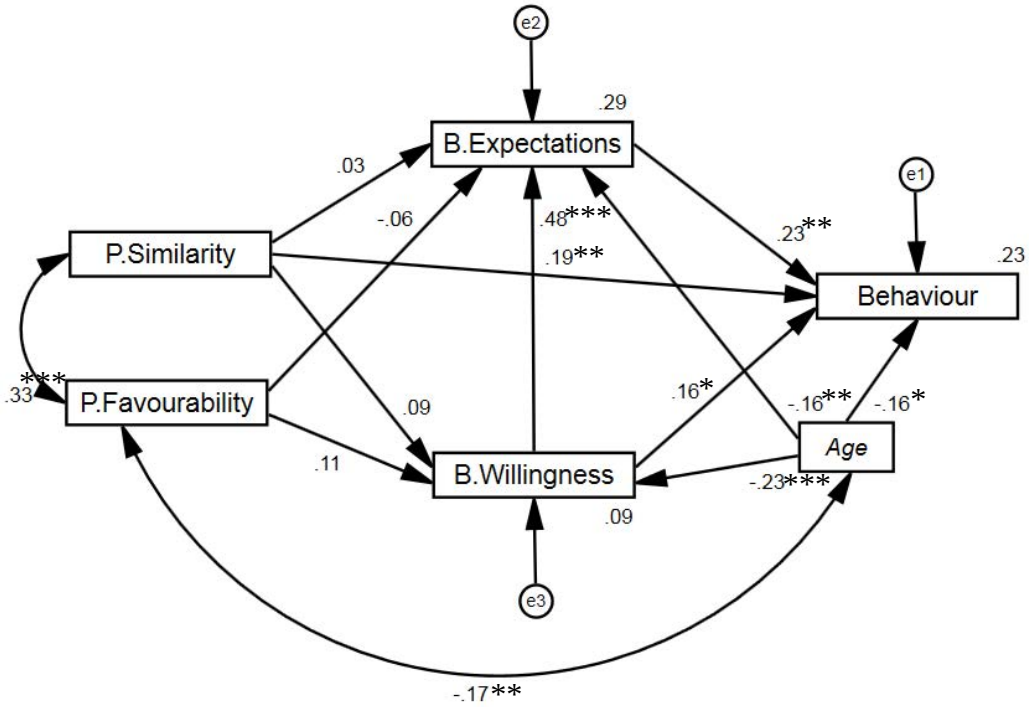

Figure 4.3. Path analysis of direct and indirect effects of behavioural expectation and Social Reactive pathway variables on incidental sun exposure, controlling for Age.

***p <.001, **p <.01, *p <.05.

Table 4.8
Standardised total effects of all predictor variables on outcome variables

	Total Effects (R^2)				
	Age	PF	PS	BW	BE
BW	-.227	.112	.090	-	-
BE	-.272	-.006	.068	.477	-
Incidental Exposure	-.262	.017	.219	.272	.228

Note: PF= prototype favourability, PS = prototype similarity, BW= behavioural willingness, BE= behavioural expectation

4.4 Discussion

A cross-sectional online survey was conducted to investigate whether the PW model provided an appropriate framework for the prediction of incidental sun exposure. Variables within the social-reaction pathway, including behavioural willingness and prototype perceptions, as well as behavioural expectations were included in the analysis. With regards to the proximal antecedents of behaviour, the findings suggested that both behavioural expectation and behavioural willingness were predictive of incidental sun exposure. This finding suggests that both reasoned and reactive processes contribute to whether an individual will incidentally expose themselves to the sun.

In the current study, behavioural expectation was assessed in replacement of behavioural intention. Some research has suggested that compared to intentions, behavioural expectations more reliably predict health risk behaviours (Armitage et al., 2015; Sheppard et al., 1988). Behavioural expectations are hypothesised to prompt reflection upon the *likelihood* of a behaviour occurring. Compared to the assessment of behavioural intentions, this reflective process is hypothesised to result in a response that is less likely to be influenced by demand characteristics, and takes into consideration extraneous elements such as opportunity, and other constraints on the behaviour. Gibbons, Gerrard, Blanton, et al. (1998) argue that willingness is more closely related

to expectation than it is to intention. Thus, the unique predictive power of behavioural willingness versus expectation is a conservative estimate compared to intention. Results of the current study suggest that the combined predictive power of expectation and willingness (18.4%) was modest compared to previous research which suggests that intention alone can account for 19-27% of the variance in behaviour (Conner & Armitage, 1998; McEachan et al., 2011). Future research should examine all three proximal indicators to determine their relative contribution to the prediction of behaviour.

With regard to prototype perceptions, the results of this study suggested that favourability of and similarity to the incidental prototype is not 'neutral', as had been previously suggested (Morris & Swinbourne, 2014). Descriptive data suggested that the majority of participants positively evaluated, and felt similar to the prototypical incidental exposer. Perhaps surprisingly, participants favoured the protector prototype, but perceptions of similarity were equal between the protector and incidental exposer. A similar pattern of findings has been reported by van Lettow et al. (2013; Study 2) with drinker prototypes. In their study, van Lettow et al. (2013; Study 2) found that while the abstainer was evaluated significantly more positively than either the moderate or heavy drinker, participants perceived themselves to be equally similar to the abstainer and moderate drinker prototypes, and significantly less similar to the prototypical heavy drinker. The findings of the van Lettow et al. (2013) and the current study suggest that the high risk image may operate as an avoidance motivator, where alignment with the high-risk prototype is avoided (Gerrard et al., 2002), and replaced by a more acceptable, moderate prototype – which in this context is the incidental exposer.

A secondary purpose of this study was to further explore the characteristics associated with each of the sun-related prototypes. Morris and Swinbourne (2014) is the

only study to date which has reported on the nature of the characteristics for each of the sun-related behaviours. The characteristics that were reported in the current study support are largely consistent with those identified in the earlier study. This suggests that there is a clear social image associated with deliberate tanning, sun protection, and incidental sun exposure. In Study 1 (Morris & Swinbourne, 2014), it emerged that participants reported a combination of personality and physical descriptors for the protector and deliberate tanner prototypes, but only personality characteristics for the incidental prototype. This finding was not replicated in the current study. Regardless, the findings of study 2 provide support for the reliability of the characteristics associated with the three sun-related prototypes in a high risk environment. It is likely that the characteristics associated with these prototypes will vary across geographical locations, thus region-specific research is needed to examine this.

In order to examine the relationships between the variables in the social reaction pathway and behaviour, a path analysis was conducted. Findings of the path analysis indicated that prototype similarity impacted upon behaviour, but this relationship was not mediated by willingness, as originally hypothesised. The hypothesised model was modified to include a direct pathway from prototype similarity to behaviour. There was neither a direct nor indirect effect of prototype favourability on incidental sun exposure. In their meta-analysis, Todd et al. (2014) argued for direct pathways between prototype perceptions and behaviour, as well as direct pathways between prototype perceptions and intention. Again, similar to our findings, Todd et al. (2014) also found that prototype similarity was more strongly associated with intentions and willingness compared to prototype favourability. These findings contrast with that originally hypothesised by the PW model, thus provide implications for the theory and relationships between variables in the model.

4.4.1 Limitations. A number of limitations must be addressed. One limitation of this study is that the calculation of incidental exposure variable assumes that all sun protective behaviours are equal, and appropriate in every setting. The calculation of sun protection in this study was additive such that the performance of any health behaviour was equally weighted. This may not be a true reflection of opportunity to sun protect. For example, sunglasses and wide-brimmed hats are not likely to be appropriate forms of sun protection while swimming. Additionally, there is evidence to suggest that sunscreen can be an inadequate form of sun protection (Loden et al., 2011). It is likely that avoidance of the sun in peak hours, and use of shade are both superior sun protective practices, compared to sunscreen for example. Furthermore, the current study does not differentiate time of day outside, and the lack of information gathered about time spent outside precludes this. Future research should aim to ensure that accurate estimates of risky sun exposure are obtained, particularly in relation to intensity of UVR during exposure times, and relative adequacy of sun protective behaviours. This could be achieved with more comprehensive data collection tools such as a sun diary, and with objective measures of sun exposure such as dosimetry or skin reflectance spectrophotometry.

Another limitation of this research is the cross-sectional design, specifically in relation to using indicators of past typical behaviours as the dependent variable in analysis. Given the exploratory nature of this research, the design was considered adequate to determine whether relationships existed between the PW model variables and typical sun-exposure behaviour. Furthermore, given that the current study aimed to determine the relationship between PW model variables and behaviour, examining predictors of expectations (intentions) or willingness to expose as an outcome variable was not considered adequate. Thus, an indication of typical sun-behaviour was used as

the outcome measure for this research. Ideally, future research should aim to explore these relationships using prospective designs, and controlling for past behaviour.

4.4.2 Implications. Incidental sun exposure is unplanned, therefore, it is unsurprising that non-deliberative processes are associated with this type of behaviour. The main finding of this research is that reactive decision-making processes are most strongly associated with the performance of incidental sun exposure. This finding supports continued use of the PW model in future research that examines this behaviour. Furthermore, the finding that prototype similarity, but not favourability, was directly related to incidental sun exposure has both theoretical and practical implications. In terms of theory, this finding adds to past research findings (Hyde & White, 2009; van Lettow, de Vries, Burdorf, & van Empelen, 2014) that have suggested that prototype similarity is more strongly related to health-risk behaviour compared to prototype favourability. Furthermore, this finding also provides further evidence for the inclusion of a direct relationship between prototype perceptions and behaviour (Todd et al., 2014). The practical implications of these findings relate to future strategies for skin cancer prevention. Given that past research has indicated that prototype perceptions are malleable (Blanton et al., 2001; Teunissen et al., 2012), future research should examine the influence that social images have on incidental sun exposure.

4.4.3 Conclusion. Overall, the findings of this study suggest that both reasoned and reactive decision making processes are implicated in incidental sun exposure. The results reported here provide support for the reliability of the characteristics associated with the typical sun protector, deliberate tanner, and incidental exposure. Furthermore, the path model suggests that prototype perceptions, especially perceptions of similarity to the incidental exposer, are related to incidental sun exposure. Given the cross-sectional design of this study, any conclusions drawn from this data must be done so

with caution. Future research should aim to provide more robust support for the use of the PW model for the prediction of incidental sun exposure. To do so, more comprehensive sun-behaviour assessments are required, as is a longitudinal prospective design.

Chapter 5: Study 3a

Prototypes: A Mechanism of Behavioural Change?

5.1 Rationale

There is now sufficient evidence to argue that prototype perceptions are implicated in incidental sun exposure. Results of the previous study (Chapter 4) suggested that prototype perceptions, specifically prototype similarity, had a direct effect on typical incidental sun exposure. Given the potential for health promotion, it is important to determine whether prototype perceptions provide a possible avenue for intervention. To date, research has not investigated whether sun-related prototype perceptions are amenable to change, however similar investigations have been undertaken for sexual behaviours, and alcohol consumption.

Various researchers have explored whether prototype perceptions are susceptible to manipulation. The first of these studies was conducted by Blanton et al. (2001; Study 4) to determine whether positive or negative information was more effective at changing behavioural willingness. Participants were exposed to one of three persuasive fabricated newspaper articles. Participants were instructed to read fictional newspaper articles that presented either positive or negative information of the typical person who used condoms when having sex. The newspaper articles were identical, with the exception of the descriptions used for those who do versus those who do not use condoms. The typical person who uses condoms were described as more responsible, and less selfish (Positive group) compared to those who do not use condoms, and vice versa (Negative group). Participants in the Control condition were instructed to read negative information about a prototype unrelated to sexual behaviour. In this group, the newspaper article described those who do not vote as more selfish and less responsible

than those who do vote. After reading the newspaper article, participants rated their willingness to use condoms when having sex. Between-group comparisons of post-test ratings of willingness indicated that there was a significant effect of experimental group on ratings of willingness. Those in the Negative condition reported significantly lower post-test willingness to engage in unprotected sex than did those in the Positive or Control groups. There was no difference for willingness scores between the Positive and Control groups. This study was the first to suggest that targeting prototype perceptions can influence willingness to engage in risk behaviour. Furthermore, this was achieved with a single, brief intervention. This finding suggests that providing negative information about risk prototypes might be an effective intervention to decrease willingness for risky behaviours. However, the omission of both pre-test measures of willingness, and behavioural measures limit the conclusions that can be made about the efficacy of this manipulation to change risk cognitions and actual risk behaviour. Furthermore, a measure of prototype perceptions at pre- and post-test would have provided evidence that the manipulation worked via the hypothesised cognitive mechanism, prototype perceptions.

In a similar study, Litt and Stock (2011) used Facebook profiles as a method by which to manipulate normative perceptions of those who drink alcohol. In their study, adolescents (aged 13-15) were recruited and assigned to either the Normative (drinker) condition or the Control condition. Those in the normative condition viewed Facebook profiles of individuals who regularly engaged in drinking behaviours. The Control condition viewed Facebook profiles of individuals who did not engage in any drinking behaviours. Results indicated that those who viewed the drinker profiles reported greater willingness to drink, more positive attitudes toward drinking, lower perceived vulnerability of the consequences of drinking, and more positive drinker prototype

perceptions. Further mediation analyses indicated that perceptions of the typical drinker, attitudes, and perceived norms fully mediated the relationship between condition and behavioural willingness to drink. These findings suggest that providing normative information is effective for the use of manipulating prototype perceptions. Furthermore, the use of Facebook profiles is both an influential source of normative information, and an effective method for intervention. These results suggest that general normative information influences the more distal antecedents to behaviour (attitudes, perceived norms, prototype perceptions) which impact on an individual's willingness to drink alcohol.

Each of these studies (Blanton et al., 2001; Litt & Stock, 2011) provide promising evidence of the impact that a brief intervention can have on willingness to engage in health risk behaviours. There is also evidence that prototype perceptions change alongside changes in behaviour. In a long-term intervention, change in favourability of the drinker prototype was associated with lower willingness to drink and lower alcohol consumption (Gerrard et al., 2006). However, it is unclear whether the change in prototype perceptions induced the change in behaviour, or whether the change in prototype perceptions were a product of behavioural change. In order to determine cause-and-effect, an experimental design is needed. To address this, Teunissen et al. (2012) investigated the impact that a brief prototype manipulation had on observed drinking behaviour.

In their experimental study, Teunissen et al. (2012) examined the impact of manipulating prototype perceptions on subsequent alcohol consumption. Participants were exposed to either positive (attractive, sociable, and successful) or negative (unattractive, unsociable, and unsuccessful) information about stereotypic drinkers. Participants' drinking behaviours were then observed in groups, in a bar laboratory that

aimed to create a naturalistic drinking setting. Findings indicated that the prototype manipulation was successful. Those in the positive information group reported higher subsequent prototype evaluations, than did those who were exposed to the negative information. Furthermore, alcohol consumption during the 45-minute observation period was greater for those who were exposed to positive information than for those who saw the negative information, controlling for number of persons present. There was a distinct gender difference observed such that these findings applied to men only; there were no differences in females' alcohol consumption across the two conditions. Gender differences in alcohol-related research are well reported (Australian Bureau of Statistics, 2012; Wilsnack, Vogeltanz, Wilsnack, & Harris, 2000) such that females consistently report lower levels of alcohol consumption than males. This finding is consistent with other research which has found that the drinker prototype is more influential on males' behaviour than females' (Todd & Mullan, 2011; Zimmermann & Sierverding, 2010). Regardless, this study is the first to provide convincing evidence that a brief manipulation of prototype perceptions can subsequently influence the performance of risky behaviour. Thus, behaviour may be impacted upon by manipulating the favourability of a social image associated with that behaviour.

Other researchers (Todd & Mullan, 2011) have reported null findings for behavioural change after a brief prototype intervention. In their study, Todd and Mullan (2011) targeted female's alcohol consumption with a single-dose prototype manipulation delivered as a newspaper article. Comparisons were made between the manipulation group and a control group, as well as to a mere-measurement group. Those in the mere-measurement group answered an identical questionnaire to those in the prototype manipulation group, however items about prototype perceptions were replaced with questions about bottled water intake. Alcohol consumption was assessed

at baseline, and again two to three weeks after exposure to the newspaper article. Their results indicated that there was no change in alcohol consumption from baseline to post-test for those in the manipulation group, when controlling for a possible mere measurement effect. However, quantity of alcohol consumed between baseline and follow-up significantly differed for those who were in the mere-measurement group. Todd and Mullan's (2011) findings indicated that answering questions about alcohol consumption reduced future alcohol consumption. However, with regard to the prototype manipulation, it is difficult to determine whether the intervention successfully impacted upon constructs within the social reactive pathway. Comparisons between baseline and follow-up levels of behavioural willingness and prototype perceptions have not been reported. Therefore, it is difficult to determine whether cognitive change occurred as a result of the prototype manipulation. Other research (Teunissen et al., 2012) has suggested that inducing behavioural change in females' alcohol consumption with a single-dose prototype manipulation is unlikely to be successful. Furthermore, the follow-up period may impact upon whether or not change is detected. In their prototype manipulation study, Gibbons et al. (2005; Study 1 and 2) reported significant differences between experimental groups for prototype favourability ratings immediately post-test, but null findings at the three or four week follow-up period. This could explain the findings reported by Todd and Mullan (2011) whereby assessments were taken two to three weeks after initial recruitment. Without immediate post-test cognitive assessments, it is uncertain whether such change occurred.

Overall, there is a paucity of prototype manipulation studies that have adopted pre- to post- test comparisons of prototype perceptions. Often, post-test comparisons of prototype perceptions are made between experimental groups, and some have lacked control groups. Furthermore, prototype perceptions have often not been reported,

instead only reporting changes to other cognitive variable such as behavioural willingness. For ease of interpretation, a tabulated summary of prototype manipulation studies has been included as Appendix G. Examining the standing literature in this manner suggests that more robust study designs should be adopted that include control conditions and pre- to post- manipulation comparisons.

5.1.1 The current study. Researchers have successfully manipulated prototype perceptions for a number of health risk behaviours (Blanton et al., 2001; Litt & Stock, 2011; Todd & Mullan, 2011), and have linked change in prototype perceptions to change in behaviour (Teunissen et al., 2012). Prototype manipulation studies have employed various methodologies, including conducting observations of drinking behaviour in bar-laboratory settings (Teunissen et al., 2012), and manipulating prototype perceptions with Facebook profiles (Litt & Stock, 2011) and newspaper articles (Blanton et al., 2001; Todd & Mullan, 2011). The current study sought to manipulate prototype perceptions using a fabricated newspaper article that purported to explain the results of a "population survey" about sun-related behaviours. A similar methodology has been used in previous research (Blanton et al., 2001; Todd & Mullan, 2011). In the current study, a newspaper article referred to the results of a fake population survey about sun protection and sun exposure, and perceptions of those who "Do (not) sun protect as often as they should". Prototype perceptions were targeted with statements that described the typical incidental exposer using either positive or negative characteristics. The characteristics mentioned in each stimulus were determined based on results from Study 1 (see Chapter 3) and Study 2 (see Chapter 4).

Importantly, a comprehensive assessment of incidental sun exposure was developed for use in this study. The sun-diary protocol asked about participants' time spent in the sun on the weekend, activities undertaken while outdoors, clothing worn when in the

sun, and whether or not sunscreen had been applied. This sun diary was adapted from previous research (Kimlin et al., 2009). Additionally, skin reflectance spectrophotometry was used as an objective measure of skin colour in this study. This tool was used to detect change in skin colour over time. Change in skin colour has been detected using skin reflectance spectrophotometry over various periods of time, up to 12-months (Mahler, Kulik, Gerrard, & Gibbons, 2007). The current study aims to detect difference in skin colour between experimental groups at a 1-month follow-up.

5.1.2 Research Questions. The aims of this study were two-fold. Using a (3) x 3 Repeated Measures Factorial design, this study set out to test whether a brief intervention could manipulate prototype perceptions. Furthermore, an aim of this study was to investigate whether a change in prototype perceptions could lead to detectable cognitive and behavioural changes at a one-month follow-up. It was expected that the brief intervention would lead to changes in prototype perceptions such that those who were exposed to positive information about the prototypical incidental exposer would report greater favourability of, and similarity to, the prototype at post-test. Those who were exposed to negative information about the prototype were expected to report lower levels of favourability of, and similarity to, the prototype at post-test. Perceptions of the prototypical incidental exposer should have remained unchanged for those in the control condition who read information about an unrelated health behaviour. Behavioural willingness and intentions were expected to change in the same direction as prototype perceptions for each experimental group. However, given that prototype perceptions were not related to behavioural willingness in Study 2, willingness may not mediate the effect of prototype perceptions on behaviour. Given previous evidence of a direct pathway between prototype perceptions and behaviour (see Study 2; Todd et al., 2014), behavioural change could be detected at follow-up, irrespective of changes to

behavioural willingness.

5.2 Method

5.2.1 Participants. In total, 231 North Queensland community participants were recruited to the study. This included 62 (27%) males and 169 (73%) females. The 231 participants were randomised into one of three groups; Control group (*n*=65), Positive prototype information group (*n* =90), and Negative prototype information group (*n*=76). All participants completed baseline questionnaire and brief post-manipulation check immediately following the manipulation in the initial session. Approximately four weeks after the first session, 181 individuals returned to complete the follow-up portion of the study. Of those, 49 were male (27.1%) and 132 were female (72.9%), ranging in age from 17 to 82, *M*=30.83; *SD*=13.83 years). This represents a return rate of 78.3% from the original recruited sample.

5.2.1.1 ***Exclusions*** Skin reflectance spectrophotometry (described below) was used in this study as an objective measure of skin colour. It is important that only natural skin colour changes were captured in this research, thus those who had an artificial (spray-on) tan in the two weeks prior to participation at either recruitment wave were excluded from analyses. Furthermore, as this research was specifically interested in the behaviour of participants who were accustomed to living in the North Queensland UVR environment, those who had lived in North Queensland for less than one year were also excluded from data analysis.

5.2.2 Study Design. The study was advertised as the "Health Behaviours in the Tropics Study" to reduce the emphasis on sun-related behaviour. Research has reported that simply measuring health-related behaviours can lead to cognitive and behavioural change (Mankarious & Kothe, 2014; Todd & Mullan, 2011). This phenomenon has

been termed the mere-measurement effect. To reduce the risk of a mere-measurement bias specific to sun exposure, this study assessed a range of health-related behaviours. The full questionnaire included items about sun-related behaviours, as well as other health-related behaviours including cigarette smoking, physical activity, and alcohol consumption. Similarly, participants' height and weight were also measured as filler assessments alongside skin reflectance spectrophotometry. Participants also completed a speeded-response computer task as part of the full study protocol. However, this data is not of interest to the research questions, thus not included in the analyses described below.

5.2.3 Materials. A questionnaire was constructed to assess demographic variables, constructs of the PW model, and sun-related behaviour. Items were adapted from, or informed by past research (Dobbinson et al., 2013; Dobbinson, Wakefield, Jamsen, et al., 2008; Hill et al., 1993) where possible, or were created based on theory (Gibbons et al., 2003) as well as findings of Study 1 (Morris & Swinbourne, 2014) and Study 2. A copy of the questionnaire is included in the full study protocol, attached as Appendix H. Skin colour was measured using a Konica Minolta CM-2500d skin reflectance spectrophotometer at baseline and follow-up assessments.

