Enhancing sun safety in young women: The relative impact of format and temporal framing on beliefs and behaviour

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_Cogent Psychology_ (2016), 3: 1210069
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Abstract: Malignant melanoma (MM) is mainly attributable to UV exposure and research indicates that maladaptive sun safe beliefs and behaviour need to be changed in order to help reduce MM prevalence in the most at-risk subset of the UK population; fair-skinned young women. Sun safety interventions which are personalised and appearance-based have been found effective at improving sun safe beliefs and behaviour. To date, no research has explored whether the effectiveness of these interventions can be improved by varying both their format of presentation and temporal framing. In this experimental study, UK fair-skinned young women (n = 65) aged between 16 and 25 rated their sun safe beliefs and behavioural cognitions after being exposed to personalised appearance-based information which varied in terms of format (text vs visual) and temporal framing (immediate vs future). Their sun safe behaviour was also observed. The visual format used the Aprilage® digital sun ageing programme. The results showed that following the visual format intervention participants had significantly lower perceptions of the skin's ability to heal, and higher levels of observed sun safe behaviour in the form of taking a sunscreen sample and a sun safety educational leaflet compared to those who received the text intervention. No significant effect of temporal framing was found. The results suggest that a visual, personalised, appearance-based intervention may be an effective form of sun safety promotion for young women in the UK.

ABOUT THE AUTHORS
Jane Ogden is a professor in Health Psychology at the University of Surrey where she carries out research into behaviour changes, communication and women’s health. Indiana Cheetham was a final-year undergraduate with a strong interest in skin damage who conceived and designed the present study. This project reflects a keen interest in promoting healthy behaviours and an attempt to challenge those beliefs which encourage people to behave in ways that are detrimental to their health. It is also in line with a recent emphasis on the ability of images to change beliefs in ways that words can’t.

PUBLIC INTEREST STATEMENT
Skin cancer is mainly caused by sun exposure and is the fastest growing cancer in the UK. Many people know the risks of sun tanning, yet the belief that a sun tan is attractive prevents people from practising sun safety. We assessed whether images of skin damage are more powerful at changing beliefs than text and whether focusing on immediate damage is more effective than that in the longer term. UK fair-skinned young women (n = 65) rated their sun safe beliefs after either reading text about sun damage or seeing a changing image of their own face using the Aprilage® digital sun ageing programme. Damage was described as immediate or future. Images had a much stronger impact on beliefs with more participants also taking a sample of sun lotion. No effect of timing was found. In this case, an image really is worth a thousand words.
1. Introduction

Malignant melanoma (MM) prevalence rates are increasing faster than any other cancer in the UK, with six people dying from MM every day (Cancer Research UK, 2015). Around 86% of MMs in the UK are attributable to ultraviolet (UV) exposure and research indicates that MM risk can be reduced using sun protection (Cancer Research UK, 2015). Though sun protection and UV knowledge is high, studies show that individuals are still not engaging in protective behaviour (Geller et al., 2002; Kyle et al., 2014). Research has therefore identified a role for factors other than knowledge (Dennis, Lowe, & Snetselaar, 2009a) suggesting that it is tanning attitudes and motivations which need to be changed. The primary motivation behind UV exposure is to improve physical appearance (Brandberg, Ullen, Sjöberg, & Holm, 1998; Dennis, Kancherla, & Snetselaar, 2009b) as tanned skin is perceived as highly attractive (Chung, Gordon, Veledar, & Chen, 2010). Accordingly, the current increase in MM may be related to the desire to be tanned which demonstrates a clear need to identify an effective sun safety promotion strategy to change tanning attitudes and behaviour. Research has highlighted the role of interventions that are both tailored and appearance based.

