



Does the holding of Compensatory Health Beliefs correlate with willingness to engage in indoor / salon tanning amongst 18-25 year olds?

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### Abstract

Compensatory Health Beliefs (CHBs) have been suggested as a means by which individuals can resolve the cognitive dissonance created by indulging in activities that they know and understand are harmful to their health (Knäuper, Rabiau, Cohen, & Patriciu, 2004). One such activity is the act of tanning, specifically indoor / salon tanning amongst young adults, despite overwhelming evidence that it is closely linked to the development of skin cancer (Ross & Reichrath, 2008). This study aimed to, firstly, develop a scale for measuring whether individuals held CHBs about tanning behaviour and, secondly, to establish whether the holding of such CHBs correlated with actual tanning activity. A total of 71 participants in the age range 18-25 were recruited to complete an on-line study during which they were invited to self-report on their actual tanning activity, and answer questions probing their views on having a tanned appearance, their general appearance, their attitude towards health-risk, and whether they held any compensatory health beliefs. Standardised scales were used except for the CHB (tanning) scale that was developed for the study by extrapolating from the style of questioning used in Knäuper et al's CHB scale. In support of Knäuper et al's findings, the results showed that the CHB (tanning) scale developed had a medium to good correlation with self-reported tanning behaviour. However, in view of some of the limitations of the study, including that test-retest reliability was not attempted, this study might best be viewed as a pilot for further work using a larger sample.

Key words:	Compensatory Health Belief	Knäuper	Tanning	Appearance
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## Introduction

Figures for the UK show that the incidence of malignant melanoma skin cancer (ICD-10 C43) had risen from 3.2 per 100,000 of the population in 1975, to 17.2 per 100,000 in 2010. (Cancer Research UK, 2013). Significantly, the rate of increase has risen since 2000, and in 2008 the chance of developing malignant melanoma stood at 1 in 61 for men and 1 in 60 for women. A significant body of research has linked the development of malignant melanoma with Ultra Violet (UV) light exposure (e.g. Ross & Reichrath, 2008). Hillhouse, Turrisi and Kastner (2000), describe a *near epidemic growth of skin cancers*, and note that the most serious form of skin cancer – cutaneous melanoma – has increased faster than all other skin cancers combined.

The high incidence of skin cancer has stimulated significant research into interventions aimed at reducing tanning behaviour. Interventions researched have included: promotion of pale skin as attractive (Cox, Cooper, Vess, Arndt, Goldenberg & Routledge, 2009); emphasizing the health risks of tanning (Jones & Leary, 1994); using UV photography to demonstrate the damage that tanning produces (Gibbons, Gerrard, Lane, Mahler & Kulik, 2005); and, educational programmes (e.g. Abar, Turrisi, Loken, Stapleton, Hillhouse and Gunn, 2010).

Joel Hillhouse and colleagues (e.g. Hillhouse, Stair & Adler, 1996, Hillhouse, Turisi & Kastner, 2000) have concluded that the main motivation for indoor and outdoor tanning is to improve physical appearance, with individuals believing that they look better with a tan. Working from the Theory of Planned Behaviour (Ajzen, 1991), Hillhouse's approach has been to modify attitudes toward the perceived benefits of tanning, with the aspiration that reducing individuals' perceptions of the benefits they will derive from tanning will, in turn, reduce their motivation towards tanning. Hillhouse suggests that this approach is congruent with Protection Motivation Theory (Rogers, 1983), which suggests that persuasive messages that highlight the severe negative consequences of a behaviour can help reduce future engagement in that behaviour. Specifically, when a perceived vulnerability to a health threat is combined with knowledge about an effective way of avoiding the threat, health enhancing actions ensue, e.g. starting a diet or stopping smoking (Rogers & Prentice-Dunn, 1997).

Cox and colleagues (Cox et al, 2009) take a different stance based on the Terror Management Health Model (Goldenberg & Arndt, 2008), which suggests that messages that appear to threaten an individual's existence will stimulate them into behaviours that promote their self-esteem rather than behaviours that aid health protection. Cox and colleagues found that making mortality salient, by highlighting the risks associated with tanning, actually increased participants' intentions towards tanning under conditions where an association between tanned skin and physical attractiveness was deemed to be important. They also found, however, a reduced intention to tan when pale skin was associated with attractiveness.