5.2.3.1 ***Demographics.*** Demographic items include age, gender, ethnicity, skin type, hair colour, education, location of residence, number of years residing in NQ, as well as personal and vicarious experience with skin cancer. A summary of sample characteristics can be found in Table 5.1, below. Skin type was assessed in the same way as that described in Study 2. This single-item assessment of skin type has been used previously in research to provide an indication of skin sensitivity (e.g. Branstrom et al., 2004). Participants were also asked to record their natural hair colour against the following list of options: blonde, light brown, dark brown, black, red or grey. Personal

experience with skin cancer was assessed with the item “Have you ever had skin cancer? If so, what type?” Vicarious experience with skin cancer was assessed with the item “Have any of your family or friends ever had skin cancer? If so, what type?” In each case, response options included “No”, “Yes, melanoma”, “Yes, non-melanoma”, “Yes, but not sure which type”.

5.2.3.2 *PW model.* *Intentions.* In the current study, intention was assessed in replacement of behavioural expectation. This is because past research has often suggested that intention is a strong predictor of behaviour (Conner & Armitage, 2001; Conner & Sparks, 2015; McEachan, et al., 2011), compared to expectation. Therefore, it is important to compare the predictive utility of willingness and intention. Behavioural intentions for all three sun-related behaviours (incidental exposure, sunbathing, and sun protection) were assessed. Intention to incidentally expose oneself was assessed with the single-item ‘I intend to go outside without sun protection in the next two weeks’. Sunbathing intention was measured with the item “I intend to sunbathe at least once in the next two weeks”, while sun protection was assessed with the item “I intend to always use sun protection when out in the sun in the next two weeks”. All responses were made on a 7-point Likert scale (1= *strongly disagree*, 7= s*trongly agree*) such that higher scores indicate stronger intentions.

Behavioural Willingness. Behavioural willingness is typically assessed by presenting a risky scenario and providing responses of varying degrees of riskiness, as described by (Gibbons & Gerrard, 1995). In the current study, willingness to engage in incidental sun exposure, sun protective behaviour, and sunbathing were each assessed in this way.

Willingness to incidentally expose was assessed with the item: “Imagine that it is the weekend and you are at home in the middle of the day. You are about to walk outside to your backyard and into the sun. How likely are you to…” Response options included the following: “Put on a long-sleeved shirt, wide brimmed hat and/or sunscreen before you go outside?”, “Go outside without sun protection?”, “Put on a wide-brimmed hat before you head outside?”. The scenario presented to measure willingness to sunbathe was “Imagine that you are on holidays with your friends when someone suggests that you should all go lie in the sun to tan.” Participants then rated how likely they were to do each of the following: “Apply sunscreen before lying on your towel in the sun”, “Sit nearby your friends, making sure that you are in the shade”, “Grab your towel and lay in the sun”. Finally, willingness to sun protect was measured with “Imagine that it is the weekend and you have planned to meet some friends at a park or at the beach and you are about to leave home.” Responses were taken to the following options: “Leave home without sun protection”, “Pack a long-sleeved shirt, wide brimmed hat and sunscreen to take with you”, “Grab a wide-brimmed hat before you leave home”. All responses were made on a 7 point Likert scale (1= *very unlikely*, 7= *very likely*) and scores were reverse scored where appropriate such that higher scores indicate greater willingness to engage in each behaviour.

Prototype Perceptions. A description of a prototype was provided to participants as it was first described by (Gibbons, Gerrard, et al., 1995). Following this, participants were asked to rate their favourability of and similarity to the typical person who acquires a bit of colour whilst going about their usual daily activities, always protects themselves from the sun, and deliberately sunbathes. Responses to each item were made on a 7-point Likert scale (1= *not at all favourable/not at all similar*, 7= *extremely favourable/extremely similar*).

5.2.3.3 ***Skin Colour.*** A Konica Minolta CM-2500d skin spectrophotometer was used to measure skin colour. The device emits a light and measures the surface reflectance, in this case from the skin, and provides a reading of skin colour (for further description see: Fullerton et al., 1996). Colour data is expressed on three scales; L* a* and b*. L* is an indication of brightness on a black/white scale where higher values indicate more brightness, or less tan. The second scale, a* provides an indication of colour on green/red scale where positive values on a* indicate greater levels of redness in the skin. The b* scale provides an indication of colour on the blue/yellow scale, where positive values on b* indicate the colour yellow, or more tan (Seitz & Whitmore, 1988). In the current study, L* and b* scales are of particular interest, as these are the scales that are susceptible to tanning. As in other research (Buller, Buller, Beach, & Ertl, 1996; Mahler et al., 2007), a* readings are discarded because this scale is susceptible to erythema or sunburn, which is an unreliable measure of skin colour. Three consecutive readings were taken for each participant at each anatomical site, and averaged for use in analyses.

5.2.3.4 ***Sun Related Behaviour.*** In order to obtain information about UVR exposure, participants completed a sun-diary for the weekend prior to participation at T1 and T2 (see Appendix H). Weekend sun exposure is often targeted in sun-related behavioural research (Dobbinson, Wakefield, Hill, et al., 2008; Dobbinson, Wakefield, Jamsen, et al., 2008; Makin et al., 2013). Focusing on this short period of time may lead to more accurate recall of behaviour. Furthermore, focusing on weekend behaviour may provide an indication of volitional sun-related behaviour outside of conventional work or business hours (Dixon, Lagerlund, et al., 2008). The sun diary that was used in this study was adapted from Kimlin et al. (2009). The sun-diary asked about time spent outdoors, activities engaged in while outdoors, type of clothing worn, and whether

sunscreen was applied. Time spent outdoors was measured by asking participants to select the amount of time spent outdoors in three time intervals including; up to 30 minutes, 31-60 minutes, and over 60 minutes. This information was obtained for three different periods of the day; including 8-11am, 11am-2pm, 2-5pm. These time periods were chosen as they reflect the period of the day that requires protection from UVR during Spring/Summer in Townsville, NQ (ARPNSA, 2007).

Type of clothing worn during each period over each weekend-day was captured as self-reported qualitative data, which was later calculated as percent of body covered. With regard to sunscreen use, participants were required to indicate whether they wore sunscreen for each time period of the day, and were also asked to shade in a body map (Kimlin et al., 2009) indicating the parts of the body that sunscreen was applied to. A list of unique items of clothing were compiled (e.g. t-shirt, board shorts, cap) and percent of body covered was calculated for each item. Conservative estimates were made based on the rule of nine, which states that the body may be divided into nine equal parts (Hettiaratchy & Papini, 2004; Knaysi, Crikelair, & Cosman, 1968). A similar method of calculating percent of body covered has been used previously in research (Dobbinson, Wakefield, Jamsen, et al., 2008; Hill et al., 1993; Hill et al., 1992). An independent scorer was recruited to replicate this process, and calculations were cross-checked. Any discrepancies were discussed until resolved. A table with items of clothing and corresponding proportion of coverage is attached as Appendix I. The same process was carried out for percent of body covered by sunscreen. Percent of body covered with clothing and percent of body covered with sunscreen were treated as two separate variables in analyses. This is because sunscreen has been criticised for not providing the same level of cover as that provided by appropriate clothing (Bauer,

Buttner, Wiecker, Luther, & Garbe, 2005; Gambichler, Dissel, Altmeyer, & Rotterdam, 2010; Turner & Harrison, 2014).

A single variable was created to calculate total exposure when out in the sun. For this analysis, data pertaining to percent of body covered with clothing was used. Total exposure was calculated by multiplying percent of body exposed (100% of body - % of body covered with clothing) with duration of time spent outdoors, where time spent outside was above zero minutes. Duration outside was weighted according to the categories of time spent outside as follows: up to thirty minutes = 0.5 hours; up to 60 minutes =1 hour; more than 60 minutes = 2 hours. This weighting procedure is similar to that used by Whiteman et al. (2006). A total exposure score was calculated for each time period on the Saturday and Sunday prior to baseline and follow-up assessments where more than zero minutes were spent outdoors. Weighting for time of day was not carried out, as UV-index data suggests that sun protection is required for all time periods between 8am and 5pm during Spring-Summer months in Townsville, North Queensland (ARPNSA, 2007). A weekend average was calculated by summing total exposure scores for each time slot, and dividing by number of times more than zero minutes was spent outdoors. Time periods with zero minutes spent outside were excluded from the average calculations so as not to reduce estimates of exposure. Average weekend exposure was calculated for weekends immediately prior to both baseline and follow-up used in subsequent analyses. Histograms for mean exposure at baseline and follow-up weekends are provided as Appendix J.

5.2.3.5 ***Prototype Manipulation.*** The manipulation consisted of a fabricated newspaper article describing population survey results about perceptions of the typical person who incidentally exposes themselves to the sun. This description was framed in either a positive or negative light, depending on group membership. Each of the

descriptions included two key statements to the manipulation. The first was an explicit statement regarding the nature of perceptions as either positive or negative. For example “Perceptions are quite positive/negative for those who gradually acquire a bit of colour while going about their daily activities”. The second statement targeted prototype characteristics reported during Studies 1 and 2 (see Chapters 3 and 4). For example, the Positive group read a statement that those who acquire a bit of colour without having to try were considered lucky and carefree, whereas those in the Negative group read the statement that those who forego sun protection for a bit of colour are lazy and careless. In fitting with the cover story that the survey was about health behaviours, those in the Control group read a brief article about the importance of physical activity. The stimuli that were used for the Positive, Negative and Control conditions are included in the full study protocol attached as Appendix H.2, H.3, and H.4 respectively.

5.3 Procedure

Community participants were recruited to participate in a two-part study about ‘Health Behaviours in the Tropics’. The study was advertised to undergraduate psychology students via print advertisements around campus and also via an online study sign up portal (SONA Systems). University staff members were recruited with an advertisement included in a weekly all-staff email bulletin. A Facebook page was created to recruit members of the North Queensland community. Snowball recruitment within community groups and workplaces also contributed to the success of recruitment. The study was approved by the James Cook University Human Research Ethics Committee (H5295; Approval noticed attached as Appendix K).

Once recruited to the study, participants were randomly allocated to one of three experimental groups. Participation in the study was completed individually; however in

cases where more than one participant attended the study at the same time, all participants were placed in the same experimental group. This was done to protect the cover story, and reduce the likelihood of participants becoming aware of the manipulation. Participation took place in a private room at the University, in private at workplaces, or other locations, as requested by participants. The ability for flexible delivery and assessment was important for this study, as it facilitated community recruitment and reduced attrition at follow-up.

Participants completed a questionnaire about Health Behaviours in the Tropics (Part 1 attached as Appendix H.1). To reduce the emphasis on skin colour readings and maintain the cover story about multiple health behaviours under investigation, participant's weight and height was also measured in the session. Physical measures were taken after the completion of the questionnaire, which provided a period of rest after arrival. A tape measure and scales were provided, but participants were allowed to self-report height and weight if they preferred. Participants' skin colour was measured with three consecutive measurements at three body sites at both baseline and follow-up. The three body sites included the inner left arm, the top of the left hand, and the left cheek. These sites were chosen to represent a low exposure site (inner left arm) and a high exposure site on both the body (left hand) and face (left cheek). In the current study, reflectance readings were recorded at 400nm and 420nm. In order to ensure a reliable measure at each site, three consecutive readings must fall within 1.0 reflectance points at 400nm (Brodie et al., 2013). Prior to each participant, the spectrophotometer was calibrated to the lighting conditions in each setting.

After the spectrophotometry was completed, participants were provided with a fake newspaper article to read. Up until this point, the investigator and participant were blind to group membership. Randomisation to experimental groups (positive, negative, or

control) occurred when the reading material was provided to participants. Participants were also told that they would be asked to answer a few questions about the content afterwards to encourage reading and comprehension of the article. Participants were asked to rate their impression of the behaviour described in the newspaper article on visual analogue scales for the relevant characteristics. For example, scales included *lazy/proactive*, *careless/careful* for the Negative group, and *lucky/unlucky*, *carefree/worried* for the Positive group. As a manipulation check, participants rated their favourability of and similarity to the typical person who incidentally exposes themselves to the sun. This rating was given on the same scale used in the initial questionnaire (1= *not at all favourable/similar*, 7= *extremely favourable/similar*).

Participants were then contacted approximately three weeks later and invited to take part in the follow-up part of study. The follow-up session was scheduled to take part approximately four weeks after the participant's initial session. On average, there were 26 (SD= 9.7) days in the follow up period. At the follow-up session, the questionnaire only consisted of items relating to sun-related behaviours. The Part 2 questionnaire is included in the full study protocol attached as Appendix H.9. Skin spectrophotometry was also performed again as a measure of skin colour. Participants were then debriefed about the deception in the study prior to leaving the Part 2 session. The initial session took approximately 45-minutes to complete, and the follow-up session took approximately 20-minutes to complete. All 412 testing sessions were conducted by a single investigator (KM). As compensation for their participation, undergraduate university students were offered course credits and community members were offered cinema or coffee vouchers at both waves of recruitment.

5.4 Results

5.4.1 Treatment of Data and Statistical Analyses. Spectrophotometry data were

downloaded from the Konica Minolta CM-2500d skin spectrophotometer using SpectraMagic NX software. The L* and b* readings for each colour reading were manually recorded for each participant and entered into SPSS, Version 21.0. The three readings taken at each anatomical site were averaged for use in analyses.

First, a series of one-way ANOVAs were conducted using to check group randomisation at baseline. Following this, two (3) (baseline vs. post-test vs. follow-up) x 3 (groups: positive vs. negative vs. control) repeated-measures ANOVAs were conducted for favourability and similarity separately to test whether the intervention successfully manipulated prototype perceptions. For these analyses, the main effect of time was examined to determine whether prototype perceptions differed at each point of assessment. Of most importance was the time x group interaction. This interaction was examined to determine whether prototype perceptions varied at each point of assessment (baseline vs. post-test vs. follow-up) by group (control vs. positive vs. negative) membership. Subsequently, a series of (2) (time: baseline vs. follow-up) x 3 (group: positive vs. negative vs. control) repeated-measures ANOVAs were conducted separately to examine whether there were any changes on any other dependent variables between baseline and follow-up assessments.

Analyses were conducted separately for each of the dependent variables, including: total sun exposure; skin reflectance spectrophotometry ratings at each anatomical site; and cognitive variables of interest. In all cases, main effects of time and condition, and a time x condition interaction were examined to determine whether there was any change between assessment sessions, and whether there were any pre-post changes on dependent variables as a result of the experimental manipulation. For all analyses, Mauchly's test of sphericity was examined to ensure this assumption had been met (Field, 2009). Where sphericity was violated, Greenhouse-Geiser statistic is reported.

Post-hoc comparisons were performed using Tukey's HSD correction. Qualitative data generated from the sun diary was entered into NVivo (QSR, Melbourne; Australia) version 10.0, and analysed for thematic content.

5.4.2 Sample Characteristics. A summary of the sample characteristics are provided in Table 5.1 below. Data is presented separately for the total sample (*n*=231), and for those were either lost to attrition or were excluded from the study (*n*=76), and for the final sample (*n*=155).

Table 5.1
Sample Demographic Information

	Baseline Group *N*=231			Lost to Attrition/Excluded *N*=76			Final Sample *N*=155		
	Control *n* = 65	Positive *n* = 90	Negative *n* = 76	Control *n* = 22	Positive *n* = 31	Negative *n* = 23	Control *n* = 43	Positive *n* = 59	Negative *n* = 53
Gender									
Male	17 (26.2)	25 (27.8)	20 (26.3)	5 (22.7)	8 (25.8)	2 (8.7)	12 (27.9)	17 (28.8)	18 (34.0)
Female	48 (73.8)	65 (72.2)	56 (73.7)	17 (77.3)	23 (74.2)	21 (91.3)	31 (72.1)	42 (71.2)	35 (66.0)
Age									
Range	17 -58	17 – 82	17 – 81	17 – 37	17 – 59	17 – 53	17 – 58	17 – 82	17 – 81
M	28.08	30.86	29.89	23.0	26.13	25.78	30.67	33.34	31.68
(SD)	(12.14)	(14.01)	(12.57)	(6.41)	(10.85)	(9.70)	(13.55)	(17.90)	(13.32)
Education									
< Year 12	4 (6.2)	9 (10.0)	3 (3.9)	2 (9.1)	2 (6.5)	2 (8.7)	2 (4.7)	7 (11.9)	1 (1.9)
High School	33 (50.8)	31 (34.4)	28 (36.8)	10 (45.5)	12 (38.7)	10 (43.5)	23 (53.5)	19 (32.2)	18 (34.0)
Trade	3 (4.6)	6 (6.7)	4 (5.3)	2 (9.1)	2 (6.5)	1 (4.3)	1 (2.3)	4 (6.8)	3 (5.7)
Cert/Dip	9 (13.8)	15 (16.7)	11 (14.5)	2 (9.1)	6 (19.4)	2 (8.7)	7 (16.3)	9 (15.3)	9 (17.0)
U Grad	10 (15.4)	22 (24.4)	20 (26.3)	5 (22.7)	8 (25.8)	6 (26.1)	5 (11.6)	14 (23.7)	14 (26.4)
P Grad	5 (7.7)	7 (7.8)	10 (13.2)	1 (4.5)	1 (3.2)	2 (8.7)	4 (9.3)	6 (10.2)	8 (15.1)
Other	1 (1.5)	-	-	-	-	-	1 (2.3)	-	-
Skin Type									
Just burn	17 (26.2)	30 (33.3)	25 (32.9)	4 (18.2)	10 (32.3)	8 (34.8)	13 (30.2)	20 (33.9)	17 (32.1)
Burn, then tan	34 (52.3)	48 (53.3)	42 (55.3)	13 (59.1)	16 (51.6)	13 (56.5)	21 (48.8)	32 (54.2)	29 (54.7)
Just tan	14 (21.5)	12 (13.3)	9 (11.8)	5 (22.7)	5 (16.1)	2 (8.7)	9 (20.9)	7 (11.9)	7 (13.2)
Hair Colour									
Blonde	12 (18.5)	15 (16.7)	11 (14.5)	5 (22.7)	4 (12.9)	6 (26.1)	7 (16.3)	11 (18.6)	5 (9.4)
Light Brown	22 (33.8)	34 (37.8)	34 (44.7)	7 (31.8)	14 (45.2)	8 (34.8)	15 (34.9)	20 (33.9)	26 (49.1)

Dark Brown	26 (40.0)	32 (35.6)	26 (34.2)	9 (40.9)	10 (32.3)	8 (34.8)	17 (39.5)	22 (37.3)	18 (34.0)
Black	5 (7.7)	6 (6.7)	4 (5.3)	1 (4.5)	3 (9.7)	1 (4.3)	4 (9.3)	3 (5.1)	3 (5.7)
Red	-	2 (2.2)	1 (1.3)	-	-	-	-	2 (3.4)	1 (1.9)
Grey	-	1 (1.1)	-	-	-	-	-	1 (1.7)	-
Skin Cancer History									
Personal									
Nil	59 (90.8)	81 (90.0)	69 (90.8)	21 (95.5)	28 (90.3)	23 (100)	38 (88.4)	53 (89.8)	46 (86.8)
Melanoma	3 (4.6)	3 (3.3)	1 (1.3)	1 (4.5)	1 (3.2)	-	2 (4.7)	2 (3.4)	1 (1.9)
Non-melanoma	3 (4.6)	5 (5.6)	6 (7.9)	-	2 (6.5)	-	3 (7.0)	3 (5.1)	6 (11.3)
Yes, unknown	-	1 (1.1)	-	-	-	-	-	1 (1.7)	-
Other									
Nil	19 (29.2)	34 (38.2)	22 (28.9)	7 (31.8)	15 (48.4)	11 (47.8)	12 (27.9)	19 (32.8)	11 (20.8)
Melanoma	24 (36.9)	22 (24.7)	21 (27.6)	8 (36.4)	6 (19.4)	6 (26.1)	16 (37.2)	16 (27.6)	15 (28.3)
Non-melanoma	11 (16.9)	16 (18.0)	16 (21.1)	3 (13.6)	5 (16.1)	4 (17.4)	8 (18.6)	11 (19.0)	12 (22.6)
Yes, unknown	11 (16.9)	17 (19.1)[a]	17 (22.4)	4 (18.2)	5 (16.1)	2 (8.7)	7 (16.3)	12 (20.7)[a]	15 (28.3)

Note: [a]data missing for *n*=1.

5.4.2.1 ***Skin Colour.*** A series of one-way ANOVAs were conducted to determine whether mean spectrophotometry readings corresponded with self-reported skin type. Results indicated that there were significant differences in spectrophotometry values based on self-reported skin type, at all anatomical sites, for both L* and b* colour indices, and in the expected directions. For the L* index, higher values indicate less tan. The pattern of descriptive statistics presented in Table 5.2 indicated that those with sensitive (typically fair) skin had higher L* values (less tan) than those with moderate and non-sensitive (typically darker) skin. In contrast, higher b* values indicate more tan. Thus, the results indicated that those with sensitive (typically fair) skin were less tanned than those with moderate and non-sensitive (typically darker) skin. The descriptive statistics, and *F*-values for these analyses are provided in Table 5.2 below. The consistency between these two skin measures indicates that skin colour has been reliably attained.

Table 5.2
Spectrophotometry readings by self-reported skin type for each anatomical site.

		Sensitive *M*(SD)	Moderate *M*(SD)	Non-sensitive *M*(SD)	*F*-value
L*	Arm	69.77 (1.80)	67.65 (3.14)	64.55 (5.11)	21.44***
	Hand	64.91 (3.48)	61.19 (4.88)	57.76 (5.54)	20.84***
	Face	61.84 (5.16)	60.15 (3.92)	58.73 (4.66)	3.83*
b*	Arm	13.68 (4.18)	15.52 (2.28)	17.12 (2.56)	11.13***
	Hand	17.65 (1.90)	19.24 (1.87)	20.13 (1.85)	16.99***
	Face	14.97 (1.57)	16.12 (2.02)	17.42 (1.73)	10.88***

Note: L* (black/white) higher values = less tan; b* (blue/yellow) higher values = more tan) Arm & Hand n=154, Face n=110. *p<.05, **p<.01, ***p<.001

5.4.2.2 ***Attrition and Exclusions.*** The data set was screened for exclusions according to the criteria outlined earlier. There were 19 persons (1 male, 18 females) in

total who had an artificial tan in the two weeks prior to either T1, or T2. Furthermore, there were 11 (1 male, 10 females) participants in total who had been living in NQ for less than one year. After applying these exclusion criteria, 30 participants were excluded from data analysis. This research is interested in both between- and within-group differences between pre- and post- manipulation, therefore it is necessary that data is available at both T1 and T2 for all participants. Therefore, participants who did not complete the follow-up component of the research were excluded from analyses. This resulted in a further 46 participants being excluded from the sample. After these exclusion criteria were applied, the final sample consisted of 155 participants. A participant flow diagram is presented in Figure 5.1 below.

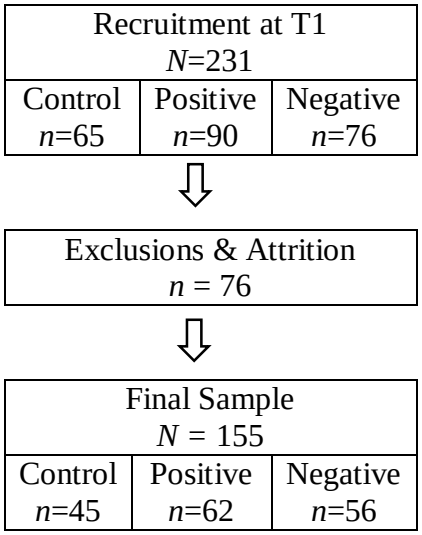

Figure 5.1. Participant flow diagram. Exclusion criteria includes: those who had spray-on tan < 2 weeks prior to T1 and/or T2; those who lived in NQ < 1 year.