Although most sun safety campaigns target the general population in an impersonal fashion (Saraiya et al., 2004), research shows that tailored messages are more effective at increasing risk perception, sun safety knowledge, behaviour and beliefs compared to non-tailored interventions (Albada, Ausems, Bensing, & van Dulmen, 2009). This may be because tailored messages increase cognitive activity, enhance message relevance or activate self-related mental processing (e.g. Kreuter & Wray, 2003). Furthermore, whilst sun safety campaigns are often health-based, emphasising the relationship between UV exposure and skin cancer, although these may change beliefs (Tuong & Armstrong, 2014) they often fail to change behaviour (e.g. Dadlani & Orlow, 2008). Therefore, as UV exposure is mainly motivated by physical appearance, interventions have also used appearance-based strategies to emphasise the impact of UV exposure on premature skin ageing. These have been widely implemented and research indicates that this focus on appearance can not only improve sun safe cognitions and knowledge but also change behaviour (e.g. Mahler, Kulik, Gibbons, Gerrard, & Harrell, 2003; Williams, Grogan, Clark-Carter, & Buckley, 2013). Further, appearance-based interventions have also been shown as more effective than health-based strategies for both genders and across age groups (Dodd & Forshaw, 2010; Mahler, Fitzpatrick, Parker, & Lapin, 1997; Williams et al., 2013). Both tailored and appearance-based interventions have therefore been shown to be effective sun safety promotion strategies. Research suggests that the format of how they are delivered may also improve their effectiveness.

Interventions can be delivered using a range of formats but in general, research shows that visual images may be more effective than text alone as they require less cognitive processing and have a stronger impact on affect, attention and recall (Cameron & Chan, 2008; Houts, Daak, Daak, & Loscalzo, 2006). Such visual strategies have been used for promoting various health behaviours and have been shown to be more effective at improving illness cognitions, behaviour, knowledge and medication adherence compared to text interventions (Cameron, 2008; Karamanidou, Weinman, & Horne, 2008). Visual images such as UV photographs have also been found effective at promoting sun safe beliefs and behaviours (Emmons et al., 2011; Gibbons, Gerrard, Lane, Mahler, & Kulik, 2005; Mahler, Kulik, Butler, Gerrard, & Gibbons, 2008, 2006). To date, however, only two studies have directly compared text and visual format for sun safety communication with contradictory findings. Boer, Ter Huurne, and Taal (2006) found that using images significantly enhanced the attractiveness of a sun safety campaign promoting sun protection when compared to the campaign in text format. In contrast, Mahler et al. (2006) found that both a visual and a text appearance-based sun safety
campaign were equally effective at improving sun safe beliefs and behaviour. Further research is therefore needed to explore whether, in line with other health behaviours, visual formats are also more effective for sun safety.

Not only may the format of the intervention improve effectiveness, but also the way a health message is temporally framed. For example, a qualitative study concluded that participants believed that the impact of cigarette warning labels would be greater if they emphasised the immediate risks of smoking (Crawford, Balch, & Mermelstein, 2002) and a quantitative study showed that framing cancer deaths as occurring daily versus yearly was associated with higher risk perceptions, regardless of message valance (Chandran & Menon, 2004). Similarly, McKay, Cole, Sumnall, and Goudie (2012) indicated that adolescents perceived the long-term consequences of alcohol consumption more abstractly than those in the short-term. In line with this, various theories have been used to explain the impact of temporal framing. For example, Trope and Liberman (2000) developed construal level theory which argues that the more distant an event is from an individual, the more abstractly it will be perceived and Green and Myerson (2004) theorised that individuals temporally discount distant consequences, putting more emphasis on those in the immediate future. In terms of sun safety, most of the consequences of UV exposure described within sun safety are in the distant future which may explain why their effectiveness remains limited. To date, however, no research has explored the impact of temporal framing on the effectiveness of sun safety interventions.

In sum, research therefore shows that tailored, appearance-based sun safety interventions are more effective than general health-based interventions. Some research also shows that a visual format may be more effective than one based upon text. To date, however, most studies have been conducted in either Australia or the USA where levels of awareness and risk perception may be higher than that of the UK, where although rates of MM are increasing, awareness remains poor. Further, most have used subjective rather than objective measures of sun safety behaviour. In addition, although research in associated areas suggest a role for temporal framing this has yet to be explored within the context of sun safety. Accordingly, the present experimental study explored the relative impact of format (visual vs text) and temporal framing (immediate vs future) on sun safety beliefs, behavioural cognitions and observed behaviour as measured by taking a leaflet and/or a sachet of sun cream. Further, the intervention targeted the most at-risk group for UV exposure and MM development; white young women with skin types 1–3 in the UK (Diepgen & Mahler, 2002). It was hypothesised that the tailored, appearance-based intervention in the visual format would have a greater impact than the text format and that the immediate temporal framing would be more effective than the future temporal framing.