A common theme in the research above is the degree to which a tanned appearance is important to the individual, especially adolescents and young adults. Gibbons et al (2005) report research that found tanning booth use tripling between 1986 and 1995,

and that by 2005 more than 50% of students in a US mid-western university engaged in tanning booth use. Citing Knight, Kirincich, Farmer and Hood (2002), Gibbons et al, go on to report that many young people seem to be alert to the risks of tanning yet, perhaps due to adolescents' behaviour willingness to accept risks, they were ready to accept the associated risks because of the popularity of having a tanned appearance.

Crocker and Wolfe (2001) suggest that an individual's sense of self-esteem is derived from a number of contingencies of self-worth, each of which is a domain or category on which a person has staked their self-esteem. Applying this theory to tanning behaviour, if one of an individual's contingencies of self-worth is having a tanned appearance then they will engage in tanning behaviour despite the risks. Crocker and Wolfe acknowledge that problems arise when people try to satisfy their contingencies in ways that are costly or destructive to them or others (see also, Leary, Tchividjian & Kraxberger, 1994). In similar vein, Gillen and Markey (2012) suggest that if an individual is concerned about their appearance, then they are more likely to engage in appearance management behaviour, such as indoor tanning.

Many of the studies cited above claim to have achieved some success in changing tanning behaviour. However, the absence of a commonly accepted intervention, proven to be effective in reducing tanning behaviour, indicates that none of the above theories alone provides a satisfactory explanation for why people, especially young people, continue to tan in the face of powerful evidence that it is extremely detrimental to their health. Gibbons (Gibbons et al, 2005) has suggested that the health messages are well understood, but are not resulting in a change to behaviour due to other factors.

There is evidence that people understand the consequences of indulging in maladaptive health behaviours, such as smoking, excessive eating and drinking, and lack of exercise (Pinel, Assanand, & Lehman, 2000). The Theory of Planned Behaviour (Ajzen, 1991) would suggest that in the face of evidence about the detrimental effects of a negative activity, people would adjust their behaviour appropriately. Not to make such behavioural adjustments would result in a state of cognitive dissonance (Festinger, 1975) that, otherwise, could only be resolved by a degree of self-deceit that dilutes the significance of the evidence.

The compensatory health beliefs (CHB) theory (Knäuper, Rabiau, Cohen, & Patriciu, 2004) provides one explanation for why people continue to engage in activities they know to be unhealthy. CHBs are beliefs that allow individuals to resolve intrapersonal conflict (cognitive dissonance) by convincing themselves that negative behaviours can be balanced out or nullified by (usually) later alternative compensatory behaviours. An example of such a behaviour might be, *"I will eat the chocolate cake and then go to the gym to burn it off"* (Kaklamanou & Armitage, 2012). Not all such beliefs are false, as some behaviours can have a compensatory affect if they are actually followed through.

Knäuper et al (2004) carried out a series of studies to identify CHBs and to develop a scale by which they could be measured. Through an online study, responses were gained from 142 people worldwide that were distilled into a 40-item scale. This scale was refined by a study using Canadian undergraduates to produce a 17-item scale

that contained 4 sub-scales: Factor 1, CHBs relating to substance use; Factor 2, CHBs relating to eating/drinking habits; Factor 3, CHBs relating to stress; and Factor 4, CHBs relating to weight regulation. The CHB scale had an internal consistency of  $\alpha = .80$ , and a 5-month test-retest correlation of  $r = .75$  ( $p < .01$ ,  $n = 141$ ). The four sub-scales had  $\alpha$  of .74, .66, .63, and .57 respectively.

The purpose of this study is to investigate whether an individual's actual tanning behaviour correlates with their holding of CHBs related to tanning. Should such a correlation be found to exist, then targeting CHBs could become a focus for future cognitive treatments aimed at reducing indoor / salon tanning behaviour, and thereby the incidence of malignant melanoma. For the purposes of the study, students / young adults - the group most likely to engage in tanning (Hillhouse, Stair & Adler, 1996) and at highest risk (Gibbons, 2005) - were assessed. While restricting the range of participants in this manner significantly reduces the degree to which the results from the study could be extrapolated to the wider population, positive results for this population sub-set might still be of use specifically because it is the high risk group.

The aim of the study was to evaluate the concept of compensatory health beliefs as an explanation for why, despite ample evidence that tanning can cause skin cancer, tanning remains so popular for young adults. Specific objectives included:

- Developing an extension to Knäuper et al's CHB Questionnaire (Knäuper et al, 2004) suitable to investigate skin protection behaviour,
- Exploring whether or not there is a relationship between tanning behaviour and the holding of tanning related CHBs. The relationship between tanning behaviour and appearance concern, desire to have a tanned appearance, and attitudes towards health risk were also measured for comparison purposes.