Analyses were conducted to determine whether there were any significant differences on demographic variables between those who completed the study, and those who were excluded or did not return to complete the follow-up part of the study.

An independent samples t-test was conducted to compare mean age of those who were excluded and those who were not. Results of this analysis indicated that those who were excluded from analyses (M = 25.12, SD = 9.38) were significantly younger on average, than those who remained in the study (M = 32.03, SD = 13.96), $t_{(229)}$= 3.91, p=.000. However, when examined by assignment to experimental group, this difference no longer existed (see Section 5.4.4.1 below).

5.4.3 Sun behaviours. A sun diary was used to capture participant's sun exposure at the weekend immediately prior to baseline, and follow-up assessments. Participants indicated their time spent outdoors over 3 x 3 hour periods (8am – 11am, 11am – 2pm, 2pm – 5pm) on both Saturday and Sunday. Participants were also asked to record the items of clothing worn during each period of time, whether sunscreen was applied during this time, and to what areas of the body, and the activities undertaken during each time slot spent outdoors. Overall, relatively few participants spent more than 60-minutes outdoors in any period of the day. A little over half of the sample went outdoors during the peak UVR hours (11am – 2pm) at baseline. On the weekend immediately prior to follow-up, the proportion of participants spending any time outside during the peak UVR hours decreased to just under half of the sample. Figure 5.2 provides a representation of the percentage of participants spending time outdoors during each time slot at baseline and follow-up, by weekend day.

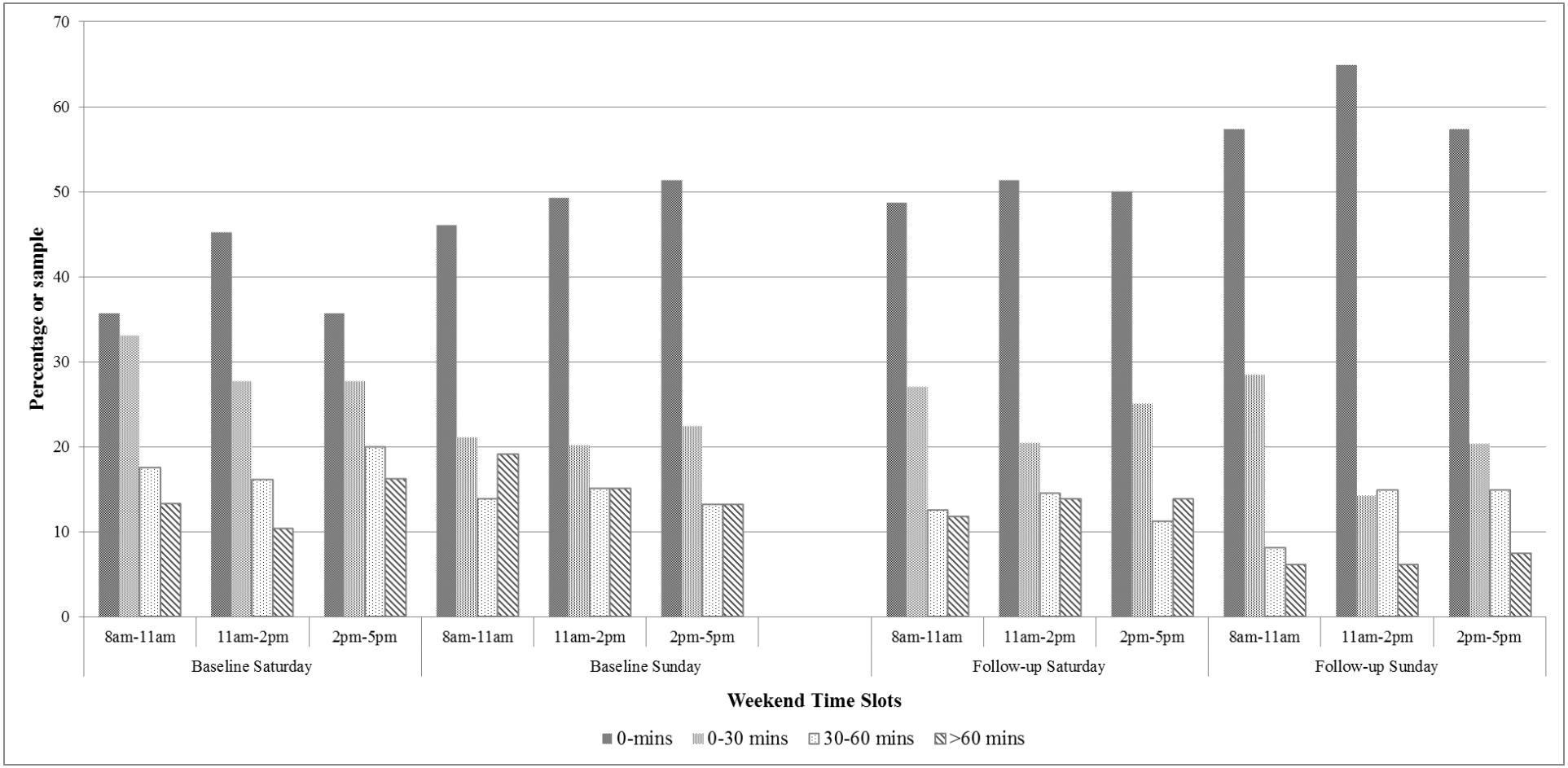

Figure 5.2. Percentage of sample spending time outdoors for each time slot at Baseline and Follow-up, by weekend day.

5.4.3.1 ***Outdoor Activities.*** Participants recorded their outdoor activities in open-format. The data were later imported to NVivo version 10 for analysis. The purpose of this analysis was to generate categories of activities undertaken outdoors. A 'Node' was created in NVivo for each unique type of outdoor activity. Results of this analysis indicated that 21 unique types of activities were engaged in by participants. These 21 activities could be assigned to one of five general categories. A blind second-rater was employed to duplicate this process so that types of activities generated, and assignment to categories could be cross checked. Any discrepancies to arise between the two ratings were discussed until resolved. A table with the 21 activities and assignment to categories is provided as Appendix L.

The data were then coded using the list of 21 activities derived earlier. In the case where participants listed more than one activity in any given time slot, the first activity listed was coded and subsequent activities were left uncoded. Figure 5.3 includes data for the percentage of sessions that were dedicated to engaging in each type of activity. Perhaps unsurprisingly, the most frequently reported reason for going outside was for leisurely pursuits such as exercise, socialising, or sporting activities. This was closely followed by household activities such as gardening, cleaning and animal care. Approximately one-fifth of the reported reasons for being outside was for transit requirements, for example getting to work, or other destinations. There was only one incident of deliberate tanning at the weekend immediately prior to baseline, and again at follow-up.

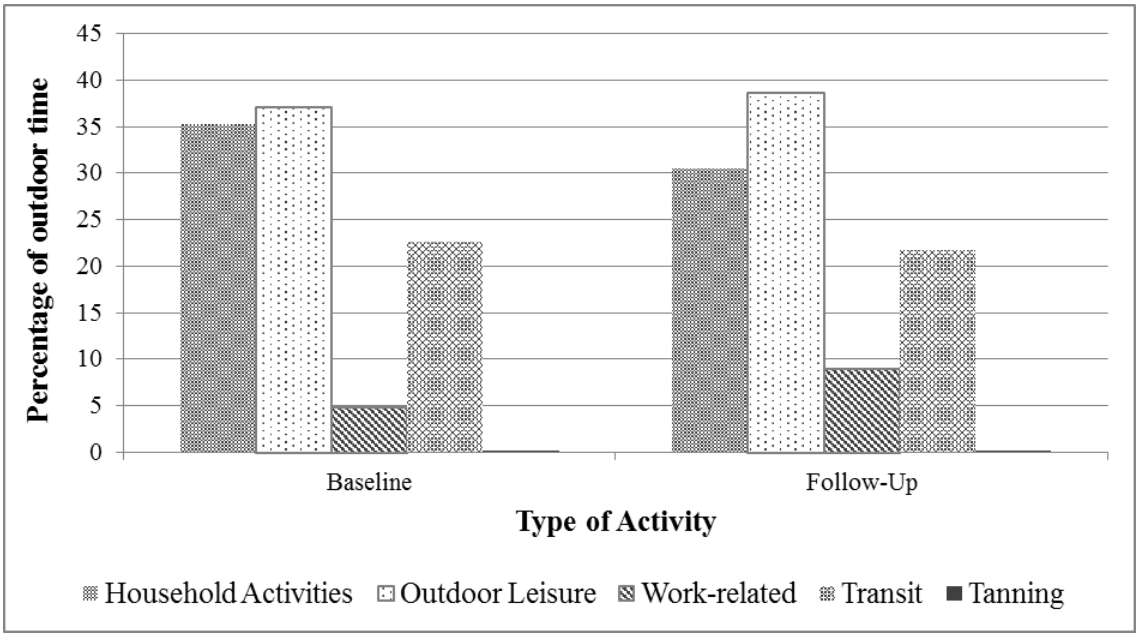

Figure 5.3. Percentage of outdoor time dedicated to each type of activity, by weekend.

5.4.3.2 ***Sunscreen Use.*** Use of sunscreen was reported alongside outdoor activities. Participants were instructed to record whether they had applied sunscreen during any of the time periods on each day. The mean percentage of body covered by sunscreen is provided in Figure 5.4 below. Overall, 46 (29.6%) participants reported wearing sunscreen at any time on Saturday, and 41 (26.4%) participants on the Sunday prior to baseline assessment. On the weekend immediately prior to follow-up assessment, the number of persons who applied sunscreen remained relatively stable with 37 (23.8%) participants applying sunscreen at any point during Saturday, and 29 (18.7%) on Sunday.

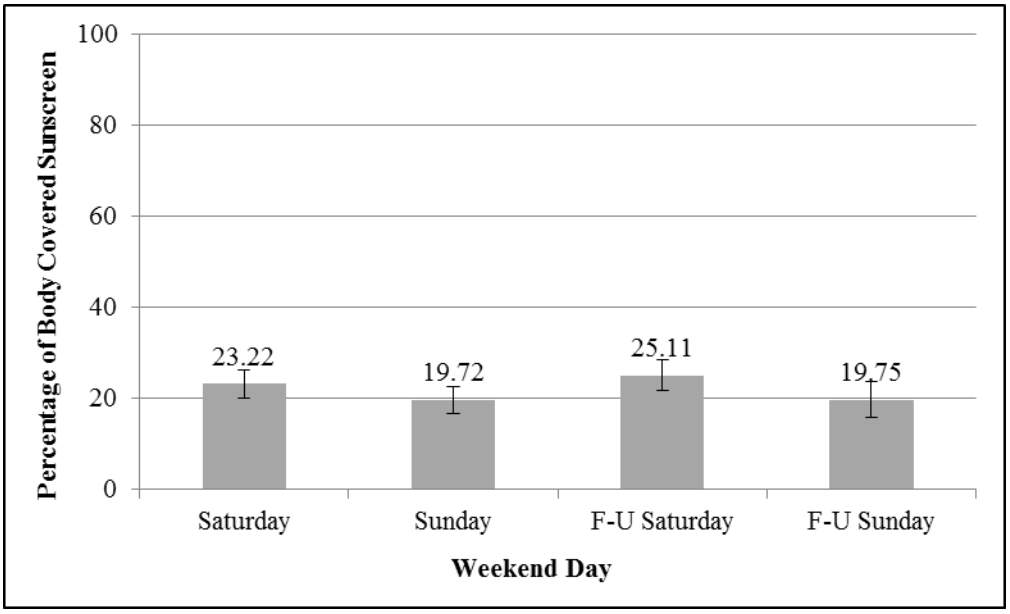

Figure 5.4. Mean percentage of body covered by sunscreen (error bars represent standard error of the mean), by weekend day.

5.4.3.3 ***Clothing.*** Type of clothing worn during each outdoor time period was also recorded on the sun diary in open-format. Data were coded and total proportion of body covered with clothing was calculated for each time period, and an average proportion of body covered with clothing was calculated for each weekend day. The mean percentage of body covered by clothing on each weekend day, with standard error bars is presented in Figure 5.5 below.

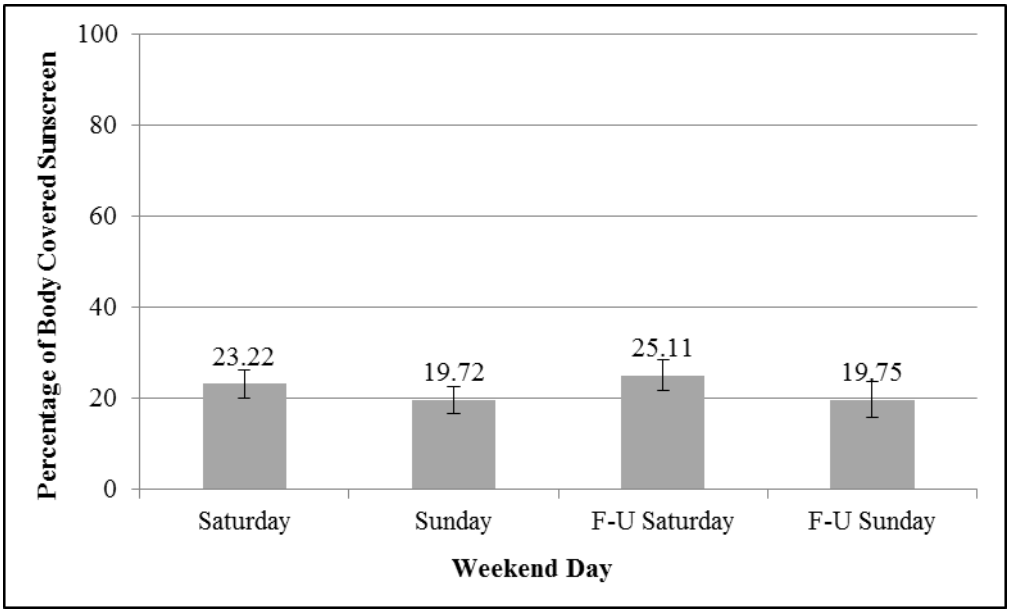

Figure 5.5. Mean percentage of body covered by clothing (error bars represent standard error of the mean), by weekend day.

5.4.4 Randomisation Checks. The following analyses were completed using data for the Final Sample (*n*=155).

5.4.4.1 ***Demographic Variables.*** Results of a one-way ANOVA indicated that there were no differences in mean age of participants across the three experimental groups in the final sample $F_{(2,152)}$ =.48, *p*=.62. Analyses were also conducted to examine group equivalence for gender, self-reported skin type, and history with skin cancer. Separate χ^2 tests of independence were all non-significant (all *p*'s >.05), indicating that there were no significant differences in demographic variables between experimental groups at baseline. The descriptive statistics for these analyses can be found in Table 4.1 presented earlier, and a table with the χ^2 statistics can be found as Appendix M.

5.4.4.2 ***Follow-up period.*** Results of a one-way ANOVA indicated that there was a significant difference in the number of days for the follow-up period between the three experimental groups $F_{(2,160)}$ = 9.17, *p*=.000. Post-hoc analyses indicated that the control

group had significantly fewer follow-up days – roughly one week (*M* = 20.8, *SD* = 6.39) than both the Positive (*M* = 27.39, *SD* = 10.10) and Negative (*M* = 28.02, *SD* = 9.66) groups. There was no significant difference in the number of days in the follow-up period between the Positive and Negative experimental groups. Follow-up duration was entered into subsequent analyses as a covariate where appropriate.

5.4.4.3 ***Dependent variables*** A series of one-way ANOVAs were conducted to examine group equivalence on dependent variables at baseline. The descriptive statistics for these analyses can be found in Table 5.3 below. Skin colour data, behavioural variables including weekend exposure score, and weekend sunscreen use, and cognitive variables of interest including intention, willingness, prototype favourability, and prototype similarity were examined. The results indicated that baseline differences existed between groups for weekend sun exposure, prototype favourability, and willingness (all *p*'s<.05). Subsequent Post-Hoc analyses using Tukey HSD detected baseline differences between the Control group and Positive group such that the control group reported higher weekend sun exposure (*p*=.04), greater willingness to incidentally expose (*p*=.02), and more favourable prototype perceptions (*p*=.01). Earlier analyses indicated that there were no significant differences on demographic variables between experimental groups at baseline. The main analyses examine within-group differences between baseline and the follow-up period, thus the differences between the Control and Positive groups should not impact on the outcomes of the analyses or conclusions of the research project. No other significant group differences were detected for any variables (all *p*'s >.05).

Table 5.3
Baseline descriptive statistics for dependent variables, by group.

		M (SD)			
	n	Control	Positive	Negative	*F*-value
Exposure Score	148	53.78 (32.95)	40.39 (20.26)	48.91 (29.25)	3.14*
Sunscreen Use	151	5.67 (12.46)	4.79 (8.57)	8.23 (14.35)	1.20
BI	154	5.19 (1.75)	4.58 (2.14)	4.42 (1.95)	1.98
BW	154	5.36 (1.41)	4.44 (1.67)	4.79 (1.74)	3.94*
P. Favourability	154	4.67 (1.06)	3.97 (1.45)	4.49 (.95)	5.00*
P. Similarity	154	4.53 (1.80)	4.19 (2.12)	4.45 (1.98)	.45

Note: * $p<.05$, ** $p<.01$, *** $p<.001$. Exposure Score = % body exposed, weighted by time spent outside on weekend prior to baseline participation. Sunscreen = % body covered in sunscreen on weekend prior to baseline participation. BI= intention to incidentally expose. BW= willingness to incidentally expose. P. Favourability & P. Similarity = incidental exposer prototype.

5.4.5 Manipulation Checks. A (3) (time) x 3 (condition) repeated measures ANOVA was conducted to determine whether the prototype manipulation presented to participants had any impact on prototype favourability or similarity ratings. Prototype perceptions measured at baseline, immediately post-test, and at the one-month follow up were compared across the three conditions. Pearson's *r* bivariate correlations indicated that prototype perceptions were unrelated to demographic variables such as age, gender or skin type (all *p*'s >.05). Separate analyses were conducted for Prototype Favourability and Similarity.

5.4.5.1 ***Prototype Favourability.*** The results of the (3) (Time) x 3 (Condition) repeated measures ANOVA for Prototype Favourability ratings indicated that there was no main effect of Condition ($F_{(2, 148)} = .2.62$, $p = .08$) on prototype favourability across the three testing phases. However, there was a significant main effect of Time ($F_{(2, 296)} = 4.31$, $p = .014$, $\eta = .03$), and a significant Time x Condition interaction ($F_{(4, 296)} = 2.761$,

p = .036, η= .03). Inspection of the left hand panel of Figure 5.6 indicates that while Favourability ratings for the Control and Positive conditions remained relatively stable over time, those for the Negative group decreased between Baseline and Post-test but returned to initial levels at follow-up. Examination of mean ratings of prototype favourability indicates that the main effect of time is likely due to this interaction effect. Mean scores are presented in Figure 5.6 below to demonstrate this interaction.

5.4.5.2 ***Prototype Similarity.*** A second (3) (Time) x 3 (Condition) repeated measures ANOVA was conducted for Prototype Similarity ratings. The findings of this analysis indicated no main effects for either Time or Condition, nor a significant Time x Condition interaction (all p's >.05). This finding indicates that the manipulation did not successfully change perceptions of prototype similarity for either of the Experimental groups. These data are plotted in Figure 5.6, alongside prototype favourability ratings.

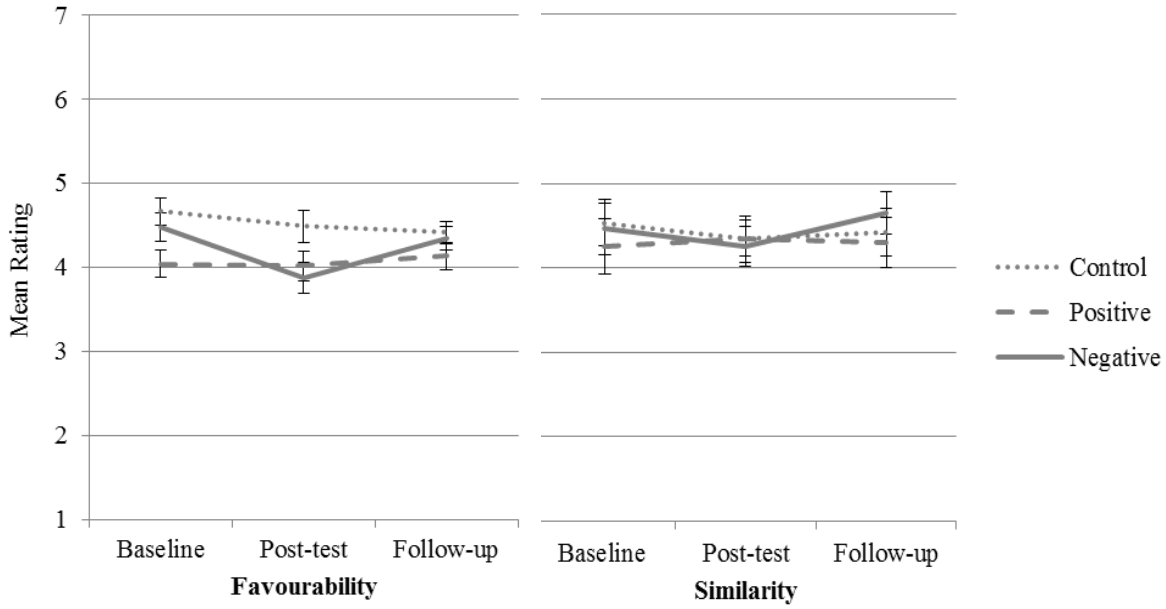

Figure 5.6. Mean Prototype Favourability and Similarity ratings at each Time point by experimental group. Error bars indicate Standard Error of the Mean.

5.4.6 Main Analyses. A series of repeated-measures ANOVAs were conducted to examine within-group differences between pre- and post- manipulation scores on the dependent variables. Separate analyses were conducted for each of the behavioural and cognitive dependent variables. These analyses are reported below, and descriptive statistics are available in Table 5.4.

5.4.6.1 ***Self-reported behaviour.*** *Sunscreen use* A (2) (Time) x 3 (Condition) repeated measures ANOVA was conducted to determine whether the experimental manipulation had any impact on sunscreen use from baseline to follow-up. Results of the analysis indicated that there was no main effect of Time or Condition, nor was there a significant Time x Condition interaction,(all *p*'s >.05). Thus, the experimental manipulation had no significant effect on percent of body covered by sunscreen at the one-month follow-up.

Sun exposure score. A (2) (Time) x 3 (Condition) repeated measures ANOVA was conducted to determine whether the manipulation had any impact on incidental sun exposure between pre- and post-test. The results indicated that there was a main effect of time on sun exposure ($F_{(1, 141}$= 4.21, p= .042, η= .03). Inspection of the descriptive statistics presented in Table 5.4 indicates that total sun exposure (percent of body exposed) decreased from pre-test to post-test for all groups. This conclusion is bolstered by the finding of no significant main effect of Condition, nor was there a Time x Condition interaction (both *p*'s >.05).

Table 5.4
Descriptive statistics for dependent variables, by group at each time point.

