“It's bit of an eye opener” - a qualitative study of women’s attitudes towards tanning, sun protection, and a facial morphing intervention

Abstract

Objective: Skin cancer is to a large degree behaviourally preventable, meaning that evidence-based interventions have scope to make a difference. Previous research indicates that appearance-based interventions such as facial morphing may be more effective than health-based interventions, and that it can personalise the issue of skin cancer.

Method: This study examined attitudes to UV exposure, as well as reactions to a facial morphing intervention, through interviews with 25 women aged 35 years and older.

Results: Thematic analysis revealed four themes; two regarding attitudes to UV exposure (confusion and contradiction, and change and continuity), and two relating to the facial morphing (negative reactions to UV-exposed photo and positive outcomes of the intervention). Women experienced a number of barriers to adopting safer behaviour in the sun; their current attitudes to UV exposure had been shaped by available information sources throughout their aging. They expressed negative evaluations of the UV photo, which fed directly into motivation to reduce UV exposure.

Conclusions: These results can be interpreted along the lines of goal-directed behaviour. This type of intervention has the potential to reduce UV exposure among this participant group, something that needs to be further investigated with randomised control trials.

***Keywords*:** Skin Cancer; UV exposure; Facial Morphing; Thematic Analysis; Goal-Directed Behaviour

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Death from skin cancer is a growing problem globally, and the UK is no exception to this; the country sees 102,000 new cases diagnosed each year (Cancer Research UK, 2016; NHS, 2014). Among females in the UK, skin cancer is the fifth most common cancer, with around 7,700 cases diagnosed annually (Cancer Research UK, 2016). Prevention and treatment puts excessive strain on the UK National Health Service, and, as these costs are expected to rise, effective strategies to reduce new incidents are paramount (Verne *et al*., 2011). There is a direct and established link between UV exposure (e.g. indoor and outdoor tanning), and skin cancer (WHO, 2016). The harmful effects of UV exposure can be avoided by using sun protection strategies, such as seeking shade, using protective clothing or applying sun protective lotion. This makes the disease to a large degree behaviourally avoidable, with 86% of malignant-melanoma cases being preventable (Cancer Research UK, 2016). Thus, there is scope for an effective intervention to make a difference. This study qualitatively investigated older women's responses to an age-appearance facial morphing intervention that showed them the likely impacts of UV exposure on their own faces.

It appears that people are aware of the dangers of UV exposure, yet fail to incorporate this understanding into taking precautions in the sun (Miles *et al*., 2005). There is a growing body of research indicating that appearance-focused interventions may be more effective than health-focused interventions in altering intentions and behaviours relating to UV exposure (Williams *et al*., 2013). A possible reason for this could be that people's intentions to tan are primarily motivated by a positive attitude to a tanned ideal; therefore, highlighting the appearance-costs of the same behaviour could reverse this (Jackson & Aiken, 2000). Two systematic reviews and meta-analyses have indicated that appearance-focused interventions such as UV photo and photo-ageing information can have positive effects on participants'

UV-related intentions and behaviour, such as decreasing intentions to sunbathe (Persson *et al*. under review; Williams *et al*., 2013a). This includes facial-morphing techniques that allow participants to see their future face with and without sun-damage.

Qualitative research with younger women (age range 18-34 years) has indicated that a facial-ageing intervention can be effective in highlighting the dangers of UV exposure and make the threat of skin cancer self-relevant, therefore increasing motivations to reduce unsafe UV behaviour (Williams *et al*., 2015). It has also indicated that facial morphing can personalise the issue of skin cancer and as such, create self-relevance. Quantitative research with both genders has shown that this type of intervention can reduce intentions to tan, as well as increase actual sun protective behaviour (Owen *et al*., 2016).

Body image research in general, and interventions to reduce harmful behaviours in particular, have tended to focus on a people aged under 35 years (Williams *et al*., 2013; Persson *et al*., under review), partly because of the well-known sampling bias of recruiting university students, but also because of a general conception that young people are more concerned about their appearance than older people, something that may not necessarily be true (Grogan, 2012; Grogan, 2016). Research indicates that older people are by no means unconcerned with their appearance, although the focus may shift to the preservation of a youthful appearance, particularly among women (Bordo, 2003; Jeffreys, 2014). The relationship between older women's body image and the ageing process is multi-faceted and dynamic. Women aged 35 and over are not immune to concerns about ageing; societal pressure, media images and attitudes of friends and family all contribute to worry and dissatisfaction about key areas of appearance, including the face (Lewis-Smith, 2014). At the same time, there is also evidence that older women self-objectify to a lesser degree than do younger women, although this effect possibly occurs later than 65 years of age (Tiggemann, 2001; 2004). A contributing factor could be that many older women have experienced

childbirth, which has resulted in a more utilitarian view of the body, rather than the body being perceived as something for others to look at (Grogan, 2016). Moreover, age increases the risk of skin cancer (Cancer Research UK, 2016), and women of an older generation are less likely to have been exposed to UV exposure health messages in their youth as compared to younger women. It is, therefore, of key interest to examine if, and how, an appearance-focused intervention like facial morphing could increase motivation to reduce UV exposure among older women. This study addresses two questions:

1. What are the attitudes (e.g. motivation and barriers) to UV exposure and sun protection among women aged 35 years and older?
2. How do women aged 35 years and older react and relate to a facial ageing intervention to reduce UV exposure?