## **Method**

### **Design**

A cross-sectional questionnaire design was adopted, using standard measures of: attitude towards having a tanned appearance; general appearance concern; attitude towards health risk; and, a CHB questionnaire developed for the study. The questionnaires were delivered on-line using Google Survey.

### **Participants**

Participants in the age range 18 and 25 inclusive (the identified high risk group) were recruited, 45 via the University of Derby research portal and the remainder by word of mouth via friends and acquaintances. Participants recruited via the research portal received credits that would help them gain approval to run their own future studies. Participants that accessed the on-line study directly received no incentives. A total of 71 participants submitted responses, but of these three were incomplete and so were omitted. Of the 68 full responses received and analysed, 12 participants were male and 56 female (Mean = 21.16, SD = 2.29).

### **Procedure**

On accessing the on-line study, prospective participants were invited to complete a consent form before being asked to self-report on their age, gender, and current or intended indoor / salon tanning activity. Participants were then directed to complete four questionnaires investigating: the importance to them of a tanned appearance; the importance to them of personal appearance; their attitudes towards health risk; and whether or not they held any compensatory health beliefs related to tanning. Each participant received an identical set of questionnaires in order to minimise confounding variables.

At the end of the questionnaires, participants were directed to a debrief sheet that informed them of their right to withdraw from the research during and up to two weeks following their completion of the study, and provided contact details for the researchers. The debrief sheet also advised participants to contact their general practitioner or the student counselling and support services if they had any concerns after taking part in the study.

The study was conducted under a self-imposed time constraint, in that the intent was to collect all data in the late Spring, before the UK weather improved sufficiently for potential participants to gain and maintain a tanned appearance in the course of their everyday outdoor activities.

## **Materials**

Participants were invited to report their actual or intended indoor / salon tanning usage by placing a tick against one of a series of statements developed by Abar et al (2010). Six options were available, ranging from 'I do not go to tanning salons or use other indoor tanning equipment' to 'I indoor tan regularly, 1-7 times each week (or every other week) all year round'.

Attitudes towards having a tanned appearance were measured using a scale developed by Abar et al (2010) that invited participants' to give their reactions to five statements about a tanned appearance using a 5-point Likert scale that ranged from 'strongly disagree' to 'strongly agree' ( $\alpha = 0.82$ ).

Participants' concerns about their personal appearance were measured using the Appearance Concern Scale (McClendon, Prentice-Dunn, Blake & McMath, 2002), which used 12 items from the Public Body Consciousness Scale (Miller, Murphy & Buss, 1981). The 12 items (Items 1, 4, 6, 9, 12R, 15R, 18, 20R, 23, 24, 26 & 28, where the suffix R denotes reverse scoring) were embedded in 18 filler items, and the scale was titled 'General Health and Appearance' in an attempt to disguise the specific nature of the subject under investigation. McClendon et al reported that the scale demonstrated acceptable internal consistency ( $\alpha = 0.84$ ).

Participants attitudes towards health risk were measured using the Health-Risk Attitude Scale (H-RAS) developed by Van Osch and Stiggelbout (2004) ( $\alpha = 0.75$ ). Thirteen questions were posed, seven of which were reverse scored, with responses measured using a 5 point Likert scale that ranged from 'not at all like me' to 'very much like me'.

### Development of a Compensatory Health Belief Scale for Indoor / Salon Tanning

In the absence of a pre-existing CHB scale to measure beliefs about indoor /salon tanning, a scale was developed. Analysis of the CHB scale developed by Knäuper et al (2004) (Table 1) identified that compensatory health beliefs could be separated into four distinct classes:

- Trade-off – compensating for an ‘excess’ with ‘abstinence’, or vice versa.
- Neutralised – engaging in an alternative beneficial/healthy activity to compensate for an unhealthy activity.
- Dilution – doing something to reduce the effect or consequences of the unhealthy activity.
- Recovery – Relying on the body’s ability to heal itself during a period of abstinence from the unhealthy activity.

Knäuper et al’s CHB scale is shown at Table 1, with each item graded into one of the four classes shown above.