2. Method

2.1. Design
An experimental 2 × 2 factorial, between-subjects design was used with self-report measures of beliefs, behavioural cognitions and direct observations of behaviour. Independent variables were (i) format (visual vs text) and (ii) temporal framing (immediate future vs distant future). Participants were randomly allocated to one of four conditions: visual/immediate future; visual/distant future; text/immediate future; text/distant future. Dependent variables were based upon the Protection Motivation Theory (Rogers, 1985) and were beliefs (the skin’s ability to heal, the skin’s ability to protect, the skin’s strength, susceptibility to sun ageing, rewards of tanning/sunbathing, costs of using sun protection), behavioural cognitions (self-efficacy and behavioural intentions) and observed behaviour (taking a sunscreen sample and taking a leaflet).

2.2. Participants
A priori power analysis indicated that 52 participants were required for 80% power for detecting a large effect size, with .05 criterion of statistical significance. An effect size of .40 was used as large effect sizes were obtained for the majority of analyses in similar studies (see Williams et al., 2013; b for a review). Participants were 65 female volunteers who were selected on the basis of being skin type 3
and below and of white ethnicity as these were deemed to be at most risk of MM and sun ageing (Gandini et al., 2005). The study received favourable ethical opinion from the University ethics committee. Participants were recruited from 6th form colleges, schools and a University in South East England.

2.3. Measures
The following measures were used to assess participant skin type, beliefs and behaviour. Most were selected from previous research, with some developed specifically for this study. Where appropriate reliability was assessed using Cronbach’s alpha.

Skin type: to screen and determine participant’s skin type, the Fitzpatrick skin photo-type classification measure was used (Fitzpatrick, 1988). It consists of 10 items, where higher scores indicate a skin type which is more tolerant to sun exposure (ranging from type 1 to type 6). The measure is regularly used in clinical settings and for research into tanning and sun protective behaviours and has demonstrated good reliability and validity (Sachdeva, 2009).

Beliefs: (a) beliefs about the skin were assessed in terms of (i) the skin’s ability to heal (3 items; $\alpha = 0.5$); removing item 2 was shown to improve this ($\alpha = 0.73$); (ii) the strength of the skin (3 items; $\alpha = 0.70$); (iii) the skin’s ability to protect (3 items; $\alpha = 0.40$). Higher scores indicated a stronger belief that the skin can heal itself, is strong and can protect. These items were taken from the literature to assess the individual’s beliefs about the sun and their skin. Three measures from existing research were also used, all of which consisted of five-point Likert scales: (b) perceived susceptibility to sun ageing (7 item; $\alpha = 0.76$; Mahler, 2014); (c) costs of using sun protection (10 items; $\alpha = 0.77$; Mahler, 2014); (d) the rewards of tanning/sunbathing (5 items; $\alpha = 0.90$; Mahler, Kulik, Gerrard, & Gibbons, 2013). Higher scores indicated higher perceived susceptibility, higher costs and rewards.

Behavioural cognitions: (a) behavioural intentions were assessed in terms of intentions to perform sun safe behaviours in the UK (4 items; $\alpha = 0.8$) and in hot countries (4 items; $\alpha = 0.8$), (adapted from Good & Abraham, 2011) using 10 point scales. The items were “staying in the shade”, “using minimum spf15 sunscreen”, “reapplying sunscreen” and “wearing protective clothing” and were based on Cancer Research UK guidelines (‘How to enjoy the sun safely’, 2015). (b) Self efficacy was assessed using a 6 item measure on a 10-point scale (Mahler, 2014), where higher scores indicate greater self-efficacy ($\alpha = 0.92$).