		Baseline *M* (SD)				Follow-up *M* (SD)			
	n	Control	Positive	Negative	Total	Control	Positive	Negative	Total
Sunscreen Use	146	4.77 (10.79)	4.53 (8.50)	8.23 (14.35)	5.86 (11.47)	2.66 (8.17)	4.45 (9.61)	7.42 (12.88)	4.96 (10.61)
Sun Exposure	144	53.78 (32.95)	40.39 (20.77)	48.65 (29.49)	47.03 (28.05)	38.70 (30.22)	40.47 (31.86)	45.54 (31.06)	41.56 (31.06)
Willingness	153	5.36 (1.41)	4.46 (1.70)	4.79 (1.74)	4.83 (1.67)	5.06 (1.26)	4.35 (1.60)	4.86 (1.70)	4.73 (1.57)
Intention	153	5.18 (1.75)	4.63 (2.14)	4.52 (1.95)	4.71 (1.98)	5.44 (1.39)	4.84 (1.92)	4.60 (1.83)	4.93 (1.77)

Table 5.5
Descriptive data for skin reflectance spectrophotometry by group, at both time points.

		Baseline *M* (SD)				Follow-up *M* (SD)			
		Control	Positive	Negative	Total	Control	Positive	Negative	Total
L*	Arm	66.97 (5.07)	68.23 (2.80)	68.14 (2.86)	67.85 (3.61)	66.95 (5.05)	68.17 (2.82)	68.07 (2.96)	67.80 (3.63)
	Hand	60.90 (5.62)	61.77 (5.45)	62.70 (4.44)	61.86 (5.19)	61.46 (6.09)	62.64 (4.94)	63.16 (4.23)	62.50 (5.07)
	Face	59.61 (4.48)	59.29 (4.54)	59.70 (3.99)	59.53 (4.28)	59.81 (4.74)	60.42 (3.93)	60.19 (3.92)	60.16 (4.13)
b*	Arm	14.87 (2.60)	15.19 (4.02)	15.32 (3.23)	15.15 (3.23)	14.97 (2.49)	15.24 (3.92)	15.52 (2.56)	15.23 (3.11)
	Hand	18.48 (1.62)	18.90 (2.21)	19.04 (2.26)	18.86 (2.08)	18.61 (1.86)	19.04 (2.26)	19.05 (2.23)	18.93 (2.14)
	Face	16.24 (1.82)	16.43 (2.26)	16.47 (1.97)	16.39 (2.01)	16.38 (2.25)	16.48 (2.23)	16.73 (2.54)	16.54 (2.33)

Note: Arm & Hand *n*=152, Face *n*=82. L* (black/white) higher values= less tan; b* (blue/yellow) higher values= more tan.

5.4.6.2 ***Skin reflectance spectrophotometry.*** A series of (2) (Time) x 3 (Condition) repeated measures ANOVAs were conducted for the skin reflectance spectrophotometry readings. Separate analyses were conducted for L* and b* readings at each anatomical site. The descriptive statistics for these analyses are provided in Table 5.5. With regard to the L* readings, there was a significant main effect of Time for skin reflectance at both high exposure sites (hand: $F_{(1, 1,149)}$= 9.28, p= .003, η= .06; face: $F_{(1,79)}$= 5.25, p= .025, η= .06). There was no main effect of Time on the low exposure site, the inner arm. Inspection of the descriptive statistics presented in Table 5.5 indicates that overall, skin colour on the hand and face became lighter from baseline to post-test. There was no main effect of Condition on L* readings at any of the anatomical sites, nor were there any Time x Condition interactions (all p's >.05).

With regard to b* readings, there were no main effects of Time, or Condition, nor any Time x Condition interactions for readings at any of the anatomical sites. These findings indicate that overall, skin colour at the high exposure sites became lighter between baseline and the one-month follow-up for all groups.

5.4.6.1 ***Cognitive DVs.*** *Willingness* A (2) (Time) x 3 (Condition) repeated measures ANOVA was conducted to determine whether the experimental manipulation had any impact on willingness to incidentally expose oneself to the sun. Results indicated that there was a main effect of Condition ($F_{(2, 150)}$= 3.64, p= .029, η= .05), but no main effect of Time on willingness to incidentally expose. The main effect of Condition is a result of the baseline differences reported earlier. No significant Time x Condition interaction was detected for willingness to incidentally expose (all p's >.05).

Intention. A final (2) (Time) x 3 (Condition) repeated measures ANOVA was conducted to determine whether the experimental manipulation had any long-term

impact on intentions to incidentally expose. There was no main effect of either Time or Condition on intentions to incidentally expose, nor was there a significant Time x Condition interaction (all *p*'s ≥.05).

5.5 Discussion

Prior research has demonstrated that alcohol (Teunissen et al., 2012), and smoking (Gibbons et al., 1991) related prototype perceptions are malleable. Teunissen et al. (2012) have also demonstrated that a change in prototype perceptions is associated with behavioural change. However, such findings have not been demonstrated in the context of sun-related behaviours. Thus, this was addressed by the current study. The first research question pertained to whether prototype perceptions were amenable to change with a brief intervention. The second research question examined whether the manipulation of prototype perceptions could lead to cognitive change on the more proximal antecedents to behaviour, and behaviour itself. Based on findings of past research with other health-related behaviours, it was expected that the brief intervention would lead to changes in ratings of favourability and similarity for the incidental sun exposer prototype.

Results of the analyses reported earlier indicated that the intervention successfully manipulated prototype favourability in the short term. Change in prototype favourability was observed for those in the negative group whereby a decrease in prototype favourability was observed immediately post-test for the Negative group. This result is similar to (Blanton et al., 2001), where differences were only observed between Control and Negative group, and not between Control and Positive. In the current study, there was no change observed for ratings of prototype similarity between baseline and post-test, or follow-up periods. As is the case for most health-risk behaviours, inducing a negative shift in the favourability of the actor prototype is

desirable. While positive change was expected, the failure to increase the favourability of the (risky) exposer prototype is of little practical consequence, as increasing favourability of a risk prototype is not desirable. Given that mean scores on incidental prototype favourability were at the mid-point of the scale, it is unlikely that a ceiling effect occurred. Rather, the evaluative conditioning literature can explain this pattern of findings. Evaluative conditioning refers to the conditioned liking or disliking for a stimulus (De Houwer, 2007). Given that prototype perceptions are evaluative judgements of the type of person who engages in risk behaviour, it makes sense that evaluative conditioning processes can explain the pattern of findings that were observed in this study. A review of evaluative conditioning studies (Hofmann, De Houwer, Perugini, Baeyens, & Crombez, 2010) suggests that inducing a negative shift in attitudes is far easier than inducing a shift in a positive direction. It is hypothesised that this is because it is adaptive to easily acquire dislike for undesirable behaviours or events. Furthermore, evaluative conditioning principles can also explain why ratings of prototype favourability returned to baseline levels at the one-month follow up. In order to maintain the conditioned response, more than one exposure would be needed (Hofmann et al., 2010). This may explain the pattern of findings for the current study.

Unexpectedly, perceived prototype similarity remained unchanged for all groups. The failure of the manipulation to induce change in prototype similarity is likely due to its design. Previous research attempts to manipulate prototype similarity have engaged participants in explicit comparisons to the prototype. This has required participants to actively engage in comparison or assimilation to the characteristics of the prototype (e.g.Gerrard et al., 2005). The design of the current study was passive receipt of information, and did not require participants to deliberately contrast or assimilate to the prototype. This active type of comparison was not prompted in this study, as it was

designed to deliver the stimulus in a similar way to that which would be delivered in a health promotion campaign, for example. Perhaps future research could investigate novel ways of shifting perceptions of similarity. Imagery may be an effective way to achieve this.

With regard to the second aim of the study, the findings suggested that there were no systematic long-term effects on either cognitive or behavioural outcome measures as a result of the intervention. However, there was a main effect of time on incidental sun exposure such that percent of body exposed to the sun decreased between baseline and the follow-up period for all groups. Given that data collection began at the beginning of summer, this finding is likely due to increasing humidity and wet weather, driving people indoors as summer progressed. The potential to induce long-term cognitive and/or behavioural change as the result of a single brief intervention is limited. Past research has also reported null findings for behaviour change at various follow-up intervals (Mermelstein & Riesenberg, 1992). As this study is the first to test whether incidental prototype perceptions can be manipulated, only a brief intervention was included, and the aim of changing follow-up behaviour was secondary to first establishing whether prototype perceptions could be manipulated.

Furthermore, results of Study 2 indicated that behaviour was directly predicted by intention, willingness and prototype similarity. Prototype favourability was not directly, nor indirectly related to behaviour (see Section 4.3.1.1). Furthermore, prototype favourability was not significantly related to either of the proximal predictors of behaviour; intention or willingness. Given the result that prototype similarity was not changed by the intervention, the results of Study 2 would predict that no other change on cognitive or behavioural measures could be expected.

Skin reflectance spectrophotometry was included in this study as an objective measure of change in skin colour. A main effect of time was observed for L* readings at both high exposure sites such that skin colour was lighter at the follow-up period. This is consistent with the finding that overall sun exposure decreased during this time also, suggesting that change in skin colour is detectable over a short period of time. Previous researchers have used skin reflectance spectrophotometry to a similar end, and have detected change in skin colour at various time intervals (Mahler et al., 2007). Given that there were no changes detected for b* readings, it is possible that those individuals who were recruited later in the study had already attained their 'summer colour', and so a ceiling effect may have occurred. To avoid this, future research should attempt to achieve a more densely concentrated recruitment wave, and earlier in spring.

The results of this study also provide some rich descriptive data about the sun-related behaviours of north Queensland residents. The findings suggest that compared to national data (Volkov et al., 2013), comparatively few individuals reported wearing sunscreen (18-29%). However, this data is likely based on estimates of sunscreen use when outdoors for planned, purposeful behaviours. The findings of the current study aimed to capture all sunscreen use for any time spent outdoors, thus it is difficult to determine if north Queensland residents are under-protecting, or if previous research has over-estimated sunscreen use when outdoors. Furthermore, the results of this study support those presented by Sinclair (2013) which suggested that around 30% of time spent outdoors is spent at the home, or private residence. In this study, 30 to 35% of time spent outdoors on weekends was attributed to household chores. A further 20% of time spent outdoors is attributed to transit, or travel. These findings further support the need for health promotion and interventions that include an emphasis on incidental sun

exposure, and not just that due to deliberate tanning or purpose-built outdoor leisure activities.

5.5.1 Limitations. Prior to discussing the implications of this research, a number of limitations must first be mentioned. The reliability of self-reported retrospective behaviour is inherently limited. Previous research has used sun-diaries (Brodie et al., 2013) where participants are required to record their time outdoors, clothing and sunscreen use on a daily basis. The risk of such measurement is that the diary itself could become a behavioural prompt, and in part an intervention in and of itself. To avoid this, measurement of behaviour was designed so as not to create a behavioural prompt, and to reduce the inflation of sun-protective behaviours in the follow-up period. Furthermore, the decision to rely on single-item measures was taken to reduce the burden on participants, and to maintain the cover of 'Health Behaviour in the Tropics'. Reducing the length of the survey would have been possible if extra questions about other health behaviours had not been included, but given that previous research suggests that a mere-measurement effect can occur (Todd & Mullan, 2011), the decision was made to include filler items and reduce the length of the questionnaire. To enhance participation and return rates, it was necessary to be flexible about the location of testing at both phases of the study. As a result, spectrophotometry measurements were not taken in an identical, darkly lit room. As a means of reducing error in measurements, it was ensured that the spectrophotometer was calibrated to each room's light settings. Furthermore, to avoid the confounding effects of bodily surface temperature or physical arousal spectrophotometry readings were taken mid-way through the testing session, and always in an air-conditioned room. While it is possible that the inconsistency in testing conditions could have introduced some confounding bias in the spectrophotometry assessments, analyses conducted here have not provided

evidence of this.

5.5.2 Conclusion. This research study aimed to test whether perceptions of the prototypical incidental exposer were amenable to change with a brief intervention, and whether inducing a change in prototype perceptions could lead to other cognitive or behavioural changes. The results of this research suggest that like other health-related prototypes, favourability of the incidental sun exposer prototype is malleable. However, there were no changes detected for prototype similarity immediately post-test. While these findings do provide some promise, further research is needed to determine effective methods by which to induce behavioural change, as this was not achieved in this study using a single exposure. Furthermore, more research is needed to determine which element of prototype perceptions must be targeted to induce such change. In any case, the results presented here indicated that cognitive change was associated with a very brief intervention. This provides evidence of the flexible nature of sun-related social images, and provides exciting opportunities for future researchers aiming to change sun-related behaviour in a high UVR environment.

Chapter 6: Study 3b

Incidental Sun Exposure: Prospective Modelling

6.1 Rationale

The primary objective of this research project was to explore whether the social reactive pathway of the PW model could aid the prediction of incidental sun exposure in a high risk environment. To this end, the preceding investigation has largely focused on the role that prototype perceptions play in the performance of sun-related behaviours. The research findings thus far indicate that distinct social images exist for sun-related behaviours (Study 1), and that these images are related to incidental sun exposure, as well as to other cognitive variables in the PW model (Study 2). As outlined earlier, research exploring the specific mechanisms by which prototype perceptions influence health risk behaviour has included: explorations of the direct and indirect pathways between prototype perceptions and behaviour (Todd et al., 2014); an examination of the separate influences of prototype favourability and similarity (van Lettow, de Vries, Burdorf, & van Empelen, 2014); as well as an examination of how perceptions of both the actor (risk) and abstainer (non-risk) prototypes influence health related behaviours (Rivis et al., 2006; van Lettow et al., 2013; Zimmermann & Sieverding, 2011). The current study examined the pathways by which favourability of, and similarity to, both risk and non-risk images impact upon incidental sun exposure.

While the research findings presented in Study 2 indicated that the variables of the PW model predicted self-reported incidental sun exposure, this analysis was based on cross-sectional data, which does not account for the role of past behaviour on incidental sun exposure. In order to determine whether the PW model provides a useful framework for the prediction of incidental sun exposure, previous behaviour must be

included in modelling (Conner & Armitage, 1998; McEachan et al., 2011; Norman, Conner, & Bell, 2000). To do so, longitudinal prospective data is needed. Therefore, given that there were no cognitive or behavioural changes detected at the follow-up assessment, the longitudinal data gathered in Study 3a was used to conduct a path analysis, controlling for previous behaviour. Additionally, the role of alternate prototypes has not been considered in this research project thus far. Therefore, the model will include perceptions of the prototypical sun protector, the 'abstainer' prototype in the context of sun behaviours.

6.1.1 Research Questions

The purpose of this study was to determine whether the social reactive pathway of the PW model is predictive of incidental sun exposure, when controlling for previous behaviour. Specifically, a path model will be conducted to examine the effect that both prototype favourability and similarity, for risk and non-risk images have on engaging in incidental sun exposure.

6.2 Method

6.2.1 Participants. The data presented here was taken from the recruited sample of Study 3a. The sample consisted of 155 (108 females, 47 males) community members and undergraduate psychology students from Townsville, North Queensland. Participants' age ranged from 17 to 82 (M = 32.03, SD = 13.96). The sample characteristics are described in depth in Section 5.4.2.

6.2.2 Materials. The questionnaire assessing demographics, PW model variables and sun-related behaviours was completed as part of participation in Study 3a. Demographic items include age, gender, ethnicity, skin type, hair colour, education, location of residence, number of years residing in NQ, as well as personal and vicarious

experience with skin cancer. PW model variables and sun-related behaviours were also assessed as described in Section 5.2. As in Study 3a, incidental sun exposure was calculated using a combination of weekend time spent outdoors and percent of body exposed (clothing only) while outdoors.

6.2.3 Procedure. As described in Section 5.3, data collection occurred over two time points. Participants completed the baseline questionnaire (T1), and the follow-up questionnaire was completely approximately one month later (T2).

6.3 Results

6.3.1 Treatment of data and statistical analysis. Path modelling was conducted using Amos version 22.0. This analysis follows the same methods that were used in Study 2. Model parameters were estimated using the Maximum Likelihood (ML) procedure, and a ratio of 5:1 for cases to parameters was adopted (Bentler & Chou, 1987; Stevens, 1986). Thus, based on the current sample (n=155), absolutely no more than 31 parameters could be estimated. Structural equation modelling is particularly sensitive to missing and non-normally distributed data. Thus, missing values analysis (MVA) was conducted prior to path modelling. Where there were missing data at random for any variable on 5% or more cases, data imputation methods were used (Schafer & Graham, 2002). Variables were checked for non-normality and the Bollen and Stine (1992) bootstrapping procedure, with 1000 iterations was used where appropriate. Nevitt and Hancock (2001) suggest that bootstrapping can stabilise model estimates in samples of >100 cases.

The model fit was considered acceptable where the χ^2 was non-significant, indicating no significant difference between the observed and expected underlying variance-covariance matrix. Other fit statistics examined include χ^2/DF (normed chi

square), which should fall between 1 and 2, and Root Mean-Square Error of Approximation (RMSEA) which should be less than 0.05 (B. M. Byrne, 2010). Standardised Root Mean-square Residual (SRMR) was also examined to assess residual variance unexplained by the model. SRMR less than 0.06 indicates an acceptable level of residual variance (Bentler, 1990). Incremental fit indices provide an indication of how well the hypothesised model accounts for variance in the data, in comparison to the null model. Incremental fit indices examined in order to determine model fit included the Adjusted Goodness of Fit Index (AGFI) and the Comparative Fit Index (CFI). Both indices should be 0.95 or greater (Bentler, 1990; Jöreskog & Sörbom, 1984) in a well-fitting model.

6.3.2 Descriptive data. Descriptive data pertaining to this sample has been provided as part of Study 3a. Refer to Section 5.4.2 for sample characteristics. Given that perceptions of both the incidental and protector prototype will be included in the model, paired-samples *t*-tests were conducted to determine their relative favourability and similarity. The descriptive statistics for prototype perceptions are included in Table 6.1 below. Findings indicated that the prototypical sun protector was evaluated more positively ($t_{(154)}$= 8.36, p <.000) than the prototypical incidental exposer. With regard to similarity however, the opposite was found such that the prototypical incidental exposer was considered to be more similar to the self ($t_{154)}$= 3.81, p <.000), compared to the prototypical sun protector.

Table 6.1
Descriptive statistics for model variables

Model Variables	*M* (SD)
Behavioural Intention	4.69 (1.98)
Behavioural Willingness	4.82 (1.66)
Incidental Prototype Favourability	4.34 (1.22)
Incidental Prototype Similarity	4.37 (1.98)
Protector Prototype Favourability	5.59 (1.39)
Protector Prototype Similarity	3.52 (1.66)
Baseline Sun Exposure	47.07 (27.25)
Follow-up Sun Exposure	46.75 (27.87)

Note: *n*=155.

6.3.3 The path model. Modelling was conducted to investigate the pathways between prototype perceptions and behaviour. As in Study 2, behavioural intention was included in the model as previous research suggested that prototype perceptions indirectly affect behaviour via intention (Gerrard et al., 2002), and because of the relationship between intention, willingness, and behaviour (Gibbons, Gerrard, Ouellette, et al., 1998). Behavioural willingness, prototype favourability and prototype similarity for the incidental exposer prototype (risk image) and the sun protector prototype (non-risk image) were also included in the model. Pathways were constructed such that PW model variables and incidental sun exposure at baseline (T1) were predicting follow-up incidental sun exposure (T2). Zero-order correlations among model variables are presented in Table 6.2.

Table 6.2
Zero-order correlations for model variables

	1	2	3	4	5	6	7	8
1. B Intention	-							
2. B Willingness	.157	-						
3. Incidental Fav	.229**	.188*	-					
4. Incidental Sim	.224**	.091	.308**	-				
5. Protector Fav	-.091	-.285**	-.101	-.140	-			
6. Protector Sim	-.303	-.444**	-.127	-.167*	.339**	-		
7. BL Exposure	.101	.113	.234**	.182*	.016	-.083	-	
8. FU Exposure	.006	.273**	.186*	.219**	-.173*	-.235**	.448**	-

Note: Spearman's Rho reported due to non-normal data, discussed below. Fav= Favourability, Sim= Similarity, BL= Baseline, FU= Follow-up.

The missing data analysis conducted in SPSS indicated that there were two variables that had missing data on at least 5% of cases. There were 7 cases (5%) with missing data for baseline incidental sun exposure, and 20 cases (13%) with missing data for follow-up incidental sun exposure. Analyses indicated that the data were missing at random ($\chi^2 = 22.04$, df= 26, p= .69). Expectation maximisation (EM) data imputation method was used to impute missing data on these variables for use in path analyses. Managing missing data in this way is the preferred method for producing stable parameter estimates in smaller samples (Schafer & Graham, 2002). The sample distribution for Baseline sun exposure had higher than acceptable levels of kurtosis (Kurtosis= 5.62, SE= .39; Field, 2009). Thus, Bollen-Stine bootstrapping adjustments were employed to correct for the effect of non-normality on estimates of model fit.

All variables are represented in the model as observed or manifest variables. As described earlier, prototype favourability, prototype similarity, and behavioural intentions are all assessed with single items. Behavioural willingness was assessed with

three items, and averaged to create single willingness score. Similarly, incidental sun exposure is assessed using various data from the sun diary, and a composite variable was used as a single dependent variable. The original hypothesised model is included as Figure 6.1. Initial analyses with this model indicated that the model had poor fit χ^2 = 31.52, df=14, *p*=.005 (Normed χ^2 = 2.25, *p*= .005, SRMR= .085, RMSEA= .09, AGFI= .88, CFI= .88). The Bollen-Stine corrected *p*-value still led to rejection of the model (*p*= .032). Inspection of the Standardised Residual Covariances indicated that a significant improvement in model fit could be observed if Baseline Incidental Exposure and Prototype Favourability (Incidental) were free to co-vary, and if the pathway between Prototype Similarity (Incidental) and Follow-up Incidental Exposure was freed. Thus, the covariance and pathway was included in the model, and the analysis was re-run.