Factor 1 – Substance use	Classification
1. The effects of regularly drinking alcohol can be made up for by eating healthily.	Neutralised
2. It is alright to drink a lot of alcohol if one drinks a lot of water to flush it.	Dilution
3. Smoking from time to time is OK if one eats healthy.	Neutralised
4. The effects of drinking coffee can be balanced by drinking equal amounts of water.	Dilution
5. The effects of drinking too much alcohol at the weekends can be made up for by not drinking during the week.	Recovery
6. Smoking can be compensated for by exercising.	Neutralised
Factor 2 – eating / sleeping habits	
7. Too little sleep during the week can be compensated for by sleeping in at the weekends.	Recovery
8. It is OK to go to bed late if one can sleep in longer the next morning (only the number of hours count).	Trade-off
9. It is OK to skip breakfast if one eats more during lunch or dinner.	Trade-off
10. Eating whatever one wants during the evening is OK if one did not eat during the entire day.	Trade-off
Factor 3 – Stress	
11. Stress during the week can be made up for by relaxing on the weekend.	Recovery
12. A stressful day can be compensated for by relaxing in front of the TV	Trade-off

13. The bad effects of stress can be compensated for by exercising.	Neutralised
14. Sleep compensates for stress.	Neutralised
Factor 4 – Weight regulation	
15. Eating dessert can be made up for by skipping the main dish.	Trade-off
16. Using artificial sweeteners compensates for extra calories.	Trade-off
17. Breaking a diet today can be compensated for by starting a new diet tomorrow.	Trade-off

**Table 1 - Knauper's CHB scale annotated with the 4 discreet classes of CHB**

Assigning the items in this way resulted in 5 'recovery' orientated questions, 2 'dilution' type questions, 3 'recovery' type questions, and 7 'trade-off' questions. The distinction between the classifications of 'trade-off' and 'recovery' is that a 'trade-off' is a relatively immediate compensation, whereas a 'recovery' is a deferred compensation that occurs after the unhealthy behaviour has been repeated a number of times. This distinction is consistent with the findings of Kaklamanou and Armitage (2012), during their 'think aloud' study, that participants tended to differentiate between short-term and long-term compensations.

The advantage of classifying CHBs in the above manner is that it makes it easier to distinguish Irrational Health Beliefs (IHBs) from CHBs. IHBs are defined as cognitive distortions (Christensen, Moran & Weibe, 1999). For example, cutting down on the number of the cigarettes smoked may (or may not) reduce the damaging effects of smoking, but it does not compensate for, mitigate or cancel out the effects of each cigarette, pipe or cigar. Thus, limiting or moderating behaviours are classed within the range of IHBs, unless they are specifically linked to a compensating behaviour.

Using the four discreet classes identified, 15 statements were developed that might describe CHBs relevant to tanning. Following discussion with medical professionals and correspondence with Barbara Knäuper, four items were dismissed as possible IHBs, and the remaining were refined to create the following 11 item CHB (tanning) scale (Table 2).

Factor 5 – Skin Protection (tanning)	
General health	
1. Tanning is OK as long as you eat healthily	Neutralised
2. Tanning is OK as long as you keep hydrated by drinking lots of water.	Neutralised
3. It is alright to tan provided you let your skin recover by not tanning for	Recovery



a while.	
4. It is alright to tan as long as you moisturize well.	Trade-off
5. Once you've got a good tan, you only need to tan a little to keep your colour.	Trade-off
6. By tanning regularly, you don't need to tan for so long	Dilution
7. By using a tanning / accelerator cream, you don't need to tan for so long.	Dilution
8. Tanning is not harmful provided you use sun screen / sun protection cream.	Dilution
9. Tanning is OK if you tan quickly, because you do not have to be in the sun for long.	Dilution
10. It is OK to tan occasionally, just not too often.	Recovery
11. Tanning is OK if you take care of your skin.	Neutralised

**Table 2 – CHB (tanning) Scale**

The resultant questionnaire consisted of 3 'recovery' orientated questions, 4 'dilution' type questions, 2 'recovery' type questions, and 2 'trade-off' type questions.

### Data Analysis

The CHB (tanning) scale developed for the study was subjected to a principal component analysis (PCA) using all 68 responses in order to determine whether more than one factor was being measured. Internal consistency of the scale was examined using Cronbach's coefficient Alpha.

The degree to which the four measures of CHB, tanned appearance concern, general appearance concern, and attitude towards health risk correlated with self-reported tanning behaviour were explored individually using Simple Regression and also with simple linear and multiple regression. Difference in beliefs between the genders was not explored as only 12 males responded to the study.

### Results

The 11 items on the CHB (tanning) scale were subject to a PCA. The Kaiser-Meyer-Olkin (KMO) measure of sampling accuracy verified the sampling adequacy for the analysis, KMO = .847 ('good' according to Field, 2009, pp 659), and all KMO values for individual items were > .792, which is well above the acceptable limit of .5 (Field, 2009, pp 659). Bartlett's test of sphericity  $\chi^2(55) = 476.225$ ,  $p < .001$ , indicated that correlations between the items were sufficiently large for a PCA.