Observed behaviour: participants were offered free sunscreen samples and sun safety leaflets at the end of the study. The number of samples and leaflets taken was recorded. Because of the time of year in the UK (i.e. autumn and winter), actual behaviour in the sun could not be assessed. These measures of indirect sun safe behaviour have been used in previous studies (e.g. Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Rothman, Salovey, Antone, Keough, & Martin, 1993).

2.4. Apparatus
For the visual format condition, Aprilage® digital face ageing software was used. The software works by visually ageing a given photograph by extracting and using ageing characteristics from a database of real head scans (see Figures 1 and 2). The programme was chosen because it provides realistic ageing effects and has been used successfully in similar studies (e.g. Williams et al., 2013). The programme was run on a laptop. For the text conditions, the sun ageing information was presented on a sheet of A4 paper. Sunscreen samples were donated by Uvistat and Big Island Sunscreen. Sun safety information leaflets were donated by Cancer Research UK and Uvistat.

2.5. The interventions
All interventions were personalised and appearance-based in nature. To assess the impact of temporal framing, those in the immediate future conditions were told how the effects of sun ageing would be visible in their 30s and those in the distant future conditions were told how they would be visible in their 60s. Thirties was chosen as the immediate future temporal frame as it has been argued that 10–15 years is the most effective and salient distal temporal frame to most people for
promoting health behaviour (Boniecki, 1980). To assess the impact of format, participants were either given an information sheet (text format) or had their photo digitally sun aged (visual format). Information sheets were personalised by being based on participant’s demographic and skin-type information and appearance-based by detailing how the sun would age their skin physically. The visual intervention was personalised using the participant’s own photo and appearance-based by demonstrating the ageing effects of the sun visually.

2.6. Procedure
Participants were screened using a 5-min online questionnaire which requested details on their demographics and skin type. Those who met study criteria were invited to take part via email. Participants were then randomly assigned to one of the four conditions using a research randomiser programme and subsequently emailed the study description. Those in the visual/immediate future and visual/distant future conditions firstly had a photograph taken of their face which was uploaded to the Aprilage® programme. To temporally frame the intervention, participants were told verbally when...
these ageing effects would occur. Photos were both naturally aged and sun aged to 60 years old, with both images being displayed in a “compare and contrast” format, so that participants could assess the differences between the images. They were then asked to look at the images for 30s. Their naturally and sun-aged photos were then converted into three-dimensional (3D) format, which allowed the participant to view ageing effects from all angles. Participants were given a demonstration of how to use this feature and were subsequently allocated one minute to explore it. Participants in the text/immediate future and text/distant future conditions were given an information sheet on how the sun would physically age them. The information provided was based on research evidence on how the sun would age their skin types (Flament et al., 2013; Hughes, Williams, Baker, & Green, 2013). It was also matched to the visual ageing effects seen in the image condition so information was congruent between conditions. The temporal frame was included in the text of the information sheet. Participants were each tested individually in the laboratory. All study measures were completed after the intervention. Participants were told verbally that they could take as many sunscreen samples and leaflets as they wished. Sunscreen samples were presented in a large bowl so that participants did not restrict themselves on the amount they took. The amount of leaflets and samples taken were counted and recorded by the researcher. Finally, participants were debriefed on the aims of the study.

3. Results

3.1. Data analysis

The results were first analysed to describe participant demographics for all participants and by condition. Next the impact of format (visual vs text) and temporal framing (immediate vs future) on participants’ beliefs and behaviours concerning sun protection was assessed. Data were screened and tested for normality and skew and kurtosis z-scores were calculated using +/− 1.96 as z-score cut-off. Age, beliefs about the skin’s ability to heal, intentions to use sun protection in hot countries, self-efficacy and both measures of observed behaviour were non-normally distributed. For these variables a Mann Whitney test was used to explore the main effect of format (visual vs text) and temporal framing (immediate vs future). For those variables that did not violate the assumptions of normality a two way ANOVA was used.

3.2. Participant demographics by condition

Participant demographics are shown in Table 1.