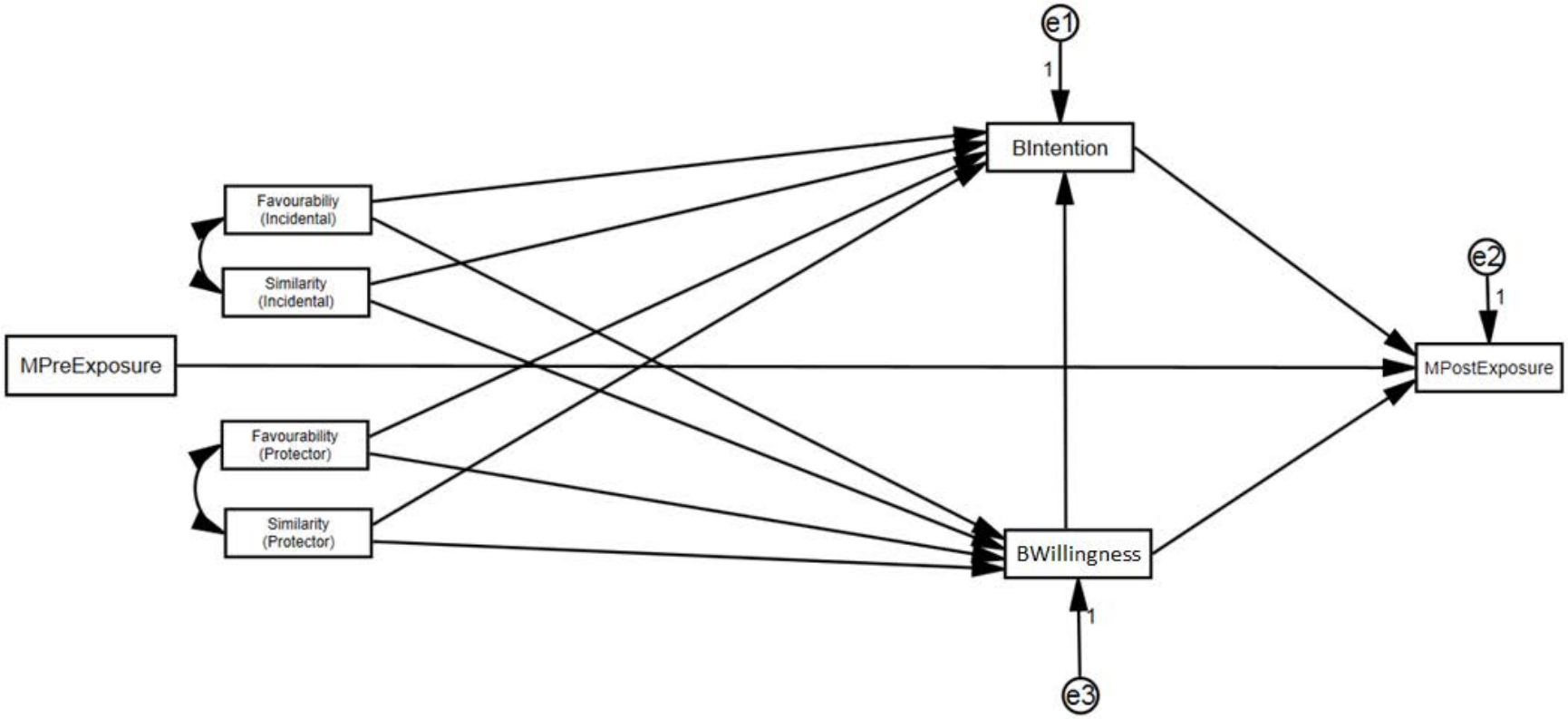

Figure 6.1. Hypothesised path model

In total, there were 24 parameters estimated in the final model, as depicted in Figure 6.2. The final model demonstrated good fit χ^2= 19.65, df= 12, *p*=.074, Normed χ^2= 1.64. The corrected *p*-value using Bollen-Stine bootstrapping also indicated a well-fitting model *p*=.201. Furthermore, the fit indices fell either close to or within reasonable bounds (SRMR= .07, RMSEA= .06, AGFI= .91, CFI= .95). Although age was a significant covariate in the path model presented in Study 2, age was not correlated with either baseline or follow-up assessment of incidental sun exposure (both *p*'s >.05), thus was not included in this path model. Overall, 20% (R^2 = .20) of the variance in incidental exposure was explained in the final model. Baseline exposure, and willingness were significantly related to incidental exposure at the one-month follow-up (T2). No relationship was observed between intentions and T2 behaviour. With regard to the incidental prototype, favourability was significantly positively associated with intentions to expose. There was a significant negative relationship between protector similarity to both intentions, and willingness. The findings suggest that dissimilarity to the protector prototype was associated with greater intentions and willingness to incidentally expose. The pathway from incidental prototype similarity to T2 sun exposure was non-significant. The standardised total effects for the predictor variables on T2 incidental sun exposure is provided in Table 6.3. Aside from baseline behaviour, behavioural willingness and similarity to the incidental prototype had the greatest total effect on incidental exposure at follow-up.

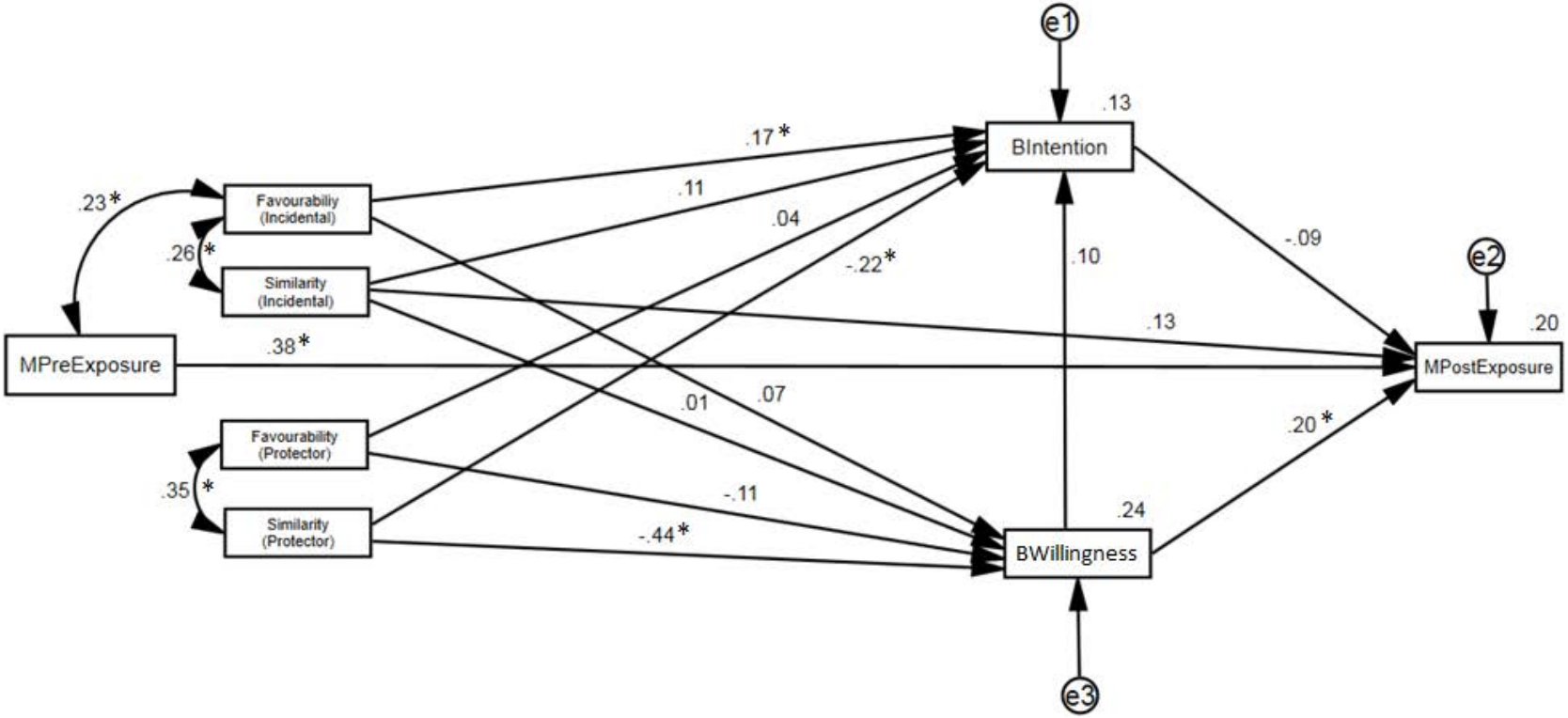

Figure 6.2. Path model, social reaction pathway variables predicting incidental exposure at one-month follow-up, controlling for baseline behaviour.

Table 6.3
Standardised total effects of predictor variables on endogenous variables.

	Total effects (R^2)						
		Incidental		Protector			
	Baseline Exposure	Fav.	Sim.	Fav.	Sim.	BW	BI
Total BW	.000	.071	.010	-.114	-.438	-	-
BIntention	.000	.175	.116	.032	-.269	.101	-
FU Exposure	.384	-.002	.117	-.025	-.062	.186	-.088

Note: BW= willingness, BIntention= behavioural intention, Fav = Favourability, Sim = Similarity, FU= follow-up.

6.4 Discussion

This study was conducted to determine the processes by which prototype perceptions impact upon incidental sun exposure. Specifically, path modelling was conducted to investigate the separate influence of prototype favourability and similarity on motivations to engage in incidental sun exposure, as well as how perceptions of both the risk and non-risk prototype impact upon motivations to engage in incidental sun exposure. With regard to the prediction of prospective incidental sun exposure, overall the model explained 20% of the variance in incidental exposure. A modest amount, given that past behaviour has been found to account for around 13% of the variance in future behaviour (Conner & Armitage, 1998; McEachan et al., 2011). Accordingly, the results indicated that baseline incidental exposure was the greatest predictor of exposure at follow-up. Additionally, willingness was related to incidental sun exposure, but intention was not. No other predictor had a significant direct effect on incidental exposure at follow-up.

The finding that intention was unrelated to behaviour may be a reflection of the non-deliberative nature of incidental sun exposure. Incidental exposure is unplanned, as

suggested by the findings presented in Study 1 (Morris & Swinbourne, 2014). In Study 1 presented earlier, participants reported that incidental sun exposure is not considered risky, thus does not require the adoption of sun protective behaviours. It is also important to note that the behavioural expectation was used in replacement of intention in Study 2. This could explain why BE was related to behaviour in that study. Previous research has suggested that expectation is more likely than intention to reliably predict non-deliberative, health risk behaviours (Armitage et al., 2015; Warshaw & Davis, 1984). However, it is difficult to draw this same conclusion from this set of studies, as the operationalisation of incidental exposure varied between studies 2 and 3b. In study 2, incidental exposure was operationalised as the inverse of sun protection. This by nature, is a deliberative behaviour. In future, research should simultaneously assess all three antecedents to behaviour to determine their relative contributions to the prediction of behaviour.

With regard to the prediction of intention, positive evaluations of the incidental exposer prototype were significantly related to intentions to expose, as was similarity to the protector prototype. The original PW model (Gibbons & Gerrard, 1995) does not specify a pathway from prototype perceptions to behavioural intention. However, this pathway has been examined in recent research, for example in studies that augment the TPB with prototype perceptions (Rivis et al., 2006; Zimmermann & Sierverding, 2010). Furthermore, results of meta-analyses (Todd et al., 2014; van Lettow, de Vries, Burdorf, & van Empelen, 2014) have demonstrated that prototype perceptions impact upon behaviour via intention as well as willingness. Additionally, there has now been substantial research comparing the separate roles of prototype favourability and similarity in both health risk and health protective behaviours (for a review, see: van Lettow, de Vries, Burdorf, & van Empelen, 2014). Overall, these investigations have

suggested that both favourability and similarity are related to the performance of health risk and health protective behaviours, but that similarity is a better predictor of behaviour (Hyde & White, 2009; Lane & Gibbons, 2007; S. Walsh & White, 2007). In the current study, the modelling suggested that a direct pathway from incidental prototype similarity and follow-up behaviour was to be freed. Results indicated that similarity to the incidental prototype had a greater total effect on behaviour than did similarity to the protector. However, the pathway between incidental prototype similarity and follow-up behaviour was non-significant in the final model. Regardless, the association between protector similarity and willingness suggested that identification with social images may be an important motivator for health related behaviours. This finding also suggests that perceived (dis)similarity to the non-risk image may impact upon behaviour via both the reasoned and reactive pathways. However, in this case it would seem that a lower perceived similarity to the protector is more strongly related to willingness to incidentally expose oneself to the sun, compared with intentions.

Indeed, perhaps of greatest interest to this study was the finding that similarity to the protector prototype was related to intentions and willingness to incidentally expose. Very few studies have investigated the role that competing prototypes have on health risk behaviour (Gerrard et al., 2002; Rivis et al., 2006; Zimmermann & Sierverding, 2010). Studies on alcohol consumption conducted in the USA (Gerrard et al., 2002), and in the Netherlands (van Lettow et al., 2013) reported that the non-drinker (non-risk) prototype was favoured above the drinker (risk) prototype. Conversely, research conducted in Germany found the opposite (Zimmermann & Sierverding, 2010). In this case, the drinker (risk) prototype was considered to be more favourable than the non-drinker (non-risk), and most similar to the self. Regardless of this difference in relative

preference, both Gerrard, et al. (2002) and Zimmerman and Sieverding (2010) found that the non-drinker prototype had either a direct or indirect negative effect on prospective alcohol consumption. In the current study, the protector prototype (non-risk image) was considered to be most favourable, and most similar to the self, on average. In their own research, Zimmerman and Sieverding (2010) suggested that perceptions of similarity to the abstainer image predicted willingness to engage in a risk behaviour because the salience of the abstainer prototype is high, as it is the not the 'norm' behaviour. This would also be true for sun protection behaviours. As demonstrated earlier (Studies 1 and 3), the majority of North Queenslanders do not routinely engage in sun protective behaviours. Thus, the protector prototype may provide a clear anchor to compare oneself to.

It may also be that the protector is a goal image, or 'ideal' image, as evidenced by the fact that the protector is the most favoured prototype. In the current study, the relative favourability and similarity of the risk vs non-risk prototype was mixed. The sun protector prototype was favoured over the incidental exposer, but the incidental exposer was considered to be most similar to the self. Interestingly though, perceptions of (dis)similarity to the protector were most strongly related to the prediction of behaviour. This may suggest that an individual may perceive a prototype to be favourable, without wanting to be similar to it – as has been found in previous research also (Van Lettow, et al., 2013). It could also be that the way in which similarity has been assessed provokes the individual to reflect on their typical or planned behaviour. Earlier research with the PW model framed similarity items as "do the characteristics that describe that person also describe you?" Perhaps this assessment of prototype similarity gets more to the crux of what the prototype similarity aims to assess, rather than a reflection on typical behaviour.

6.4.1 Limitations. The limitations to this research should be discussed prior to the study implications. The analyses presented here have not included an exploration of the full PW model. In order to operate within the guidelines appropriate for this sample size, emphasis was placed on examining only those variables within the social reaction pathway to behaviour. Thus, statements that can be made about the relative predictability of the social reaction versus reasoned action pathway are limited without having included all variables of the reasoned action pathway. Furthermore, the total proportion of variance accounted for by the model is quite modest, and was largely attributable to the role of previous behaviour. Despite this, behavioural willingness did significantly predict follow-up incidental exposure whereas intention did not.

6.4.2 Conclusion. The modelling presented in this study provides further evidence to support the inclusion of competing prototypes in the prediction of health related behaviour. Prior to this study, this finding had not been explored with sun-related behaviours. The findings suggested that the similarity to the protector (non-risk) prototype was significantly related to willingness and intention to incidentally expose. However there was no significant relationship between similarity to the incidental (risk) prototype and intention, willingness or behaviour. Only ratings of Favourability of the incidental prototype were related to intentions to incidentally expose, but intention was not significantly related to behaviour. Favourability of the protector prototype was not related to willingness, intentions, or behaviour. These findings suggest that perceptions of similarity to the protector prototype influence behaviour via both reasoned and reactive processes. The stronger influence of the protector (no-risk) prototype may be due to the relative salience of the protector prototype, compared to the incidental exposer prototype (Zimmermann & Sierverding, 2010). Future research could investigate this further, as well as whether participant's ratings of perceived similarity

to incidental exposer prototype matched their behaviour.

Chapter 7

General Discussion

7.1 Summary of research

This research project is the first to explore psychosocial factors relating to incidental sun exposure in a high UVR environment. Using the PW model as a framework, a series of studies were undertaken to first identify whether individuals' incidental sun exposure was driven by factors similar to those that relate to other health risk behaviours. Investigations were also conducted to determine whether incidental sun exposure prototypes can be manipulated, and whether such change impacts upon behaviour.

The results of the first two studies indicated that distinct social images existed for sun-related behaviours, and that the variables of the PW model's social reaction pathway were related to incidental sun exposure. Based on these findings, an experimental study was conducted to determine a) whether the incidental sun exposer prototype could be manipulated, and b) whether manipulation of the prototype leads to subsequent cognitive or behavioural changes. The brief intervention successfully manipulated immediate perceptions of the prototypical incidental sun exposer, but there was no long-term maintenance of this change. Furthermore, there was no impact of change in prototype favourability on intention or willingness to incidentally expose, or on actual behaviour at the one-month follow-up. Finally, prospective path modelling was conducted to examine the pathways between the PW model's social reaction pathway variables and incidental sun exposure, when controlling for the role of previous behaviour. This modelling suggested that reactive decision-making processes are implicated in the performance of incidental sun exposure. As a result, there is now a

greater understanding of the characteristics associated with the prototypical incidental exposer. Further empirical support has been provided for the malleability of prototype perceptions using a brief intervention. The theoretical and practical implications of these findings, as well as limitations of the research will be discussed below.

7.2 Prototype Characteristics

One of the defining assumptions of a prototype is that it is a vivid and stable representation of the typical person who engages in any given behaviour (Gibbons & Gerrard, 1995; van Lettow, de Vries, Burdorf, Conner, & van Empelen, 2014). There is growing empirical support for prototypes associated with other health behaviours including alcohol consumption (Spijkerman, Larsen, Gibbons, & Engels, 2010; van Lettow et al., 2013; van Lettow et al., 2012), cigarette smoking (Gibbons et al., 1991; Rivis, Sheeran, & Armitage, 2009), and risky sexual practices (Myklestad & Rise, 2007) for example. For a review, see van Lettow, de Vries, Burdorf, and van Empelen (2014). The collection of research studies suggests that prototype perceptions play a role in health risk behaviour, and add predictive power over and above other key determinants of behaviour, such as intention, for example (Todd et al., 2014). Prototype perceptions are an integral component of the PW model, thus if this framework is to be used, perceptions surrounding sun related prototypes must be explored. To date, no other research has reported on the characteristics associated with each of the sun-related prototypes. Therefore, the initial step in determining whether or not the PW model was an appropriate framework to examine sun-related behaviour was to determine whether distinct social images, or prototypes, existed in this context.

The first study was conducted to examine the specific characteristics of each of the sun-related prototypes. Results of this study indicated that both physical descriptors and personality characteristics were reported for both the deliberate tanner and the sun

protector. The personality characteristics used to describe the prototypical deliberate tanner were negative (i.e. vain, foolish, fake), while the physical descriptors associated with this prototype included positive or desirable attributes (i.e. pretty, slim, healthy, attractive). In contrast, while the personal qualities ascribed to sun protectors tended to be positive (i.e. clever, happy, organised), the physical descriptors associated with sun protectors were viewed in a negative light (i.e. pastey, lots of moles). Only personality characteristics that were neutral to positive in valence were reported for the incidental exposer (i.e. lucky, normal, and natural). This presents a conflict which has not yet been explored in other research with any other health behaviours. Most research with prototype perceptions has focused only on personal qualities or attributes, and not physical descriptors (for a review, see: van Lettow, de Vries, Burdorf, & van Empelen, 2014; Zimmermann & Sieverding, 2011). While this could be a potential area for further exploration with other health-related behaviours, it is likely that this finding is specific to health behaviours that are related to change in physical appearance. Tanning, and motivations for tanning are closely associated with appearance-based motivations (Cafri et al., 2006; K. Thomas et al., 2011), thus physical descriptors are likely to be easily accessible and recalled when considering this type of behaviour. The same is true for a typical sun protector, in that phenotypic characteristics such as hair, eye, and skin colour are often associated with skin cancer risk, and sun protective behaviours (Cox, Cooper, Vess, Arndt, & Goldenberg, 2009). The typical incidental exposer is neither deliberately subscribing to the 'tan ideal' nor are they typified by the appearance of a sun protector. This could explain why the incidental exposer prototype is not characterised by any specific physical descriptors.

While the characteristics used to describe the incidental exposer prototype were often neutral (i.e. normal, natural), findings from subsequent studies indicated that

perceptions of the incidental prototype were positive. In fact, results indicated that the incidental exposer prototype was perceived to be the most similar to the self, followed by the sun protector and the deliberate tanner (Study 2). With regards to favourability, the sun protector was perceived as the most favourable, followed by the incidental exposer and the deliberate tanner. That the sun protector has the most favourable evaluation differs from one other study which has examined perceptions surrounding the typical sun protector. In their study, Araujo-Soares et al. (2012) reported that Portuguese adolescents did not rate the sun protector as favourable. This disparity in findings could be due to the young age of their sample, or due to cultural and societal differences between Australia and Portugal related to sun exposure behaviours. It could be that decades of sun protection campaigns are responsible for the positive evaluation of the typical sun protector in Australia. This rationale could also explain the greater favourability of the protector prototype compared to the incidental and sunbathing prototypes. In Studies 2 and 3, evaluations of the sun protector were more favourable than for either the sunbather or incidental exposer. With regard to similarity, findings of Study 1 indicated that most individuals perceived themselves to be most similar to the incidental exposer prototype, and the same pattern of findings was observed in Study 3b.

Determining the relative favourability and similarity of opposing prototypes is becoming increasingly important in research (Teunissen et al., 2014). van Lettow et al. (2013) argues that it is important to examine whether individuals are aligning with the prototype that is appropriate to their behaviour. Unfortunately, such comparisons were unable to be conducted in the current set of studies. As reported earlier, relatively few persons deliberately sunbathe in North Queensland, so sampling this population does not provide adequate numbers to conduct sensible group comparisons between those

who do, and do not sunbathe. Targeted recruitment would be required to conduct such analyses.

A number of researchers have suggested that similarity is more strongly related to intention (Rivis et al., 2006) and willingness (Hyde & White, 2009) to perform health related behaviours than is favourability. Indeed, the results of a meta-analysis conducted by van Lettow, de Vries, Burdorf, and van Empelen (2014) support this statement. These findings suggest that it is important to consider both prototype favourability and similarity, for various prototypes separately. In order to examine how alternate prototypes impact upon the performance of incidental sun exposure, path modelling was conducted. These findings are discussed below.

7.3 Predicting incidental sun exposure

Predictive modelling including hierarchical regression, commonality analysis, and path analysis was conducted in order to determine whether the variables of the PW model's social reaction route could assist in the prediction of incidental sun exposure. Initial investigations suggested that the including willingness to incidentally expose added significant unique predictive power to the model.

Results of the commonality analysis and path model conducted as part of Study 2 indicated that both willingness and expectation were significantly related to usual sun exposure behaviour. This suggested that both reasoned, and reactive decision making processes were implicated in sun exposure. In Study 3b, further path modelling was conducted where it was found that willingness was related to prospective incidental sun exposure, but intention was not. The findings of study 3b provide clearer evidence about the relative contribution of intention versus willingness. As discussed earlier, this finding reflects the nature of incidental sun exposure. Incidental sun exposure is not

planned, or deliberate, thus behavioural intentions are not likely to be predictive of this behaviour. Furthermore, accounting for the role of past behaviour may reduce the predictive validity of intention (Conner & Armitage, 1998; McEachan et al., 2011; Norman et al., 2000). This may explain why the reasoned action pathway was predictive of usual behaviour in Study 2, but was not associated with behaviour in Study 3b. The fact that expectation was related to behaviour in Study 2 could also suggest that an individual may *expect* to be out in the sun without adequate sun protection, but does not *intend* to do the same. This finding, combined with the finding that the protector prototype was evaluated most favourably (Study 3b) suggests that an individual knows what they should be doing. The greater perceived similarity to the incidental prototype suggests that overall, individuals do not expect to follow through on that knowledge.

The finding that intention was completely unrelated to behaviour suggests that incidental sun exposure is not the result of a deliberate decision making process, which makes sense when considering the nature of incidental sun exposure. With regard to the predictive power of prototype perceptions, results of the path analysis presented in Study 3b suggested that similarity is more closely related to behaviour than is prototype favourability. This finding has been reported by others (Hyde & White, 2009; Lane & Gibbons, 2007), and summarised by Todd et al. (2014) and van Lettow, de Vries, Burdorf, and van Empelen (2014) in their meta-analyses. Furthermore, the findings presented earlier also suggest that alternate prototypes are predictive of health-related behaviours.