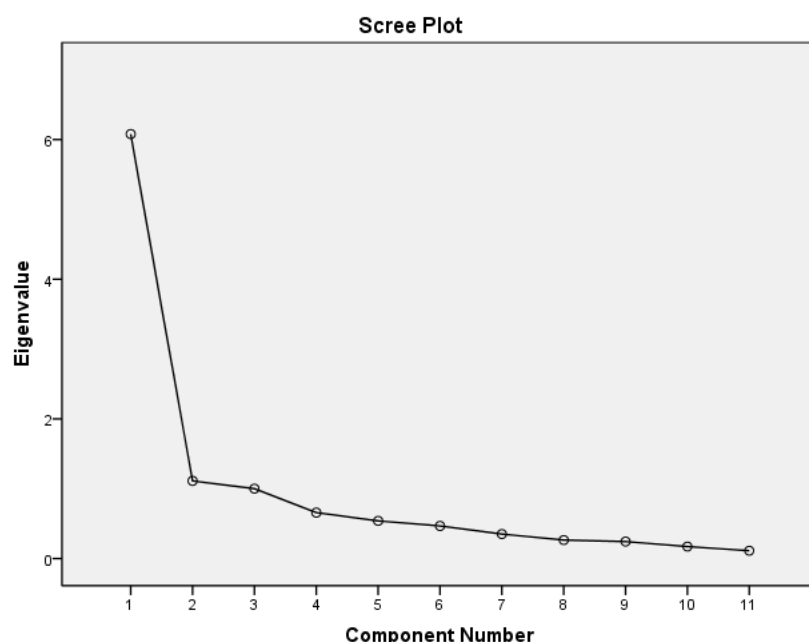
An initial analysis was run to obtain eigenvalues for each component in the data (Table 3). Three components had eigenvalues over Kaiser's criterion for 1 and in combination explained 74.4% of the variance.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.079	55.262	55.262	6.079	55.262	55.262
2	1.112	10.109	65.370	1.112	10.109	65.370
3	1.001	9.102	74.472	1.001	9.102	74.472
4	.658	5.982	80.454			
5	.539	4.902	85.356			
6	.467	4.246	89.602			
7	.351	3.190	92.792			
8	.265	2.411	95.202			
9	.243	2.213	97.415			
10	.172	1.563	98.979			
11	.112	1.021	100.000			

Extraction Method: Principal Component Analysis.

**Table 3 – Total Variance Explained**

The scree plot (**Figure 1**) was unambiguous and showed an inflexion that would justify retaining just one component. Given the moderate sample size, the convergence of the scree plot, and Kaiser's criterion on 3 components, a single component utilizing all questions was retained for the final analysis.



**Figure 1 – Scree Plot**

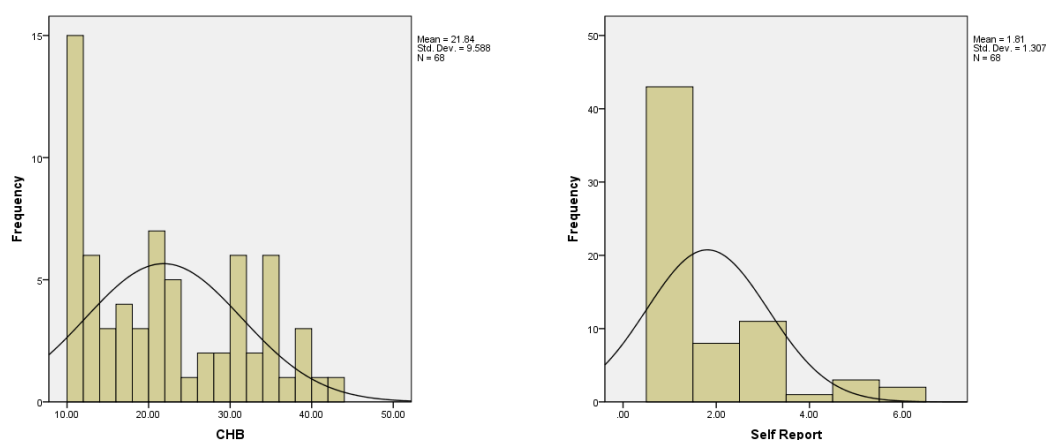
Correlations between variables (Table 4) showed only two items scoring below the minimum value of .3 (shown in bold italics), and none greater than .8 (Field, 2009,

pp648), indicating that all items could be retained. The CHB (tanning) scale was found to have high internal reliability, Cronburg's  $\alpha = .915$ , with all individual items scoring  $\alpha > .902$