The results showed that the mean age of the sample was 19 years and that the majority were white British, currently students and had skin type 3. There were no differences by condition for occupation, ethnicity and skin type. However, those in the visual/distant group were older than the others.

| Var.        | All (n = 65) | Visual/ immediate (n = 16) | Visual/ distant (n = 18) | Text/ immediate (n = 16) | Text/future (n = 15) | KW/χ²/p           |
|-------------|-------------|---------------------------|--------------------------|--------------------------|----------------------|-------------------|
| Age         | X = 19.57   | X = 18.25                 | X = 20.56                | X = 19.5                 | X = 19.87            | KW = 10.2 p = 0.02 |
| Mean Rank   | SD = 2.2    | SD = 1.7                  | SD = 1.9                 | SD = 2.3                 | SD = 2.2             |                  |
|             |             | 32.84                     | 35.97                    | 21.25                    | 41.11                |                   |
| Ethnic      | WBritish = 61 | WBritish = 15              | WBritish = 17            | WBritish = 4             | WBritish = 15        | X² = 6.5 p = 0.37 |
|             | WOther = 4  | WOther = 1                 | WOther = 1               | WOther = 2               | WOther = 0           |                   |
| Occup       | FTWork = 36 | FTWork = 6                 | FTWork = 14              | FTWork = 7               | FTWork = 9           | X² = 7.8 p = 0.25 |
| College     | College = 27 | College = 9                | College = 4              | College = 8              | College = 6          |                   |
|             | Uni = 2     | Uni = 1                   | Uni = 0                  | Uni = 1                  | Uni = 0              |                   |
| Skin type   | 1 = 4       | 1 = 1                     | 1 = 1                    | 1 = 1                    | 1 = 1                | X² = 0.69 p = 0.9  |
|             | 2 = 24      | 2 = 3                     | 2 = 5                    | 2 = 12                   | 2 = 4                |                   |
|             | 3 = 46      | 3 = 12                    | 3 = 12                   | 3 = 12                   | 3 = 10               |                   |
Table 2. The impact of the intervention on beliefs about sun protection

|                          | Visual (n = 34) | Text (n = 31) | ME format | ME temporal |
|--------------------------|-----------------|---------------|-----------|-------------|
|                          | Immediate future (n = 16) | Distant future (n = 18) | Immediate future (n = 16) | Distant future (n = 15) | F/U/p | F/U/p |
| Skin ability to heal     | $\chi = 2.94$ | $\chi = 2.69$ | $\chi = 3.17$ | $\chi = 3.22$ | U = 336 | p = 0.01 |
|                          | SD = 0.65 | SD = 0.61 | SD = 0.37 | SD = 0.51 |               |               |
|                          | Mean rank = 30.94 | Mean rank = 24.25 | Mean rank = 38.94 | Mean rank = 39.37 |               |               |
| Skin’s ability to protect| $\chi = 3.13$ | $\chi = 3.17$ | $\chi = 3.42$ | $\chi = 3.13$ | F = 0.85 | p = 0.36 |
|                          | SD = 0.54 | SD = 0.61 | SD = 0.48 | SD = 0.61 |               |               |
| Skin’s strength          | $\chi = 2.89$ | $\chi = 2.76$ | $\chi = 2.79$ | $\chi = 2.78$ | F = 0.06 | p = 0.79 |
|                          | SD = 0.84 | SD = 0.55 | SD = 0.53 | SD = 0.74 |               |               |
| Susceptibility to sun ageing | $\chi = 3.55$ | $\chi = 3.65$ | $\chi = 3.40$ | $\chi = 3.25$ | F = 2.6 | p = 0.11 |
|                          | SD = 0.64 | SD = 0.68 | SD = 0.61 | SD = 0.81 |               |               |
| Rewards of tanning       | $\chi = 3.28$ | $\chi = 3.32$ | $\chi = 3.50$ | $\chi = 2.72$ | F = 0.54 | p = 0.46 |
|                          | SD = 1.0 | SD = 0.99 | SD = 1.08 | SD = 1.01 |               |               |
| Costs of using sun protection | $\chi = 2.72$ | $\chi = 2.78$ | $\chi = 3.01$ | $\chi = 2.69$ | F = 0.37 | p = 0.55 |
|                          | SD = 0.48 | SD = 0.76 | SD = 0.67 | SD = 0.79 |               |               |