Method

The current study utilised a qualitative approach, with individual interviews with women aged between 35 and 61 years old. Individual interviews were chosen as they result in rich data, allowing participants to answer the questions in an in-depth and personal manner (Willig, 2013).

The research team

The research team is composed of four female psychology researchers. The interviewer (first author) was a female PhD researcher in her 20s, Fitzpatrick skin type 3 (cream white; sometimes mild burn). The other authors were three women in their 30s (skin type 2: white, fair; usually burn, tan less than average – with difficulty), 40s (skin type 3) and 50s (skin type 2). All were involved in design, data analysis and write up. We engaged in reflexive analysis throughout the process of analysing and interpreting the data, following Finlay and Gough (2003).

Participants

There were 25 participants in total. The median age of participants was 51 (*M* = 49.32, *SD* = 6.92). The most common skin types (Fitzpatrick, 1975) were type 3 (36%; cream white; sometimes mild burn, tan about average) and 2 (32%; white, fair; usually burn, tan less than average - with difficulty). Twenty percent of participants described themselves as having type 1 skin (white, very fair; always burns, never tans), and 12% as having type 4 skin (brown; rarely burns, tans with ease). The number of participants was based on reaching data saturation (Guest *et al*., 2006), i.e., when little or no new information is presented in the interviews, as well as considerations of information power (Malterud *et al.*, 2016), and was also guided by previous work in this area with younger women under 35 years (Williams *et al*., 2012). Participants were initially recruited by approaching people at a British university, and from this a snowball recruitment approach was used. All women spoke fluent English.

Apparatus

APRIL® age progression software was used to simulate real-life ageing up to 72 years of age, i.e. to demonstrate what a person could potentially look like as they age up to a maximum of 72 years old. This means that the number of years a participant is morphed will vary according to their current age, i.e. a person who is 30 will "age" 42 years, whereas a person who is 50 will "age" 22 years, resulting in both their photos being 72 years old. The software uses an ageing algorithm, and is based on previously published material on facial ageing, as well as a 5-year study on the facial ageing of 7000 people of varying ethnicities, ages, and lifestyles (AprilAge Inc., 2017). This can be contrasted with traditional age progression software which is often based on an artist's rendition of aging or unhealthy lifestyles. The APRIL® software shows future, hypothetical damage, as compared to UV photo techniques which demonstrate actual and current sun related damage. APRIL® produces two separate photos over a 55 second period for participants to compare: their faces aged as though had not been exposing their skin to UV rays and using sun protection, and

their faces aged as though they had been exposing their skin to UV rays and had not been using sun protection, so that the differences in facial damage are visually represented side by side. Participants are also shown a 3D version of each photo, encouraging a life-like experience of the ageing by highlighting UV damage to the sides and neck. The software takes can be used effectively with people of different ages and ethnicities.

A laptop and web camera with the APRIL® software installed and an audio recorder (mobile telephone) were used in this study.

Materials

A list of topic areas was developed, which was based on previous research with younger women (Williams *et al*., 2012), and modified to accommodate the aims of the current study (e.g. to investigate general attitudes to UV exposure as well as specific reactions to facial morphing) following discussions within the research team. Topics included current and previous attitudes and behaviour regarding UV exposure and sun protection, and reactions to the facial morphing, and this list was used flexibly in interview sessions to stimulate discussion. Example questions include: "Was there a particular age when your attitudes to UV exposure and sun protection became relevant to you?", and "How do you feel about the photo on the right (high-UV photo)?".

Procedure

The study mostly took place at a British university, but also in participants' homes if the person facilitating their recruitment was previously known to the interviewer, and University lone working policies were followed. All sessions took place in a private space to allow for an element of participant-researcher confidentiality. Participants were first given the study information sheet, and were asked to sign consent forms. They were then asked to identify their skin colour according to the Fitzpatrick test. Following this, the facilitator gave a brief introduction of the structure of the session, which were as follows: initially