7.4 Manipulating prototype perceptions

This set of studies is the first to investigate whether perceptions of the incidental sun exposer prototype can be manipulated with a brief intervention. A change in prototype

favourability was observed immediately post-test but only for those in the negative group. This finding suggests that it was possible to decrease favourability of the incidental exposer over a short period of time. Prototype favourability then returned to baseline levels by the one-month follow-up. Unexpectedly, perceived prototype similarity remained unchanged for all groups. The failure of the manipulation to induce change in prototype similarity is likely due to its design. Previous research attempts to manipulate prototype similarity have encouraged direct comparisons to the prototype. Such studies have required participants to actively engage in comparison or assimilation (Gerrard et al., 2005; Lane et al., 2011) to the characteristics of the prototype.

There were no long-term effects of the intervention on any of the cognitive variables, or behaviour. Results of Study 2 indicated that prototype favourability was neither directly nor indirectly related to behaviour. Instead, typical incidental exposure was directly predicted by intention, willingness and prototype similarity. Furthermore, prototype favourability was not significantly related to either of the proximal predictors of behaviour; intention and willingness. Given the result that prototype similarity was not changed by the intervention, no other change on cognitive or behavioural measures should be expected, based on the findings of the modelling presented earlier.

7.5 Limitations

Prior to discussing the theoretical and practical implications of this research project, there are a number of limitations that must be addressed. Firstly, there are a number of factors to consider when comparing the results of the modelling conducted as part of Study 2 versus Study 3b. The disparity of results in these models could be attributable to the use of behavioural expectation as the proximal antecedent to behaviour in the reasoned action route in Study 2 versus behavioural intention in Study 3a. In Study 2, expectation was related to typical sun exposure behaviour whereas in Study 3a,

intention was not associated with behaviour. Future research should examine all three proximal indicators to determine their relative contribution.

It is also difficult to make statements about the relative predictive validity of expectations versus intention because the modelling conducted in Study 2 is based on cross-sectional data, and as such, did not control for past behaviour. It could be that the role of expectation in this case was over-estimated. While cross-sectional research can be considered to be limited, given the exploratory nature of this research, the design was adequate to determine whether relationships existed between the PW model variables and typical sun-exposure behaviour. Furthermore, given that study 2 aimed to determine the relationship between PW model variables and behaviour, examining predictors of intentions or willingness as the outcome variable was not considered adequate. Thus, an indication of typical sun-behaviour was used as the outcome measure for this research.

The other limitations relating to this research project relates to assessment of outcome variables. These studies were the first attempt to operationalise incidental sun exposure. As previously mentioned, the assessment of incidental sun exposure in Study 2 was more akin to 'general' sun exposure, as used in earlier research (Berwick et al., 1992; Branstrom et al., 2004). However, the assessment of incidental sun exposure in Studies 3 and 3b were much more comprehensive, although still retrospectively reported. Previous research has used sun-diaries where participants are required to record their time outdoors, clothing and sunscreen use on a daily basis (Brodie et al., 2013). In this research, the decision was made to reduce the risk of the diary becoming a behavioural prompt, thus retrospective recordings were made by participants for the weekend immediately prior to each wave of recruitment. Additionally, a strength of the methodology of Study 3a was the inclusion of skin reflectance spectrophotometry.

Previous research has used this tool as an objective measure of skin colour (Mahler, Kulik, Gerrard, & Gibbons, 2006; Mahler et al., 2007). The results of Study 3a suggested that skin colour became lighter over time, for all groups. This finding may be the result of individuals spending less time outdoors, perhaps due to the weather as summer progressed, or as the result of a mere measurement effect. Todd and Mullan (2011) reported that on average, those who had their alcohol consumption assessed reported less alcohol consumption compared to a control group. The fact that incidental sun exposure decreased for all groups from baseline to post-test may support this assumption. Unfortunately, weather data were not recorded as part of this research, therefore conclusive statements about how weather may have impacted upon behaviour cannot be made. Future research should opt for alternate objective measures of UVR exposure such as personal dosimetry meters. This option was considered for use in the current study, however this method is expensive, labour intensive for both the researcher and participant, and is susceptible to damage in its current, readily available format. Regardless, the body of research presented earlier provides pioneering insights into the sun-related behaviours of community members living in a high UVR environment.

7.6 Implications

This research is the first to examine the psychosocial factors surrounding incidental sun exposure in a high UVR environment. As a result, there is now a greater understanding of sun-related behaviours in this population, as well as attitudes, sun-protective practices, and perceptions of skin cancer risk. The outcomes of this research have a number of implications for the study of incidental sun exposure, psychological theory, and population-level skin cancer prevention strategies in high UVR environments. Given the finding that most participants perceived themselves to be most

similar to the incidental exposer, future research should focus on the determinants of incidental sun exposure as a means of reducing the incidence of skin cancer. Future prevention strategies may also need to highlight the dangers associated with all UVR exposure, not just the danger associated with deliberate tanning.

One of the most interesting findings to emerge from this study is the null relationship between intentions and incidental sun exposure. This suggests that incidental sun exposure is not a deliberative behaviour, thus cannot be targeted using the same methods employed for reducing deliberate sunbathing, or sun protection. Rather, the findings of this research suggest that the social reaction pathway to behaviour, including prototype perceptions and willingness, have a larger role to play in minimising incidental sun exposure. Having said this, the overall proportion of the variance accounted for was modest. This suggests that there are other cognitive or psychosocial factors that are yet to be explored. Given that exposure to UVR is so embedded within the lifestyle of north Queensland residents, exploring the role of habit formation and self-regulatory processes may be a fruitful option. Regardless, the findings provide further evidence to support the inclusion of competing prototypes in the prediction of health risk behaviour. Prior to this study, this finding had only been demonstrated with alcohol consumption. Future research should continue to explore the link between alternate prototypes and engagement in risk behaviour to explore this mechanism in greater depth.

The findings of this collection of studies support earlier research (for a review, see: van Lettow, de Vries, Burdorf, & van Empelen, 2014), which suggests that perceptions of similarity may be more important for the prediction of behaviour than are perceptions of favourability. With regard to sun-related behaviours, it appears that perceptions of the prototypical sun protector influence performance of incidental sun

exposure. In terms of implications for health promotion, these findings suggest that strategies could target perceptions of similarity to the sun protector. The evidence presented here indicates that manipulating similarity may impact upon health related behaviour. Future research is needed to determine effective and brief mechanisms by which perceived similarity can be manipulated.

The fact that associations between similarity and behaviour are stronger than for favourability and behaviour may be influenced by the method by which similarity is assessed (e.g. how similar are you to the typical sun protector). Perceptions of similarity are hypothesised to reflect self-appraised group membership. This method of assessment may provoke the respondent to reflect on their past behaviour in order to determine such group memberships. Earlier research with the PW model assessed similarity with the item 'do the characteristics that describe that person also describe you'. Perhaps this latter method of assessment engages a direct comparison with prototypical characteristics, rather than prompting a reflection on the individual's typical behaviour. Further research is needed to determine whether this is the case. Future research should also look at moderation effects of the model. In particular, whether baseline levels of intention, willingness, or social comparison tendencies impact upon the workings of this model.

7.7 Conclusion

Overall, this collection of studies provides support for the use of the PW model in research examining incidental sun exposure. When controlling for past behaviour, the social reaction route of the model was able to explain incidental sun exposure, whereas reasoned action processes could not. More specifically, this research provides the first insights into the characteristics associated with various sun-related prototypes. Furthermore, the results also provide empirical support for the malleability of sun-

related prototypes, and extend the application of the model to multiple sun-related behaviours. Path modelling also suggested that alternate prototypes should be considered in future investigations of health-related behaviours. This research also provides important insights into perceptions of sun-related behaviours, particularly incidental sun exposure in a high UVR environment. The findings of this research project highlight the reactive nature of incidental sun exposure, which contrasts with deliberative sunbathing behaviour.

The outcomes of this research are particularly important for high-risk regions where incidental sun exposure presents a risk to individuals' health. As evidenced by the findings of Study 1, North Queenslanders perceive incidental sun exposure to be 'normal'. Findings from subsequent studies suggested that although the sun protector is evaluated positively, perceptions of similarity to the protector prototype is low, compared to the prototypical incidental exposer. Additionally, perceived dissimilarity to the sun protector was associated with greater levels of incidental sun exposure. This may suggest that targeting health promotion activities toward enhancing assimilation to the protector prototype may be a promising avenue for future interventions. Overall, this program of research has highlighted a need for region-specific health promotion programs and initiatives that target non-deliberative decision making processes in order to reduce incidental sun exposure.

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Appendices

Appendix A: Study 1 - Semi-Structured Interview

Today I'd like to have a chat about your attitudes and beliefs about sun protection and sun exposure. As outlined in the information sheet, your participation is completely voluntary so we can stop any time you like if you'd like a break, or if you no longer wish to be continue.

Thinking back over your life, even to when you were a child - have you ever been sunburnt?

On the weekend just gone, how many hours did you spend in the sun?

What time of the day were you out in the sun?

What were you doing?

Do you ever protect yourself from the sun?

How do you usually do this?

Is sun protection a daily priority for you?

Why/why not?

Do you think that it is something that you could do every day?

What is it that prevents you from sun protecting on a daily basis?

When was the last time that you deliberately tanned yourself?

Solarium?

Sun bake?

Tanning Lotion?

During the past year how many times have you deliberately tanned yourself?

Is having tanned skin an ideal for you?

Describe to me what it means to you to have a tan

Do you think that it is also important to others?

Do you think that fair skin looks good on some people?

Does fair skin look good on you?

What is it about tanned skin that makes it more appealing?

Do you feel pressure to be tanned?

Where do you think those pressures come from?

Do you think that your friends feel pressured to have a tan?

I am interested in your ideas about typical members of different groups. We all have ideas about what the typical movie star is like, or the typical grandmother. When asked we might say that the typical movie star is attractive, or wealthy, or that a typical grandmother is sweet and frail. This doesn't mean that all movie stars or grandmothers are like, but just that many share certain characteristics.

So now, I'd like you to think of each of the following types of people and tell me the first few things that come to mind.

So when you think of....

a) The typical person your age who deliberately tans in the sun
b) The typical person your age who acquires a tan without meaning to
c) The typical person your age who acquires a tan with tanning lotion or spray tan
d) The typical person your age who protects themselves from the sun

…what comes to mind?

Do you think that you are similar to any of those images?

Which do you think that you are most similar to?

That's all the questions that I have to ask. Is there anything that you would like to add about sun protection or sun exposure?

Is there anything you think I have missed?

Thank you very much for your participation!

Appendix B: Study 1 - Ethics Approval

This administrative form has been removed

Appendix C: Study 1 - Pre-Interview Questionnaire

Age: _____

Gender: Male Female

Place of Birth (e.g. North QLD, NSW, North America): _____

For the following questions please circle the response that best describes you.

Suppose your skin was exposed to strong sunshine at the beginning of summer with no protection at all. If you stayed out in the sun for 30 minutes, would your skin…

Just burn, and not tan afterwards | Burn first, then tan afterwards | Not burn at all, just tan

How would you describe your **natural** skin colour?

Fair Olive Light Brown Dark Brown

How would you describe your **current** skin colour?

Fair Olive Light Brown Dark Brown

Have you ever had skin cancer? Yes No

If yes, what type? If you're not sure select "Not Sure"

Melanoma Non-Melanoma Not Sure

Has anyone in your family ever had skin cancer? Yes No

If yes, what type? If you're not sure, select "Not Sure"

Melanoma Non-Melanoma Not Sure

Appendix D: Study 2 - Questionnaire

Attitudes and Behaviours Surrounding Sun Exposure

Gender: _____

Age: _____

Where were you born? (Country & Region, egg. Aus, Vic; USA, California)
_____

How many years have you lived in North Queensland? _____

Do you identify with an ethnic group? YES NO

If so, which ethnic group? _____

Suppose your skin was exposed to strong sunshine at the beginning of summer with no protection at all. If you stayed out in the sun for 30 minutes, would your skin…

Just burn, and not tan afterwards | Burn first, then tan afterwards | Not burn at all, just tan

What is your natural hair colour?

Blonde Light Brown Dark Brown Black

In the past 12 months how many times have you…

Been unintentionally sunburnt?

Had a sunburn that has peeled?

Been in the sun for a long time without sun protection?

Suntanned or Sun bathed?

Gone to a solarium or sun bed?

Had a spray-on tan?

On a typical week-day, approximately how many hours do you spend outdoors? (hours)

This includes time spent outdoors while working, fishing, gardening, playing sport, washing your car, pegging out the washing etc.

Approximately how much time did you spend outdoors last weekend? (hours)

This includes time spent outdoors while working, fishing, gardening, playing sport, washing your car, pegging out the washing etc.

While you were outdoors last weekend, did you... (yes/no)

Intentionally sun bathe? If so, for how long?

Use SPF 30+ sunscreen?

Wear a ¾ length or long sleeved shirt?

Wear a wide-brimmed hat?

Wear sunglasses?

Spend most of the time in the shade?

Have you ever had skin cancer? If so, what type?

No Yes, Melanoma Yes, Non-Melanoma Yes, but not Sure

Has any of your family or friends ever had skin cancer? If so, what type?

No Yes, Melanoma Yes, Non-Melanoma Yes, but not Sure

Please select the response that best describes your views.

(1= strongly disagree, disagree, neither agree/disagree, agree, 5= strongly agree)

Attitudes

I do not need a sun-tan to feel good about myself

A sun tan makes me feel better about myself

I feel more attractive when I have a tan

Skin that has a bit of colour to it is more attractive than fair skin

I think that tanned skin is more attractive than fair skin

I think that fair skin is more attractive than tanned skin

Fair skin is attractive

I am not interested in having a suntan

I look healthier with a sun-tan

Other people look healthier with a tan

Norms

Most of my friends think that a sun tan is a good thing

Most of my family think that a sun tan is a good thing

All of my friends have a tan

Most people have a tan these days

These questions relate to tanning in the sun. Please select the response that best describes your views.

(1= strongly disagree, disagree, neither agree/disagree, agree, 5= strongly agree)

I protect myself when in the sun to prevent getting sunburnt

If I think that I'm too fair, I will seek the sun to get a bit of colour

I do not seek the sun because I get enough sun from normal daily activities (e.g. exercising, gardening etc.).

If I did not get a tan from my normal daily activities I would sunbathe to get a tan

I do not need to actively seek the sun to get a tan, it just happens

Behavioural Expectations

(Very unlikely, unlikely, neither likely/unlikely, likely, very likely; higher scores = greater level of expectation)

In the next month, how likely is it that you will use sun protection (e.g. sunscreen, hat, and long-sleeved clothing) when out in the sun?

In the next month, how likely is it that you will actively seek the sun to get a tan?

In the next month, how likely is it that you will visit a solarium to get a tan?

Willingness to deliberately tan

(Very unlikely, unlikely, neither likely/unlikely, likely, very likely; higher scores = greater willingness)

Imagine that you're at the beach with your friends. One of your friends suggests that you should all lie in the sun to get a bit of a sun tan. How likely is it that you will do each of the following?

Sit in the shade nearby your friends.

Apply sunscreen, then grab your towel and head for the sun

Grab your towel and head for the sun

Willingness to expose (incidental exposure)

(Very unlikely, unlikely, neither likely/unlikely, likely, very likely; higher scores = greater willingness)

Imagine that it is a typical week-day and you're leaving home for the day. How likely is it that you will do each of the following?

Protect yourself from the sun with four methods of sun protection: a long sleeved shirt, sunglasses, sunscreen and a wide-brimmed hat

Protect yourself from the sun with one or two methods of sun protection.

Leave home without any sun protection

Willingness to protect

(Very unlikely, unlikely, neither likely/unlikely, likely, very likely; higher scores = greater willingness)

Suppose that you're at home during the day about to peg out the washing on the clothes line. How likely is it that you will do each of the following?

Wear a long sleeved shirt, sunglasses, sunscreen and a wide-brimmed hat to peg out the washing

Just grab a hat or sunglasses before heading out in the sun

Dash out to peg out the clothes without any sun protection

Prototype Perceptions

The following questions concern your images of people. What we are interested in here are your ideas about typical members of different groups. For example, we all have ideas about what typical movie stars are like or what the typical grandmother is like. When asked, we could describe one of these images – we might say we think the typical movie star is pretty or rich, or that the typical grandmother is sweet and frail. We are not saying that all movie stars or grandmothers are exactly alike, but rather that many of them share certain characteristics.

Please provide up to 3 words that you believe describe the prototypical person who **deliberately seeks a tan.** By this we mean someone who **sunbathes** to get a tan.

Please indicate your overall favourability of the type of person who deliberately tans:

1	2	3	4	5	6	7
Not At all Favourable			Neutral			Extremely Favourable

How similar are you to the type of person who deliberately tans?

1	2	3	4	5	6	7
Not At all Similar			Neutral			Extremely Similar

Please provide up to 3 words that you believe describes the prototypical person who **incidentally acquires a tan.** By this we mean someone who does not sunbathe, but is happy to **get a bit of colour** by exposure to the sun in the course of normal daily activities.

Please indicate your overall favourability of the prototypical person who incidentally gets a bit of colour:

1	2	3	4	5	6	7
Not At all Favourable			Neutral			Extremely Favourable

How similar are you to the type of person who incidentally gets a bit of colour?

1	2	3	4	5	6	7
Not At all Similar			Neutral			Extremely Similar

Please provide up to 3 words that you believe describe the prototypical person who **protects themselves from the sun**. By this we mean someone who protects themselves by applying sunscreen, wearing a hat, protective clothing and sunglasses **most of the time** when outdoors.

Please indicate your overall favourability of the type of person who <u>protects themselves from the sun</u>:

1	2	3	4	5	6	7
Not At all Favourable			Neutral			Extremely Favourable

How similar are you to the type of person who <u>protects themselves from the sun</u>?

1	2	3	4	5	6	7
Not At all Similar			Neutral			Extremely Similar

Social Comparison

Most people compare themselves from time to time with others. For example, they may compare the way they feel, their opinions, their abilities and/or their situation with those of other people. There is nothing particularly 'good' or 'bad' about this type of comparison, and some people do it more than others. We would like to find out how often you compare yourself with other people. To do that we would like to ask you to indicate how much you agree with *each* statement below, by using the following scale.

(1= I disagree strongly, I disagree, I neither agree or disagree, I agree, 5= I agree Strongly)

I often compare how my loved ones (boy or girlfriend, family members etc.) are doing with how others are doing

I always pay a lot of attention to how I do things compared with how others do things

If I want to find out how well I have done something, I compare what I have done with how others have done

I often compare how I am doing socially (e.g. social skills, popularity) with other people

I am not the type of person who compares often with others

I often compare myself with others with respect to what I have accomplished in life

I often like to talk with others about mutual opinions and experiences

I often try to find out what others think who face similar problems as I face

I always like to know what others in a similar situation would do

If I want to learn more about something, I try to find out what others think about it

I *never* consider my situation in life relative to that of other people

Appendix E: Study 2 - Ethics Approval

This administrative form has been removed

Appendix F: Study 2 – Reported prototype characteristics

Table F.1
Frequencies of reported characteristics for incidental prototype

Characteristic	*n* (%)
Active	97 (19.13)
Normal/Average	91 (17.95)
Careless	52 (10.26)
Worker	42 (8.28)
Healthy	41 (8.09)
Admired	32 (6.31)
Unaware	25 (4.93)
Damaging	22 (4.34)
Tanned skin	18 (3.55)
Nonchalant	13 (2.56)
Attractive	9 (1.78)
Practical	8 (1.58)
Skin care	8 (1.58)
Ethnic	8 (1.58)
Acceptable	7 (1.38)
Smart	5 (1.18)
Aware	5 (0.99)
Low income	4 (0.79)
Stubborn	3 (0.59)
Vitamin D	2 (0.39)
Fair skin	2 (0.39)
Hair	1 (0.20)
Female	1 (0.20)
Male	1 (0.20)
Middle-aged	1 (0.20)
Not wasteful	1 (0.20)
Simple	1 (0.20)
Skin cancer	1 (0.20)
Smart	1 (0.20)
Trusting	1 (0.20)
Unlucky	1 (0.20)
Vain	1 (0.20)
Youth	1 (0.20)
Risky	1 (0.20)

Note: total number of reported characteristics= 507

Table F.2
Frequencies of reported characteristics for deliberate prototype

Characteristic	*n* (%)
Vain	129 (22.67)
Foolish	86 (15.11)
Damaged skin	47 (8.26)
Unaware	42 (7.38)
Fake/dishonest	32 (5.62)
Young	28 (4.92)
Dangerous	24 (4.22)
Tanned skin	24 (4.22)
Attractive	18 (3.16)
Female	16 (2.81)
Appearance (blonde, thin)	14 (2.46)
Desperate	9 (1.58)
Admired	8 (1.41)
Unattractive	8 (1.41)
Dedicated	7 (1.23)
Active	7 (1.23)
Stereotypic	7 (1.23)
Unhealthy	6 (1.05)
Bored	5 (0.88)
Old	5 (0.88)
Healthy	5 (0.88)
Beach	5 (0.88)
Fair	4 (0.70)
Conformist	4 (0.70)
Relaxed	3 (0.53)
Wealthy	3 (0.53)
Acceptable	3 (0.53)
Outdoor	3 (0.53)
Lazy	2 (0.35)
Male	2 (0.35)
Party	2 (0.35)
Ethnic	2 (0.35)
Impractical	1 (0.18)
Unhappy	1 (0.18)
Judgmental	1 (0.18)
Concerned	1 (0.18)
Proactive	1 (0.18)
Ordinary	1 (0.18)
Myself	1 (0.18)
Unemployed	1 (0.18)
Strong	1 (0.18)

Note: total number of reported characteristics= 569

Table F.3
Frequencies of reported characteristics for protector prototype

Characteristics	*n* (%)
Sun smart	204 (36.11)
Cautious	95 (16.81)
Healthy	51 (9.03)
Fair	50 (8.85)
Grown up	28 (4.96)
Over protective	27 (4.78)
Responsible	18 (3.19)
Prepared	13 (2.30)
Normal	11 (1.95)
Admirable	8 (1.42)
Worker	5 (0.88)
Practical	5 (0.88)
Self-confident	5 (0.88)
Nerd	5 (0.88)
Previously affected	5 (0.88)
Young	4 (0.71)
Nice skin	3 (0.53)
Attractive	3 (0.53)
Active	3 (0.53)
Committed	3 (0.53)
Sensitive	2 (0.35)
Positive	2 (0.35)
Fun	2 (0.35)
Douche	1 (0.18)
Uneasy	1 (0.18)
Indoorsy	1 (0.18)
Beach	1 (0.18)
Cold	1 (0.18)
Restricted	1 (0.18)
Wealthy	1 (0.18)
Socially welcome	1 (0.18)
Female	1 (0.18)
Misinformed	1 (0.18)
Reliable	1 (0.18)
Vain	1 (0.18)
Dark skinned	1 (0.18)

Note: total number of reported characteristics= 565

Appendix G: Study 3a - Tabulated prototype manipulation studies

Table G.1
Sample summary of prototype intervention studies

Authors	Behaviour	Sample	Length of follow-up	Intervention target	Manipulation check?	Dependant variable of interest	Intervention successful on DV?	Prototype perceptions manipulated?
Blanton, van den Eijnden, Buunk, Gibbons, Gerrard & Bakker (2001) – Study 4	Condom use.	University students (*n*=120)	Single session.	Newspaper article – risk prototype, favourability manipulation (positive vs. negative vs. control)	No.	Willingness	Yes, sig differences for negative vs. positive, and negative vs. control groups	Not reported.
Thornton, Gibbons & Gerrard (2002) – Study 2	Risky sex behaviours	Female university students (*n*=68)	Single session.	Person profiles – risk prototype, similarity manipulation (similar profile vs. dissimilar profile conditions)	Yes. Similar profile group sig. greater perceived similarity & favourability compared to dissimilar profile group.	Willingness to have unprotected sex.	Yes, willingness to have unprotected sex sig. different between groups.	Not reported.
Gibbons, Gerard, Lane, Mahler & Kulik (2005) – Study 1	Indoor tanning	Female university students (*n*=58)	4 weeks	UV image – (UV photo vs. no photo), no prototype focus.	No.	Willingness to expose to the sun Sunbather prototype	No sig difference between groups immediately post-test, but sig. difference between groups at 4-week follow-up. Yes (UV photo group vs. no-UV photo group) sig. differences immediately post-test, but no difference at 4-week follow-up.	Yes (UV photo group vs no photo group differences; immediately post-test only)