	1	2	3	4	5	6	7	8	9	10	11
1. Eating healthily	1.0										
2. Recover later	.432	1.0									
3. Keep hydrated	.748	.602	1.0								
4. Moisturise	.588	.555	.751	1.0							
5. Keep topped up	.439	.616	.546	.575	1.0						
6. Tan regularly	.522	.493	.506	.585	.656	1.0					
7. Use accelerant	.339	.365	.418	.402	.515	.701	1.0				
8. Screen cream	.296	.534	.434	.408	.604	.474	.399	1.0			
9. Tan easily	.691	.456	.703	.511	.414	.474	.500	.398	1.0		
10. Tan Occasionally	.361	.611	.452	.484	.431	.417	.312	.491	.440	1.0	
11. Take care of skin	.536	.483	.720	.719	.475	.466	.257	.446	.392	.575	1.0

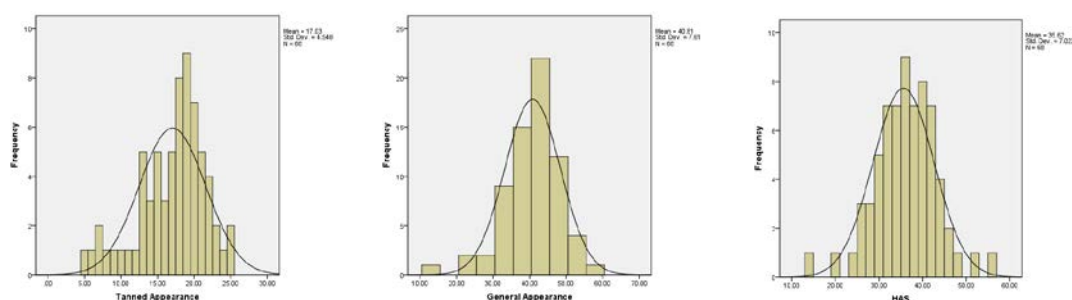
**Table 4 - Correlation Matrix for the 11 items on the CHB (tanning) Scale**

Central to the study was whether or not CHBs correlated with indoor /salon tanning behaviour. The other scales (tanned appearance concern, general appearance concern, and the H-RAS) were also measured for comparison purposes. The data were analysed using SPSS. While the descriptive statistics for all five factors showed the distributions were within acceptable limits (2.58 to -2.58) for skew and kurtosis, the graph for Self-report of tanning behaviour showed a strong bias against indoor tanning (**Figure 2b**). For this reason, correlation was explored using Spearmen's rho.



**Figure 2 – a) Showing the distributions for CHB and b) Self-report of tanning behaviour**

There was a moderate, positive and significant relationship between self-reported indoor tanning behaviour and the holding of tanning related CHBs ( $r(66) = .511$ ,  $p(\text{one-tailed}) < .001$ ).



**Figure 3 – Showing the distributions for Tanned Appearance, General Appearance and the Health-Risk Attitude Scale**

There was a weak, positive significant relationship between self-reported indoor tanning behaviour and having a tanned appearance ( $r(66) = .232$ ,  $p(\text{one-tailed}) < .05$ ). There was no significant relationship between self-reported tanning behaviour and general appearance concern ( $r(66) = .003$ ,  $p(\text{one-tailed}) = .49$ ), or between self-reported tanning behaviour and attitudes towards health risk measured on the Health-Risk Attitude Scale ( $r(66) = .081$ ,  $p(\text{one-tailed}) = .25$ ).

The relationship between self-reported tanning behaviour and the four variables measured in the study was further analysed using simple linear and multiple regression. Descriptive statistics are shown at Table 5.

	<i>M</i>	<i>SD</i>	<i>N</i>
Self Report	1.8088	1.30735	68
CHB	21.8382	9.58794	68
Tanned Appearance	17.0294	4.54815	68
General Appearance	40.8088	7.61040	68
H-RAS	35.6176	7.02241	68

**Table 5 - Descriptive Statistics**

Simple linear regression was used to examine the relationship between self-reported indoor tanning behaviour and the holding of tanning related CHBs. The regression equation produced a satisfactory fit with the data ( $R^2 = 0.22$ ) indicating that the holding of CHBs related to tanning was a medium to good predictor of indoor tanning behaviour ( $F(1,66) = 18.25$ ,  $p < .001$ ).