Table 3. The impact of the intervention on behavioural cognitions and observed behaviour

|                          | Visual (n = 34) | Text (n = 31) | ME Format | ME temporal |
|--------------------------|-----------------|---------------|-----------|-------------|
|                          | Immediate future (n = 16) | Distant future (n = 18) | Immediate future (n = 16) | Distant future (n = 15) | F/U/p | F/U/p |
| Intentions in hot countries | $\chi = 7.66$ | $\chi = 7.38$ | $\chi = 7.48$ | $\chi = 7.37$ | U = 525 | p = 0.97 |
|                          | SD = 1.09 | SD = 1.93 | SD = 1.59 | SD = 2.09 |               |               |
|                          | Mean rank = 33.25 | Mean rank = 32.89 | Mean rank = 32.22 | Mean rank = 33.70 |               |               |
| Intentions in the UK     | $\chi = 5.16$ | $\chi = 5.71$ | $\chi = 4.75$ | $\chi = 5.67$ | F = 0.19 | p = 0.7 |
|                          | SD = 2.00 | SD = 2.25 | SD = 1.79 | SD = 2.00 |               |               |
| Self-efficacy            | $\chi = 7.97$ | $\chi = 8.71$ | $\chi = 7.55$ | $\chi = 8.62$ | U = 499 | p = 0.7 |
|                          | SD = 1.45 | SD = 2.14 | SD = 1.97 | SD = 1.06 |               |               |
|                          | Mean rank = 31.65 | Mean rank = 32.69 | Mean rank = 29.31 | Mean rank = 38.77 |               |               |
| Took sample              | $\chi = 1.88$ | $\chi = 1.33$ | $\chi = 0.94$ | $\chi = 0.80$ | U = 324 | p = 0.002 |
|                          | SD = 1.31 | SD = 0.91 | SD = 0.57 | SD = 0.68 |               |               |
|                          | Mean rank = 43.75 | Mean rank = 34.69 | Mean rank = 28.09 | Mean rank = 24.73 |               |               |
| Took leaflet             | $\chi = 1.13$ | $\chi = 0.83$ | $\chi = 0.31$ | $\chi = 0.27$ | U = 321 | p = 0.002 |
|                          | SD = 0.96 | SD = 0.92 | SD = 0.70 | SD = 0.59 |               |               |
|                          | Mean rank = 41.75 | Mean rank = 36.67 | Mean rank = 26.56 | Mean rank = 26.13 |               |               |
3.3. The impact of format and temporal framing on sun safe beliefs, behavioural cognitions and observed behaviour

The means, standard deviations and mean ranks (where relevant) for beliefs, behavioural cognitions and behaviour are shown in Tables 2 and 3.

3.3.1. Beliefs

The results showed no main effects of the format of the intervention for beliefs related to the skin as protective or strong, susceptibility to sun ageing, the rewards of tanning or the costs of using sun protection. The results did show a significant main effect of format for the skin’s ability to heal with those receiving the image-based intervention rating the skin’s ability to heal as lower (Mean rank: 27.4) than those who received the text-based intervention (Mean rank = 39.15), (U = 336; p = 0.01). No main effects of temporal framing were found for any variables.

3.3.2. Behavioural cognitions

The results showed no main effects of either format or temporal framing on intentions to use sun cream either in the UK or hot countries or on self-efficacy.

3.3.3. Observed behaviour

The results showed a main effect of format for both measures of observed behaviour. In particular, those who received the image-based intervention took more samples (Mean rank = 38.96) compared to those who received the text-based information (Mean rank = 26.47) (U = 324.5; p = 0.002). Likewise those who received the image-based intervention also took more leaflets (Mean rank = 39.06) compared to those who received the text-based intervention (Mean rank = 26.35), (U = 321.00; p = 0.002). No main effect of temporal framing was found.