						Indoor tanning use	UV photo group sig. less indoor tanning than no-photo group at 4 weeks	
Gibbons, Gerard, Lane, Mahler & Kulik (2005) – Study 2	Indoor tanning	Female university students (*n*=109)	3 weeks	UV image – (UV photo vs. Black and white photo), no prototype focus.	No.	Willingness to expose to the sun Sunbather prototype Indoor tanning	Sig difference between groups immediately post-test, and at 3-week follow-up Sig difference between groups immediately post-test, but no difference at 3 week follow-up UV photo group sig. less indoor tanning than black and white photo group at 3 weeks	Yes (UV photo group vs black and white photo group differences; immediately post-test only)
Gerrard, Gibbons, Brody, Murry, Cleveland, Wills (2006)	Alcohol consumption	Community sample (*n*=281)	3months & 2 years	7 x 2hr weekly group meetings (control vs. intervention)	Not reported.	Alcohol consumption (2yrs)	Control vs. intervention group differences for alcohol consumption.	None reported.
Lane, Gibbons, O'Hara, Gerrard (2011)	Alcohol consumption	University students (*n*=55)	Single session.	Newspaper article norms, plus distancing (dissimilar) or assimilation (similar) task – risk prototype, similarity manipulation (similar vs. dissimilar groups)	Not reported.	Willingness to drink alcohol	Similarity sig. related to willingness. No main effect of condition on willingness, but a significant similarity x condition interaction.	None reported.
Litt & Stock (2011)	Alcohol consumption	Adolescents (*n*=189)	Single session.	Facebook profiles – risk prototype, favourability manipulation (positive/drinker vs. control/non-drinker).	No.	Willingness Drinker prototype	Yes, positive vs. control, for willingness and prototype evaluation	Yes (positive vs. control group differences)

Todd & Mullan (2011)	Alcohol consumption	Female university students (*n*=159)	2 – 3 weeks	Newspaper article – risk prototype, favourability manipulation (manipulation, vs. mere-measurement, vs. control)	Not reported.	Alcohol consumption	No	None reported.
Teunissen, Spijkerman, Larsen, Kremer, Kuntsche, Gibbons, Scholte & Engels (2012)	Alcohol consumption	University students (*n*=192)	Single session.	Magazine article – specific characteristics - risk prototype, favourability manipulation (positive vs. negative)	Sig differences for prototype characteristics between positive and negative groups at post-test.	Alcohol consumption	Yes, positive vs. negative groups, for males only	Yes (positive vs. negative group differences)
Walsh & Stock (2012)	Sun protection	Male university students (*n*=152)	2 weeks	UV image – no prototype focus (UV image vs. black and white image)	UV image manipulation check.	Sun protection willingness	No UV image vs. black and white image group differences for willingness.	Not reported.
Stock, Gibbons, Peterson & Gerrard (2013) – Study 2	Substance Use & Risky Sex behaviours	African-American adults (*n*=110)	Single session.	Exclusion using 'Cyberball' game – no prototype focus (inclusion vs. exclusion groups)	Exclusion manipulation check.	Substance use willingness Risky sex willingness	Exclusion group sig. higher willingness to engage in substance use & risky sex, compared to inclusion group.	Not reported.
Teunissen, Spijkerman, Cohen, Prinstein, Engels, Scholte (2014)	Alcohol consumption	Male adolescents (*n*=88)	Single session.	Online chat with confederates - 2 (popular vs. unpopular) x 2 (pro-alcohol vs. anti-alcohol), risk prototype, favourability.	Yes, popularity sig. differed across groups.	Favourability & Similarity: (Abstainer, Moderate & Heavy Drinkers) Willingness	Sig. difference for favourability and similarity between pro-alcohol and anti-alcohol groups for heavy drinker prototype only. Sig. differences in willingness to drink for anti-alcohol norms group vs. pro-alcohol norms group.	Yes (pro-alcohol vs. anti-alcohol group differences for heavy drinker prototype).

							Sig. lower willingness when normative information delivered by popular peer, compared to unpopular peer	

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Appendix H: Study 3a – Full study protocol

Appendix H.1

Part 1 - Health Behaviours in the Tropics Questionnaire

We would like to know a little about you. Please answer all the questions as accurately and honestly as possible. Your responses will be kept completely confidential and there are no right or wrong answers.

Age: _____

Please indicate your gender by ticking the appropriate box □Male □Female

Postcode: _____

How long have you lived in North Queensland (years/months)? _____

Do you identify with an ethnic group? □ Yes □ No
If so, which ethnicity do you identify with? _____

Please select your highest level of education:

Less than Year 12	□
Year 12	□
Trade Qualification	□
Certificate/Diploma	□
Undergraduate Degree	□
Post-graduate Degree	□
Other_____	□

Have you ever had skin cancer? If so, what type?

No Yes, Melanoma Yes, Non-Melanoma Yes, but not sure

Have any of your family or friends ever had skin cancer? If so, what type?

No Yes, Melanoma Yes, Non-Melanoma Yes, but not sure

Suppose your skin was exposed to strong sunshine at the beginning of summer with no protection at all. If you stayed out in the sun for 30 minutes, would your skin…

Just burn, and not tan afterwards | Burn first, then tan afterwards | Not burn at all, just tan

What is your natural hair colour?

Blonde Light Brown Dark Brown Black

Do you smoke cigarettes? □ Yes □ No

If yes, how long have you smoked cigarettes? _____

On average, how many cigarettes do you smoke each week? _____

Do you drink alcohol? □ Yes □ No

Please think about your recent alcohol consumption starting from two Sunday's ago and ending with the Saturday immediately prior to completing this survey.

For **example**, if you consumed 2 drinks on Tuesday two weeks ago, 4 drinks on Friday two weeks ago and 10 drinks last Saturday, your table would look like this:

Example Response:

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
x	x	**2**	x	x	**4**	x
Sun	Mon	Tues	Wed	Thurs	Fri	Last Sat
x	x	x	x	x	x	**10**

Please think about **how many standard drinks you consumed on each day** over the two week period starting from two Sundays ago and ending with the Saturday immediately prior to completing this survey. Please provide a number indicating how many drinks you consumed each day in the empty table below. **Please place an 'X' in the box for any day you did not drink.**

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Sun	Mon	Tues	Wed	Thurs	Fri	Last Sat

Do you regularly engage in planned physical activity? □ Yes □ No

In an average week, how many hours or minutes do you spend engaged in planned physical activity?

_____ hours _____ mins

Have you ever had a spray-on tan or used tanning lotions? □ Yes □ No

If yes, when was the last time you did this?

□ Within the last two weeks □ More than 2 weeks ago □ More than 1 month ago

Did you spend **any time in the sun on Saturday**? This does **not** just include planned outdoor activities or leisure time, but can also include time spent working, walking around your garden, pegging out washing, or doing other household chores while outside.

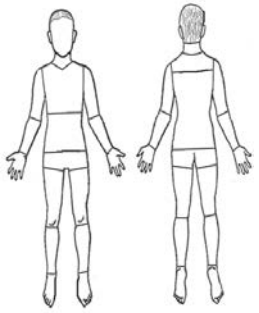
Using the table below, please indicate the time you spent outside on the **Saturday immediately prior to completing this survey**. Please **think very carefully** and include **ALL** the time spent outdoors in the sun on Saturday.

Saturday – Time spent outside

Time Outdoors Tick the box which best represents the amount of time you spent outdoors during each three hour interval				**Did you apply sunscreen?**	**What type of clothing were you wearing during each three hour interval on Saturday?** (comments)	**Reason for being outside during each three hour interval on Saturday** (comments)
	0 – 30 mins	**30 – 60 mins**	**60 mins +**			
Example		✓		~~Yes~~ (No)	***T-shirt, shorts, sandals, sunglasses***	***Hanging out washing + watering the lawn***
5am – 8am				Yes No		
8am – 11am				Yes No		
11am – 2pm				Yes No		
2pm – 5pm				Yes No		
5pm – 7pm				Yes No		

Did you apply sunscreen on Saturday? □ Yes □ No

If yes, please shade the diagram to show the parts of the body that you applied sunscreen to on Saturday.



Front Back

Did you spend **any time in the sun on Sunday**? This does **not** just include planned outdoor activities or leisure time, but can also include time spent working, walking around your garden, pegging out washing, or doing other household chores while outside.

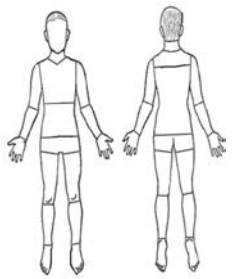
Using the table below, please indicate the time you spent outside on the **Sunday immediately prior to completing this survey**.

Sunday – Time spent outside

Time Outdoors Tick the box which best represents the amount of time you spent outdoors during each three hour interval				**Did you apply sunscreen?**	**What type of clothing were you wearing during each three hour interval on Sunday?** (comments)	**Reason for being outside during each three hour interval on Sunday** (comments)
	0 – 30 mins	**30 – 60 mins**	**60 mins +**			
Example			✓	~~Yes~~ (No)	***Long-sleeved shirt, shorts, wide-brimmed hat***	***Fishing + Cleaning the boat***
5am – 8am				Yes No		
8am – 11am				Yes No		
11am – 2pm				Yes No		
2pm – 5pm				Yes No		
5pm – 7pm				Yes No		

Did you apply sunscreen on Sunday? □ Yes □ No

If yes, please shade the diagram to show the parts of the body that you applied sunscreen to on Sunday.



Front Back

These next questions are about your plans for the **future**. Please indicate your intentions for the **next two weeks**. Please circle the response that **best** describes your plans for the future.

I intend to sunbathe at least once in the next two weeks

Strongly Agree	Agree	Agree Slightly	Neither Agree/Disagree	Disagree Slightly	Disagree	Strongly Disagree

I intend to smoke cigarettes in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

I intend to ALWAYS use sun protection when out in the sun in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

I intend to drink alcohol on at least one week day in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

I intend to go outside without sun protection at least once in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

I intend to drink alcohol on at least one weekend day in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

I intend to exercise at least three times per week in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

These next questions are about your views on different behaviours. You might not ever find yourself in these situations, but just imagine what you might do **if** you found yourself in each of the following scenarios. **Please provide a response for each option:**

Imagine that you are on holidays with your friends when someone suggests that you should all go lie in the sun to tan. How likely are you to….

Apply sunscreen before lying on your towel in the sun

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Sit nearby your friends, making sure you are in the shade

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Grab your towel and lay in the sun

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Imagine that it is the weekend and you have planned to meet some friends at a park or at the beach. You are about to leave home. How likely are you to…

Leave home without sun protection

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Pack a long-sleeved shirt, wide brimmed hat and sunscreen to take with you

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Grab a wide-brimmed hat before you leave home

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Imagine that it is the weekend and you are at home in the middle of the day. You are about to walk outside to your backyard and into the sun. How likely are you to…

Put on a long-sleeved shirt, wide brimmed hat and/or sunscreen before you go outside

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Go outside without sun protection

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Put on a wide-brimmed hat before you head outside

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

The following questions are about your images of people. We are interested in your ideas about typical members of different groups. For example, we all have ideas about what the typical movie star is like or what the typical grandmother is like. When asked, we can describe these images. We might say that we think the typical movie star is pretty or rich, or that the typical grandmother is sweet and frail. We are not saying that all movie stars or grandmothers are exactly alike, but rather that many of them share certain characteristics.

When you think about the following, please think about the **typical** person who does these things, rather than a specific individual.

Think about the typical person who **acquires a bit of colour whilst going about their usual daily activities**. For example, walking around their backyard or walking to and from their car and office building. This type of person is not intentionally seeking a tan, but might acquire a tan over time.

What is your opinion of the type of person who acquires a bit of colour over time?

1	2	3	4	5	6	7
Not at all favourable						Extremely favourable

Do you think you are similar to the type of person who acquires a bit of colour over time?

1	2	3	4	5	6	7
Not at all similar						Extremely similar

Think about the typical person who **always protects themselves from the sun**. By this we mean someone who takes protective measures such wearing a hat, long-sleeved clothing or sunscreen at all times when outdoors – even when only outside for short periods of time.

What is your opinion of the type of person who always protects themselves from the sun?

1	2	3	4	5	6	7
Not at all favourable						Extremely favourable

Do you think you are similar to the type of person who always protects themselves from the sun?

1	2	3	4	5	6	7
Not at all similar						Extremely similar

Think about the typical person who **deliberately sunbathes**. By this we mean someone who goes out into the sun with the sole purpose of getting a tan.

What is your opinion of the type of person who deliberately sunbathes?

1	2	3	4	5	6	7
Not at all favourable						Extremely favourable

Do you think you are similar to the type of person who deliberately sunbathes?

1	2	3	4	5	6	7
Not at all similar						Extremely similar

The following questions are about your opinions. Please read each question carefully and **circle the best response** that describes your views.

If you were to always **use sun protection**, what do you think the chances are that you would develop skin cancer?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

If you were to always **use sun protection**, what do you think the chances are that you would damage your skin?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

In general, I believe that **sun protection** is…

1	2	3	4	5	6	7
Very Good						Very bad

If you were to regularly **sunbathe** to get a tan, what do you think the chances are that you would develop skin cancer?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

If you were to regularly **sunbathe** to get a tan, what do you think the chances are that you would damage your skin?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

In general, I believe that **sunbathing** is…

1	2	3	4	5	6	7
Very Good						Very bad

If you were to **acquire a bit of colour whilst going about your usual daily activities**, what do you think the chances are that you would develop skin cancer?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

If you were to **acquire a bit of colour whilst going about your usual daily activities**, what do you think the chances are that you would damage your skin?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

In general, I believe that **acquiring a bit of colour whilst going about my usual daily activities** is…

1	2	3	4	5	6	7
Very Good						Very bad

These questions are about your opinions. We would like to know how much you agree with each of the following statements. Place a tick in the column that **BEST** describes your views.	**Strongly Disagree**	**Disagree**	**Neither Agree/Disagre**	**Agree**	**Strongly Agree**
Most of my friends smoke cigarettes					
Most of the people who are important to me deliberately sunbathe					
Most people think it is OK to get a little extra colour					
Most people are SunSmart these days					
Cigarettes make me feel more relaxed					
Alcohol makes me feel good					
Most people deliberately sunbathe to get a tan					
Most of my friends think that drinking alcohol is a good thing					
Most of the people who are important to me think that I should ALWAYS use sun protection when out in the sun					
Most of my friends drink alcohol					
Most of my friends exercise regularly					
Most of the people who are important to me think that I should deliberately sunbathe					
Most people drink alcohol					
Most of the people who are important to me ALWAYS use sun protection when out in the sun					
Alcohol makes me more sociable					
Most of the people who are important to me think that it's OK for me to be outside without any sun protection					
Drinking alcohol gives me confidence					
Exercise makes me feel good					
Most of the people who are important to me go outside without any sun protection					

Most people compare themselves from time to time with others. For example, they may compare the way they feel, their opinions, their abilities and/or their situation with that of other people. There is nothing particularly 'good' or 'bad' about this type of comparison, some people do it more than others. We would like to find out how often you compare yourself with other people.

To do that, we would like to ask you to indicate how much you agree with each statement below.

I often compare how my loved ones (boy or girlfriend, family members etc.) are doing with how others are doing

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

I always pay a lot of attention to how I do things compared with how others do things

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

If I want to find out how well I have done something, I compare what I have done with how others have done

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

I often compare how I am doing socially (eg. social skills, popularity) with other people

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

I am not the type of person who compares myself often with others

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

I often compare myself with others with respect to what I have accomplished in life

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

I often like to talk with others about mutual opinions and experiences

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

I often try to find out what others think when they face similar problems that I face

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

I always like to know what others would do in a similar situation

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

If I want to learn more about something, I try to find out what others think about it

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

I *never* consider my situation in life relative to that of other people

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

Thank you for completing this survey. Your participation is greatly appreciated!

Please let the researcher know that you have finished.

Appendix H.2 - Positive Stimuli

Extra colour in sunny QLD

SUN SMART: New research into perceptions of sun safety

Research finds Queenslanders admire those who can tan in the sun.

Jillian Cartour

How, when and why people protect themselves from the sun was the subject of research recently conducted in North Queensland by Cancer Council Queensland.

The researchers found that the majority of people surveyed thought that sun protection was important, but not always necessary. "We all know that we should be 'slip', 'slop', 'slapping' but some people don't mind getting a bit of colour either" said Donna Harris, Chair, Cancer Council Queensland. The research reveals that 85% of people surveyed thought that those who can acquire a bit of colour without having to actively try were considered to be lucky and carefree.

"We were not surprised to find that the perceptions are quite positive for those who gradually acquire a bit of colour in the course of their daily activities. A staggering 90% of people surveyed thought that it was not practical to be SunSmart all of the time. Those who gradually acquire extra colour due to small doses of the sun are admired" she said.

The research also indicates that more people are remembering to incorporate sun protection into their plans when heading out to the beach or to their local park for the day. "While it is difficult to shield ourselves from the sun all the time, most people in North Queensland believe that we must look after our skin by protecting it from the sun when outside for extended periods of time" Harris said.

In press: 8th July 2013

Appendix H.3 - Negative Stimuli

Don't be lazy in the sun

SUN SMART: New research into perceptions of sun safety

Research finds Queenslanders look down on those who aren't 'sun smart'.

Jillian Cartour

How, when and why people protect themselves from the sun was the subject of research recently conducted in North Queensland by Cancer Council Queensland.

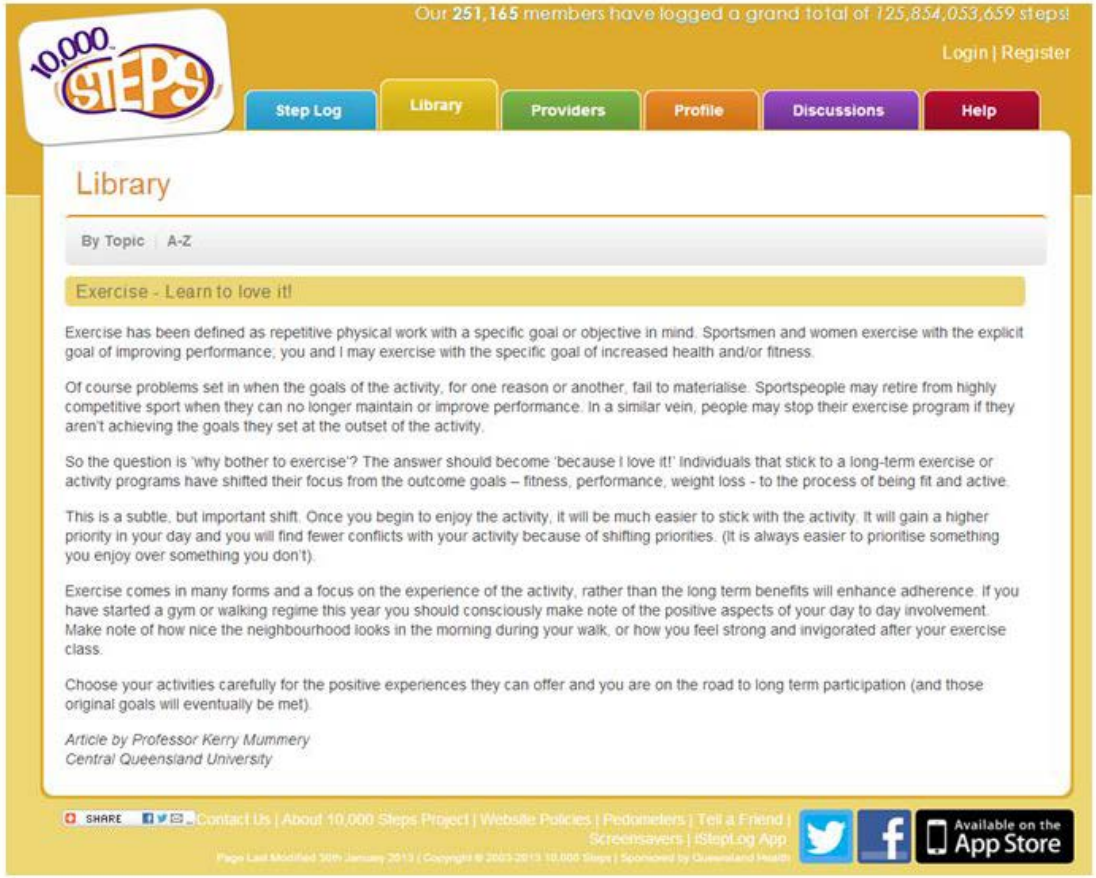
The researchers found that the majority of people surveyed thought that sun protection was important. "We all know that we should be 'slip', 'slop', 'slapping' every day, all year round" said Donna Harris, Chair, Cancer Council Queensland. The research reveals that 85% of people surveyed thought that those who forego sun protection for a bit of colour are lazy and careless.

"We were not surprised to find that the perceptions are quite negative for those who do not sun protect as often as they should. A staggering 90% of people surveyed thought that going out in the North Queensland sun with exposed skin is irresponsible – even if it is just for a few minutes" she said.

The research also indicates that more people are sun protecting as part of their daily routine, rather than only protecting for planned outdoor activities. "It is reassuring to see an upward trend for daily sun protection – we are now in a position where most people in North Queensland believe that we must look after our skin by protecting it from the sun all of the time" Harris said.