There was a significant positive relationship between indoor tanning behaviour and the holding of tanning related CHBs ( $t = 4.27$ ,  $df = 67$ ,  $p < .001$ ), with the tendency to engage in indoor / salon tanning increasing with the holding of tanning related CHBs. The model predicts that a one unit change in CHB would result in an increase in indoor / salon tanning of 0.06.

Multiple regression was used to examine whether the four factors measured in the study (CHB, tanned appearance concern, general appearance concern, and attitudes towards health risk) predict the amount an individual engages in indoor / salon tanning. The final regression equation produced a medium fit with the data ( $R^2 = .256$ , Adjusted  $R^2 = .209$ ), indicating that the combined influence of the four factors measured were a moderate predictor of indoor / salon tanning behaviour, ( $F$

(4,63) = 5.43,  $p < .001$ ). A Durbin-Watson score of 1.97 indicated there was virtually no correlation between the variables.

There was a significant positive relationship between CHB score and self-reported indoor / salon tanning behaviour,  $t(63) = 3.87$ ,  $p < .001$ , but no relationship between self-reported indoor /salon tanning behaviour and any of tanned appearance concern,  $t(63) = 1.61$ ,  $p > .05$ , general appearance concern,  $t(63) = .36$ ,  $p > .05$ , or attitudes towards health risk,  $t(63) = .44$ ,  $p > .05$ .

## Discussion

Gibbons et al (2005) reported that in an American Mid-western university, 50% of females and 15% of males reported recent use of tanning booths, and that young people were most likely to accept the risks to health and to indulge in tanning behaviour. Gillen and Markey (2012) report a number of studies showing similar patterns of behaviour amongst adolescents and young adults. Consequently, the strong bias against indoor tanning found in this study sampling the views of 18-25 year olds was unexpected. Despite this bias, there was a significant, moderate correlation between self-reported indoor tanning behaviour and the holding of tanning related CHBs.

The two analysis methods found no correlation between the general appearance concern and attitudes towards health risk with self-reported indoor / salon tanning behaviour. The lack of a correlation between self-reported tanning behaviour and attitude towards health risk is broadly consistent with the findings of Gibbons et al (2005), that young people seem to be alert to the risks of tanning but are more concerned with appearance than health risk.

There was some discrepancy in results for the relationship between tanned appearance concern and self-reported tanning behaviour, with Spearman's rho showing a weak correlation that was not replicated using multiple regression analysis. However, it can be concluded that concern about having a tanned appearance is a better indicator of indoor / salon tanning behaviour than general appearance concern. In sum, the significant, moderate positive correlation between self-reported tanning behaviour and the holding of CHBs would indicate that the holding of CHBs related to tanning merits further exploration. If a firm link can be found between CHBs and behaviour, then interventions that challenge those CHBs should be explored as a means of reducing indoor tanning / tanning salon usage.

The evidence for CHBs shown by Knäuper et al (2004) appeared to be something of a break-through with respect to resolving the cognitive dissonance triggered by negative health behaviours and the findings of this study, though somewhat limited, provide support for Knäuper's concept. However, a number of studies have failed to replicate Knäuper and colleagues' strong results. De Nooijer, Puik-Hekman and van Assema (2009) attempted to adapt Knäuper et al's original CHB scale for use in the Netherlands. They found some differences in the factor analysis and that the internal consistency of the four sub-scales was low, ranging from  $\alpha = 0.52$  to 0.66. Conversely, they also found that the overall scale showed a high internal consistency ( $\alpha = 0.78$ ), and recommended using the scale in this manner.

Kaklamanou and Armitage (2012) tested the CHB scale on a UK population and while, like de Nooijer and colleagues, they found the full scale to have good internal reliability, they found only three factors (stress, sleeping pattern and exercise) emerged compared with the four factors identified by Knäuper and colleagues. Kaklamanou and Armitage gave four reasons why they might have failed to replicate Knäuper's earlier work, including: significant differences in health profile between the UK and Canadian populations, specifically with respect to alcohol and tobacco consumption, and the incidence of obesity; GPs in the UK being much less forthcoming with health-related lifestyle advice; some systemic issues in the study related to the role of temptation; and that, simply, the UK population tested did not really understand the concept of CHBs. Kaklamanou, Armitage and Jones (2013) further explored the CHB concept in a 'think aloud' study that used 32 of the 40 items in Knäuper et al's original scale (including all 17 items on the reduced CHB scale). Their study provided some useful insights into how individuals' interpret CHB questionnaires but, importantly, Kaklamanou and colleagues found that all the items in their 32 item scale showed much greater reliability than the sub-factors in the 17 item CHB scale. They went on to suggest that CHB scales could be improved in the future by including items that are specific to a situation or behaviour, citing Radtke, Scholz, Keller, Knauper and Hornung (2011), who had developed a specific CHB scale for smoking.