4. Discussion

The present study aimed to investigate whether format and temporal framing improved the efficacy of a personalised, appearance-based sun safety intervention. The results showed that those receiving the intervention in a visual format perceived the skin as less able to heal and engaged in more sun safe behaviour through taking more sun safety leaflets and sunscreen samples than those receiving the intervention in text format. These results provide some support for previous research indicating that visual interventions are more effective than text-based interventions at changing cognitions (Cameron, 2008; Karamanidou et al., 2008). They also illustrate that a visual-based intervention using digital imagery can also change observed behaviour rather than just self reported behaviour. Further they support previous research indicating that visual format may be particularly effective for sun safety interventions (e.g. Williams et al., 2013). This may be because the appearance concerns central to tanning and the motivations behind unsafe behaviour are particularly suited to a visual (and therefore appearance led) approach to change. These results, however, contrast with Mahler et al. (2006), who found that visual and text format appearance-based interventions were equally effective at enhancing sun safe beliefs and behaviour. This may be due to the type of visual intervention used (digital sun ageing versus UV photography) as the three dimension and interactive nature of digital sun ageing used in the present study may be more effective than a two-dimensional (2D) non-interactive image. Accordingly, visual interventions may be more effective at changing cognitions and behaviour as they capture attention and have a stronger impact upon affect, which may be specifically appropriate to an appearance-related behaviour such as tanning (e.g. Cameron & Chan, 2008). But this may not be for all visual interventions equally, with those that also involve an interactive element being more effective than those which do not. No differences by format, however, were found for beliefs relating to the skin’s ability to protect and strength, their susceptibility to sun ageing and the costs and rewards of using sun protection and tanning. Further, no effects were found for behavioural cognitions in terms of intentions and self efficacy. It would seem that the visual format changed observed behaviour without changing the majority of beliefs or behavioural cognitions. This conflicts with much research exploring the predictors of a range of health behaviours which illustrate the key role for beliefs as mediators of behaviour.
(e.g. Conner & Norman, 2014). It provides some support, however, for the suggestion that some interventions may have either a direct impact on behaviour or be mediated through emotions rather than cognitions (Sheeran, Gollwitzer, & Bargh, 2013).

In terms of temporal framing, the results showed no differences between the immediate versus future framing on either cognitions or behaviour. This conflicts with previous research and theory which indicates a role for temporal framing on health beliefs and behaviour (Chandran & Menon, 2004; McKay et al., 2012). There are two possible reasons for this. The “immediate” condition was targeted as within the participants’ “30’s” in contrast to their “60’s” and to make the study realistic (i.e. immediate ageing effects within weeks would not have been believed). It is possible that to young people aged 18–24 their “30’s” are too far into the future to have any impact. Accordingly, both time frames may well have been too distal to create any result. Second, personalised, appearance-based interventions may be effective at improving sun safe beliefs and behaviour regardless of temporal framing which would be in line with a previous study which reported that a personalised appearance-based intervention for osteoporosis effectively improved protective behaviour regardless of temporal frame (Smith Klohn & Rogers, 1991).

Overall, the results from the present study indicate that a tailored, personalised, appearance-based sun safety intervention is more effective if presented using a visual format compared to a text format in terms of creating a more realistic perception of the skin as being less able to self-heal. Furthermore, it is also more effective for changing objectively measured sun protection behaviour in terms of taking a leaflet and sun cream samples. This visual, personalised, appearance-based intervention could therefore help better promote sun safe beliefs and behaviour in at-risk UK young women, potentially helping to reduce MM prevalence rates within the population. Further, the intervention could be implemented online, with a version of the Aprilage® software which the individual could run themselves which would be cost-effective, practical and could reach a wider number of individuals through the medium of the computer that this audience is most familiar with.

Acknowledgements
The authors are grateful to the students at Colyiers 6th form college and George Abbot School for taking part in this study.

Funding
The authors received no direct funding for this research.

Competing Interest
The authors declare no competing interest.

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Citation information
Cite this article as: Enhancing sun safety in young women: The relative impact of format and temporal framing on beliefs and behaviour, Indiana Cheetham & Jane Ogden, Cogent Psychology (2016), 3: 1210069.

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