In press: 08/07/2013

Appendix H.4 - Control Stimuli



Taken from: http://www.10000steps.org.au/library/exercise-learn-to-love-it/

Appendix H.5 - Physical measurements

Date_____ Time _____

Physical Measurements

Height: _____cm

Weight: _____kg

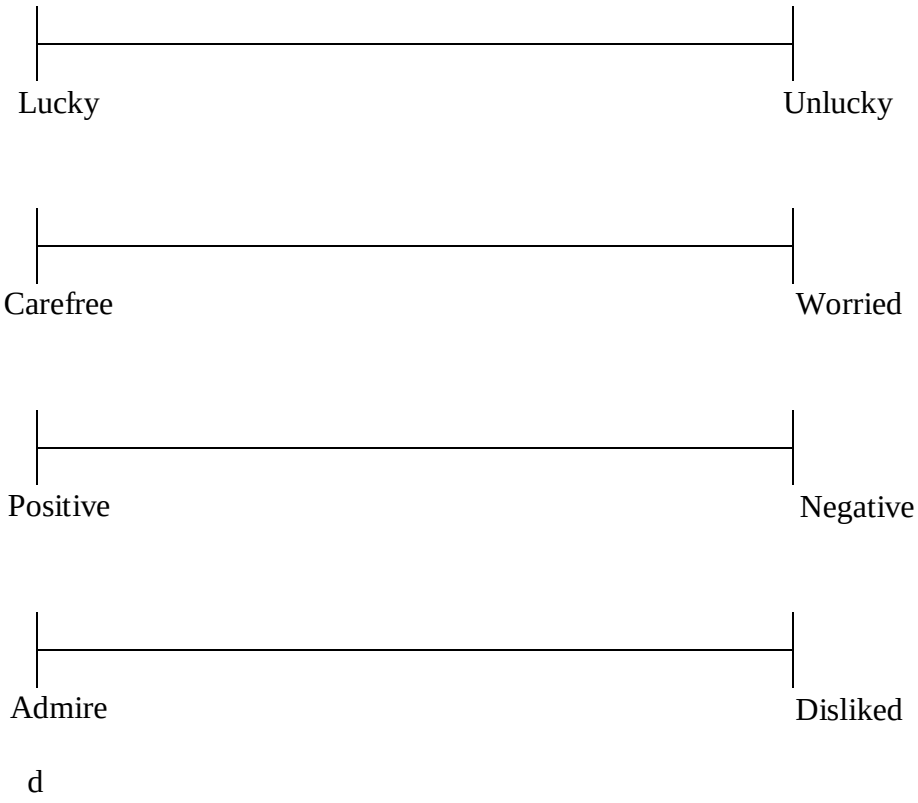
Spectrophotometer Measures

	Flash #	400nm	420 nm	L*	A*	B*
Inner Upper L) Arm		(11.0 – 33.6)				
i						
ii						
iii						
L) Hand		(6.0 – 26.4)	(6.0 – 24.0)			
i						
ii						
iii						
L) Cheek		(6.0 – 26.4)	(6.0 – 24.0)			
i						
ii						
iii						

Appendix H.6 – Manipulation check for Positive group

Please think about what you read in the newspaper article while considering the following.

Please place a 'X' mark on the lines below to indicate your impression of the behaviour described in the article.



What is your opinion of the type of person who acquires a bit of colour over time?

1	2	3	4	5	6	7
Not at all favourable						Extremely favourable

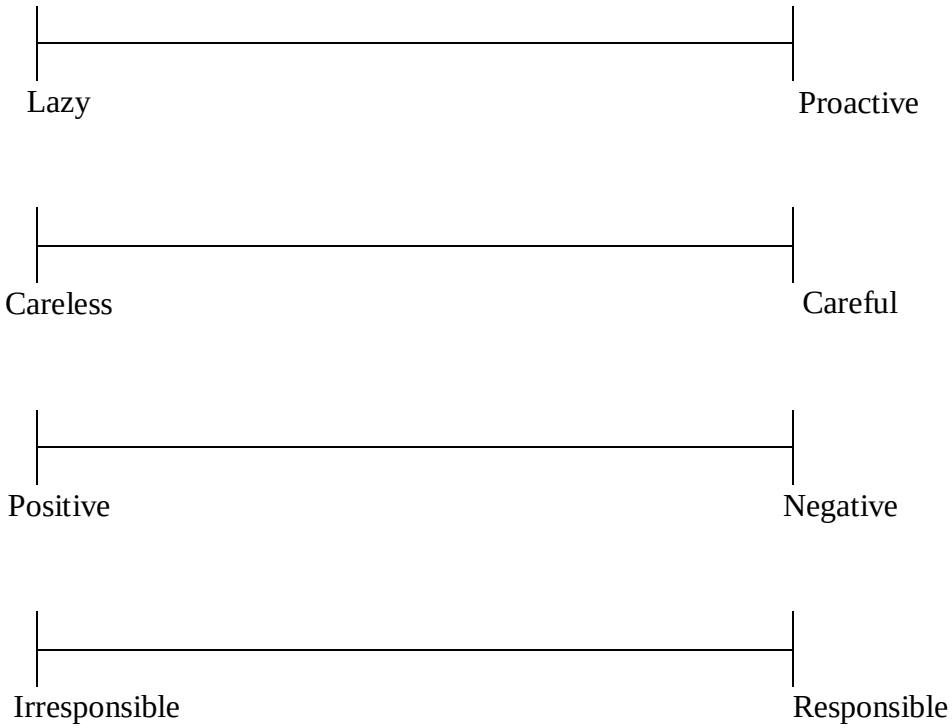
Do you think you are similar to the type of person who acquires a bit of colour over time?

1	2	3	4	5	6	7
Not at all similar						Extremely similar

Appendix H.7 – Manipulation check for Negative group

Please think about what you read in the newspaper article while considering the following.

Please place a 'X' mark on the lines below to indicate your impression of the behaviour described in the article.



What is your opinion of the type of person who acquires a bit of colour over time?

1	2	3	4	5	6	7
Not at all favourable						Extremely favourable

Do you think you are similar to the type of person who acquires a bit of colour over time?

1	2	3	4	5	6	7
Not at all similar						Extremely similar

Appendix H.8 – Manipulation check for Control group

Please place a ‘X’ mark on the lines below to indicate your opinions about **physical activity.**

Overall, I think that engaging in physical activity is…

Now, please think about the typical person who might gradually acquire a tan over time…

What is your opinion of the type of person who gradually acquires a bit of colour whilst going about their usual daily activities?

1	2	3	4	5	6	7
Not at all favourable						Extremely favourable

Do you think you are similar to the type of person who gradually acquires a bit of colour whilst going about their usual daily activities?

1	2	3	4	5	6	7
Not at all similar						Extremely similar

Appendix H.9 – Part 2 Questionnaire

Health Behaviours in the Tropics – Part 2

Please answer all the questions as accurately and honestly as possible. Your responses will be kept completely confidential and there are no right or wrong answers.

Age: _____

Gender: _____

Did you drink alcohol in the last two weeks? □ Yes □ No

Please think about your recent alcohol consumption starting from two Sunday's ago and ending with the Saturday immediately prior to completing this survey.

For **example**, if you consumed 2 drinks on Tuesday two weeks ago, 4 drinks on Friday two weeks ago and 10 drinks last Saturday, your table would look like this:

Example Response:

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
x	x	**2**	x	x	**4**	x
Sun	Mon	Tues	Wed	Thurs	Fri	Last Sat
x	x	x	x	x	x	**10**

Please think about **how many standard drinks you consumed on each day** over the two week period starting from two Sundays ago and ending with the Saturday immediately prior to completing this survey. Please provide a number indicating how many drinks you consumed each day in the empty table below. **Please place an 'X' in the box for any day you did not drink.**

Sun	Mon	Tues	Wed	Thurs	Fri	Sat
Sun	Mon	Tues	Wed	Thurs	Fri	Last Sat

Have you engaged in planned physical activity in the last two weeks? □ Yes □ No

On average, how many hours or minutes did you spend engaged in planned physical activity each week?

_____ hours _____ mins

Have you had a spray-on tan or used tanning lotions in the last two weeks?
□ Yes □ No

Did you spend **any time in the sun on Saturday**? This does **not** just include planned outdoor activities or leisure time, but can also include time spent working, walking around your garden, pegging out washing, or doing other household chores while outside.

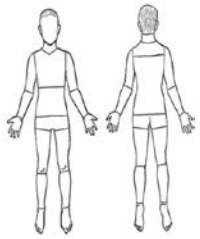
Using the table below, please indicate the time you spent outside on the **Saturday immediately prior to completing this survey**. Please **think very carefully** and include **ALL** the time spent outdoors in the sun on Saturday.

Saturday – Time spent outside

Time Outdoors Tick the box which best represents the amount of time you spent outdoors during each three hour interval				**Did you apply sunscreen?**	**What type of clothing were you wearing during each three hour interval on Saturday?** (comments)	**Reason for being outside during each three hour interval on Saturday** (comments)
	0 – 30 mins	**30 – 60 mins**	**60 mins +**			
Example		✓		~~Yes~~ (No)	***T-shirt, shorts, sandals, sunglasses***	***Hanging out washing + watering the lawn***
5am – 8am				Yes No		
8am – 11am				Yes No		
11am – 2pm				Yes No		
2pm – 5pm				Yes No		
5pm – 7pm				Yes No		

Did you apply sunscreen on Saturday? □ Yes □ No

If yes, please shade the diagram to show the parts of the body that you applied sunscreen to on Saturday.



Front Back

Did you spend **any time in the sun on Sunday**? This does **not** just include planned outdoor activities or leisure time, but can also include time spent working, walking around your garden, pegging out washing, or doing other household chores while outside.

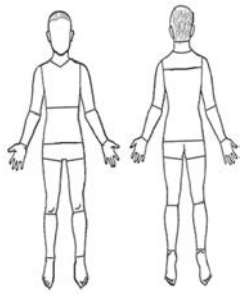
Using the table below, please indicate the time you spent outside on the **Sunday immediately prior to completing this survey**.

Sunday – Time spent outside

Time Outdoors Tick the box which best represents the amount of time you spent outdoors during each three hour interval				**Did you apply sunscreen?**	**What type of clothing were you wearing during each three hour interval on Sunday?** (comments)	**Reason for being outside during each three hour interval on Sunday** (comments)
	0 – 30 mins	**30 – 60 mins**	**60 mins +**			
Example			✓	~~Yes~~ (No)	***Long-sleeved shirt, shorts, wide-brimmed hat***	***Fishing + Cleaning the boat***
5am – 8am				Yes No		
8am – 11am				Yes No		
11am – 2pm				Yes No		
2pm – 5pm				Yes No		
5pm – 7pm				Yes No		

Did you apply sunscreen on Sunday? □ Yes □ No

If yes, please shade the diagram to show the parts of the body that you applied sunscreen to on Sunday.



Front Back

The following questions are about your images of people. We are interested in your ideas about typical members of different groups. For example, we all have ideas about what the typical movie star is like or what the typical grandmother is like. When asked, we can describe these images. We might say that we think the typical movie star is pretty or rich, or that the typical grandmother is sweet and frail. We are not saying that all movie stars or grandmothers are exactly alike, but rather that many of them share certain characteristics.

When you think about the following, please think about the **typical** person who does these things, rather than a specific individual.

Think about the typical person who **acquires a bit of colour whilst going about their usual daily activities**. For example, while walking around their backyard or walking to and from their car and office building. This type of person is not intentionally seeking a tan, but might acquire a tan over time.

What is your opinion of the type of person who acquires a bit of colour over time?

1	2	3	4	5	6	7
Not at all favourable						Extremely favourable

Do you think you are similar to the type of person who acquires a bit of colour over time?

1	2	3	4	5	6	7
Not at all similar						Extremely similar

Think about the typical person who **always protects themselves from the sun**. By this we mean someone who takes protective measures such wearing a hat, long-sleeved clothing or sunscreen at all times when outdoors – even when only outside for short periods of time.

What is your opinion of the type of person who always protects themselves from the sun?

1	2	3	4	5	6	7
Not at all favourable						Extremely favourable

Do you think you are similar to the type of person who always protects themselves from the sun?

1	2	3	4	5	6	7
Not at all similar						Extremely similar

Think about the typical person who **deliberately sunbathes**. By this we mean someone who goes out into the sun with the sole purpose of getting a tan.

What is your opinion of the type of person who deliberately sunbathes?

1	2	3	4	5	6	7
Not at all favourable						Extremely favourable

Do you think you are similar to the type of person who deliberately sunbathes?

1	2	3	4	5	6	7
Not at all similar						Extremely similar

These next questions are about your plans for the **future**. Please indicate your intentions for the **next two weeks**. Please circle the response that **best** describes your plans for the future.

I intend to sunbathe at least once in the next two weeks

Strongly Agree	Agree	Agree Slightly	Neither Agree/Disagree	Disagree Slightly	Disagree	Strongly Disagree

I intend to acquire a bit of colour whilst going about my usual daily activities in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

I intend to ALWAYS use sun protection when out in the sun in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

I intend to drink alcohol on at least one week day in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

I intend to go outside without sun protection at least once in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

I intend to drink alcohol on at least one weekend day in the next two weeks

Strongly Agree	Agree	Slightly Agree	Neither Agree/Disagree	Slightly Disagree	Disagree	Strongly Disagree

These next questions are about your views on different behaviours. You might not ever find yourself in these situations, but just imagine what you might do **if** you found yourself in each of the following scenarios. **Please provide a response for each option:**

Imagine that you are on holidays with your friends when someone suggests that you should all go lie in the sun to tan. How likely are you to….

Apply sunscreen before lying on your towel in the sun

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Sit nearby your friends, making sure you are in the shade

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Grab your towel and lay in the sun

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Imagine that it is the weekend and you have planned to meet some friends at a park or at the beach for a lunch time barbecue. You are just about to leave home. How likely are you to…

Leave home without sun protection

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Pack a long-sleeved shirt, wide brimmed hat and sunscreen to take with you

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Grab a wide-brimmed hat before you leave home

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Imagine that it is the weekend and you are at home in the middle of the day. You are about to walk outside into the sun in your backyard. How likely are you to…

Put on a long-sleeved shirt, wide brimmed hat and/or sunscreen before you go outside

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Go outside without sun protection

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

Put on a wide-brimmed hat before you head outside

Very Likely	Likely	Somewhat Likely	Neither Likely/Unlikely	Somewhat Unlikely	Unlikely	Very Unlikely

The following questions are about your opinions. Please read each question carefully and **circle the best response** that describes your views.

If you were to always **use sun protection**, what do you think the chances are that you would develop skin cancer?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

If you were to always **use sun protection**, what do you think the chances are that you would damage your skin?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

In general, I believe that **sun protection** is…

1	2	3	4	5	6	7
Very Good						Very bad

If you were to regularly **sunbathe** to get a tan, what do you think the chances are that you would develop skin cancer?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

If you were to regularly **sunbathe** to get a tan, what do you think the chances are that you would damage your skin?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

In general, I believe that **sunbathing** is…

1	2	3	4	5	6	7
Very Good						Very bad

If you were to **acquire a bit of colour whilst going about your usual daily activities**, what do you think the chances are that you would develop skin cancer?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

If you were to **acquire a bit of colour whilst going about your usual daily activities**, what do you think the chances are that you would damage your skin?

1	2	3	4	5	6	7
No chance of happening						Would definitely happen

In general, I believe that **acquiring a bit of colour whilst going about my usual daily activities** is…

1	2	3	4	5	6	7
Very Good						Very bad

These questions are about your opinions. We would like to know how much you agree with each of the following statements. Place a tick in the column that **BEST** describes your views.	**Strongly Disagree**	**Disagree**	**Neither Agree/Disagree**	**Agree**	**Strongly Agree**
Most of my friends smoke cigarettes					
Most of the people who are important to me deliberately sunbathe					
Most people think it is OK to get a little extra colour					
Most people are SunSmart these days					
Alcohol makes me feel good					
Most people deliberately sunbathe to get a tan					
Most of my friends think that drinking alcohol is a good thing					
Most of the people who are important to me think that I should ALWAYS use sun protection when out in the sun					
Most of my friends drink alcohol					
Most of the people who are important to me think that I should deliberately sunbathe					
Most people drink alcohol					
Most of the people who are important to me ALWAYS use sun protection when out in the sun					
Alcohol makes me more sociable					
Most of the people who are important to me think that it's OK for me to be outside without any sun protection					
Drinking alcohol gives me confidence					
Most of the people who are important to me go outside without any sun protection					

Thank you for completing this survey. Your participation is greatly appreciated! Please let the researcher know that you have finished.

Appendix I: Study 3a – Calculation of body cover

Table I.1
Percent of body covered, for each item of clothing

Item of clothing	% of body covered
Visor/helmet	4
Gloves	4
Partially closed shoes	4
Closed shoes	5.5
Cap	6
Bucket hat	7.5
Wide-brimmed hat	8.5
Bikini	13
Shorts	19
Singlet	22
Full-piece swim suit	23
Board shorts	28
T-shirt	31
¾ length pants	34
Sundress	36.5
Tights/Long pants	40
Long-sleeved shirt	42
Long-sleeved shirt with collar	42.5
Robe	64
Stinger suit	82

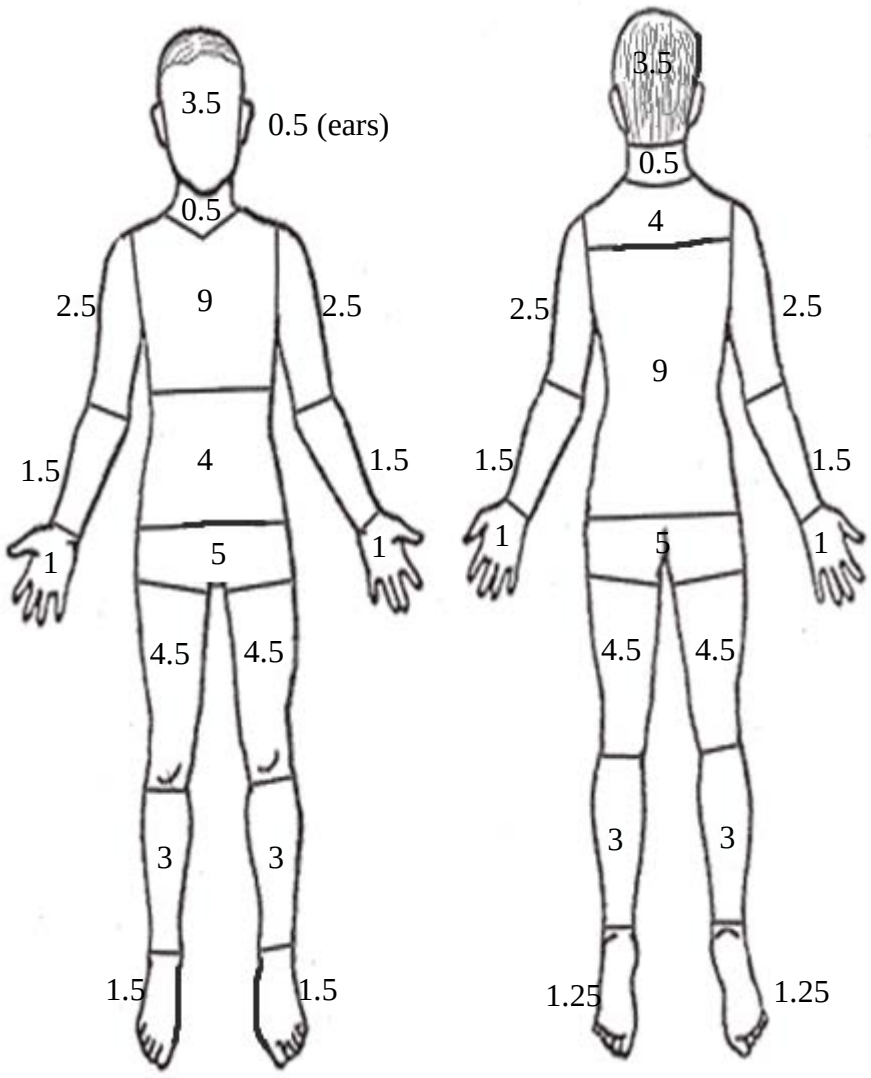


Figure I.1: Body map with values assigned for calculation of percent of body covered with sunscreen. Adapted from (Kimlin et al., 2009).

Appendix J: Study 3a – Histograms for Mean sun exposure at baseline and follow-up

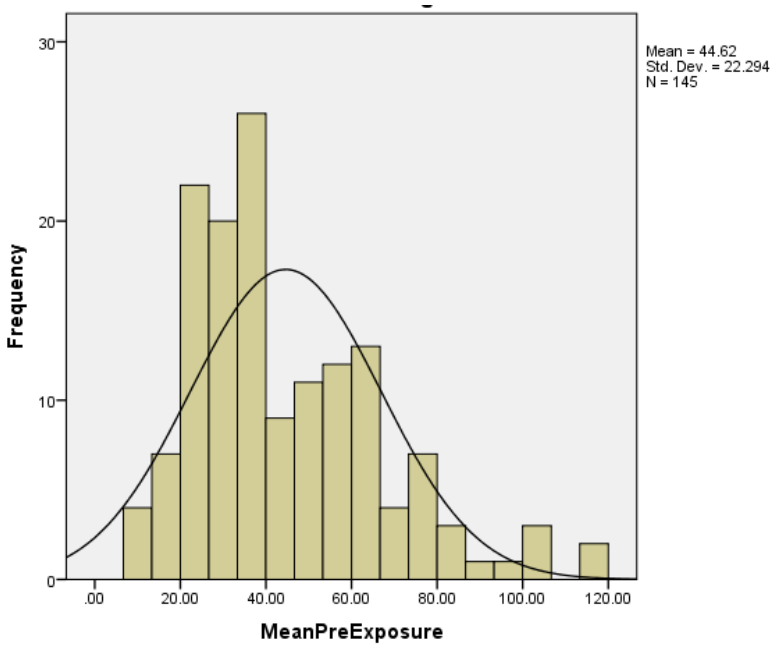


Figure I.1: Histogram of frequency of scores for Baseline Mean Sun Exposure

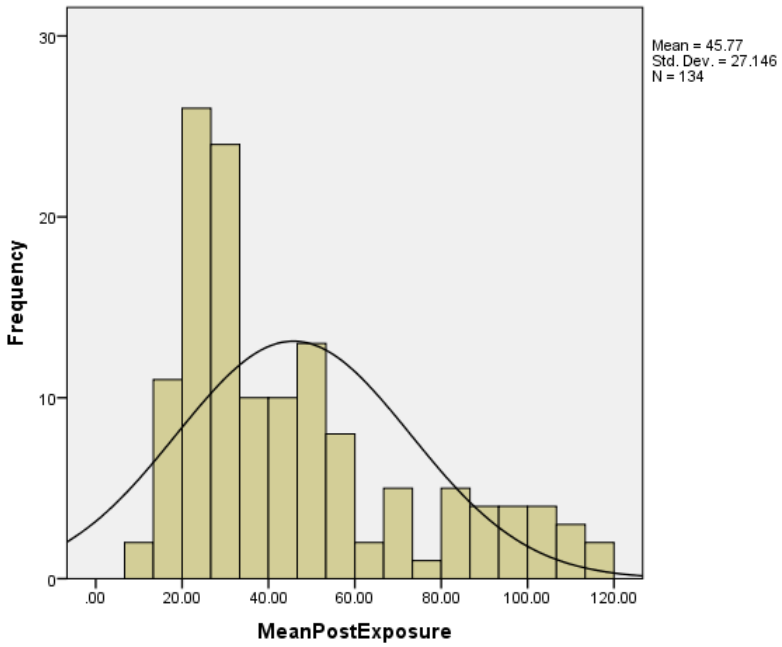


Figure I.2: Histogram of frequency of scores for Post-test Mean Sun Exposure

Appendix K: Study 3a - Ethics Approval Notice

This administrative form has been removed

Appendix L: Study 3a – Coding for weekend outdoor activities

Activities undertaken while outdoors: activities and categories generated using NVivo v. 10

Category	Activity
Household Activities	Animal Care
	Cleaning
	Gardening
	Washing
	Other household activities
Leisure Activities	Exercise
	Eating/Dining & Drinking
	Playing
	Shopping
	Socialising
	Sporting
	Beach & surrounds
	Swimming
	Other leisure activities
Work-related Activities	Manual Labour
	Work
Transit	Transport
	Walking to and from places
Tanning	Sunbathing/Tanning

Appendix M: Study 3a – Chi squared statistics for randomisation checks

Chi-squared (χ^2) statistics for randomisation check of demographic variables at Baseline

Demographic Variables	Condition (Control/Positive/Negative) χ^2 (*p*-value)
Gender (Male/Female)	.52 (.77)
Skin Type (Sensitive/Moderate/Non-sensitive)	1.81 (.77)
Personal History Skin Cancer (No/Yes)	.251 (.88)
Vicarious History Skin Cancer (No/Yes)	2.02 (.36)

Note: Parentheses indicate category labels. Descriptive data can be found in text,