Given these recent developments, it has been concluded that there is little merit at this stage in refining the 11-item tanning CHB scale down to a handful of questions that can be incorporated into Knäuper et al's 17 item scale as a 5<sup>th</sup> factor addressing skin protection. Instead, the scale is likely to have more utility as a stand-alone metric for assessing indoor / salon tanning behaviour. There are other reasons why tanning should be considered a special case. Unlike smoking, eating and drinking, all of which could be partially accounted for as 'succumbing to temptation', the act of indulging in indoor tanning, especially when this involves travelling to a tanning salon, is a more pre-meditated, less impulsive activity. The mechanisms by which individuals that indulge in indoor tanning resolve any cognitive dissonance they might experience about the activity could, therefore, be more ingrained and enduring than those drawn on to allow a brief capitulation to temptation, such as succumbing to a proffered cigarette or chocolate bar.

There are a number of limitations to this study, which are discussed in turn below.

Although a moderate correlation between self-reported indoor / salon tanning behaviour and the holding of CHBs relevant to tanning was found for the perceived population at risk, the narrow age range used in the study (18-25) means the results cannot be generalised across the wider population. As earlier discussed, while this is limiting from the academic perspective, it might be less important from a practical viewpoint. Individuals' priorities change with age, as do their beliefs. Consequently, that a CHB / behaviour relationship potentially exists amongst the population identified as being most at risk might be sufficient justification for interventions based on mitigating CHBs to be developed targeted at this population.

The limited sample size achieved during the study, and the bias against tanning shown by the sample that runs contrary to previous research evidence (e.g. Gibbons et al, 2005), would indicate a need for much larger sample group in order to explore

the strength of the relationship between the holding of CHBs and indoor / salon tanning behaviour in the UK. A possible reason for such an apparently high bias against tanning might be that the sample potentially included a significant proportion of respondents of non-Caucasian origin, for whom obtaining a tanned appearance is a low priority. It is also possible that respondents played-down the extent to which they indulge in indoor / salon tanning on the basis that such behaviour might be considered socially undesirable. Certainly, studies using self-report of behaviour are regularly criticised due to potential halo effects, mood effects and response bias, and because the behaviours being examined cannot be verified. In this study, given the measures taken to ensure their anonymity, no reason can be identified as to why any of the participants should have suffered from any of these effects or felt pressured into making a socially acceptable response. Nonetheless, any follow-up studies would benefit both from increased sample size, and controlling for ethnicity and the vagaries of self-report, possibly by direct sampling at tanning salons. Finally, as suggested by Kaklamanou and Armitage (2012), it might simply be that the health profile of UK citizens is different from the Canadian citizens that participated in the earlier study.

The time-constraints of this study also resulted in some limitations. Firstly, there was insufficient time to canvass for CHBs related to tanning, in the way in which Knäuper et al (2004) developed their scale. However, the classification approach used was logical and the effectiveness of the questionnaire was to some extent borne out by the results. A second constraint was that there was insufficient time to check for test-retest reliability.

Looking to the future, the results of this study are sufficiently positive to merit further exploring the link between CHBs and tanning behaviour. However, in the course of the study, two other avenues have come to light that might merit deeper analysis. The first is to explore the nature of CHBs in more detail. Classifying the beliefs in Knäuper et al's CHB scale into 'neutralise', 'dilute', 'recover', and 'trade-off' provided a simple method for generating CHB-type beliefs relevant to indoor / salon tanning. However, the proportions of questions falling under each classification differed significantly between the two scales, with more trade-off type questions in Knäuper et al's scale, and more dilution questions in the CHB (tanning) scale generated for this study. It is possible, therefore, that certain types of belief are more predictive of behaviour than others. The second area to be explored is the linkage between temptation, belief and behaviour: specifically, how quickly a desire can be sated or a compensatory behaviour achieved. Eating an extra piece of cake or smoking another cigarette can be quickly fulfilling (unless one needs to visit a shop to buy cakes or cigarettes!), but tanning requires more planning and commitment. In terms of compensatory behaviour, drinking additional water (dilution) can be quick and easy, whereas visiting the gym for a work-out requires significantly more commitment.

In conclusion, notwithstanding that the study has some limitations and so might, perhaps, be best seen as a pilot for further work, the study has provided additional evidence to support the concept of CHBs, and the CHB (tanning) scale developed here appears a relatively robust indicator of indoor / salon tanning behaviour.

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