participants had their photo taken, and a few personal details noted to set up the software. As this stage, the session was not recorded, and it was used as an opportunity to familiarise the participant with the facilitator, to create rapport. Once the software was set-up, the audio recorder was turned on, and participants were asked about their general attitudes to UV exposure, e.g. "Do you use sun protection?" and "Do you sunbathe?". This was before any facial morphing took place, to enable capturing participants' attitudes unaffected by the intervention. After these questions, the basics of facial morphing were explained (e.g. that the right-hand photo viewed on the computer screen would be with UV exposure and the left one without). Participants faces were then morphed and displayed on the computer screen. Natural reactions to this process were recorded, initially without asking any specific questions. Following this, participants were asked specific questions about their reactions to the facial morphing, e.g. "Is there anything in particular you notice about the photo on the right?", and its impact on their future intentions, e.g. "Does this photo make you motivated to change your behaviour". Subsequent questions asked were based on participants' responses to the initial questions, ensuring that topics considered important by participants were covered. Finally, participants were asked if there was anything they would like to add, to ensure no crucial information was overlooked. The recorder was then turned off, and participants given a debrief sheet and thanked for their participation.

Data analysis

The audio-taped interviews were transcribed verbatim, and the resulting data were analysed by the first author through inductive thematic analysis (Braun & Clarke, 2006) using NVivo Qualitative Data Analysis Software (QSR International, 2016). The six stages identified by Braun and Clarke were followed, including reading through the interviews and identifying words and concepts that appeared frequently, developing these into themes, reviewing these between the authors, and picking out the most prominent themes based on

how frequently they appeared. Transcripts were initially read and interesting points were noted. They were then re-read, and coded line by line. Finally, these codes were analysed further and organised into themes with a more abstract meaning. The coding and themes were discussed and agreed upon by all the authors. Inductive thematic analysis was chosen as it allows rich themes to emerge from the data, thus linking them strongly to the information provided by participants (Patton, 1990). For the quotes below, (.) is used to denote a pause.

Results

The themes that emerged were organised under the two categories covered in the interview questions: attitudes to UV exposure and reactions to facial morphing, and two key themes emerged in each category. See figure one for theme matrix.

Attitudes to UV exposure:

1. Confusion and contradiction
2. Change and continuity

Reactions to facial morphing:

3. Shock, surprise and negative reactions
4. Positive outcomes of the intervention

Theme 1: Confusion and contradiction

There was a level of confusion and contradiction in how the women discussed their attitudes to UV exposure and negotiated use of sun protection, clearly demonstrating awareness of some sun safety recommendations but remaining unsure about others. The women's perceptions of the costs and benefits of UV exposure impacted the choices they made, and sometimes served as a post-exposure justification that was used to make inferences about their own behaviour in certain situations. Costs included the impact on long-term health and appearance:

> "I know I like tanning but I don't like it that much that I can put my body in danger" (Laurie, age 56, Skin Type 3)
>
> "overexposure does... um... damage your skin and makes you look older" (Kristin, age 61, Skin Type 3)

Benefits included short-term appearance, health, and recreation. These women emphasized the importance of spending time in the sun for their well-being, which was associated with leisure time and holidays, and this was a more common reason given for tanning than wanting a tanned appearance. A tan was sometimes valued as a representation of having been on holiday, e.g. achieving "a bit of a glow" (Naomi, age 51, Skin Type 2). That the primary motivations for UV exposure were not about appearance concerns may be something that differentiates them from a younger sample:

> "You feel better I think when you're in the sun (.) makes you feel (.) good, gives you them good vibes" (Kristin, age 53, Skin Type 3)

Costs and benefits would be more or less salient at different times. Simultaneous awareness of various costs and benefits of being in the sun led the women to feel confused about UV exposure, as they were unsure whether spending time in the sun was good or bad for them. This confusion also appeared to stem from a lack of knowledge about some aspects of the dangers of UV exposure and when to use sun protection:

> "I read you're supposed to have it (sun screen) on all year around and I also know that you're supposed to get some (.) is it 20 minutes of sunshine (.) or daylight so that your vitamin D. (.) grows so I'm a bit confused about that, about having it on or not having it on (laughter) or when you should put it on but generally" (Doris, age 54, Skin Type 1)

There was also evidence of a mental distinction between harmful UV exposure (i.e. actively sunbathing abroad), and what was perceived as less harmful UV exposure (e.g. incidental sun exposure), where site and situation-specific cues determined whether women would protect

their skin, and what precautions they should take to do this. This was particularly evident in situations where women were exposed to the sun but not actively sunbathing (perceived as not harmful UV exposure):

> "If I was thinking I'm gonna go in the garden and read a book I'd think I'd need to put some sun (.) (protection) whereas if I was just popping out to do a bit of gardening (.) It's mad isn't it, you fool your brain." (Margaret, age 51, Skin Type 2)

It was also evident that the women perceived the sun in the UK as less harmful compared to the sun "abroad", and reported not feeling the need to take as many precautions when in the UK. This further supports the notion that although the women were aware of some sun safety recommendations, they lacked knowledge and were generally confused about others:

> "I've not really bothered with sun creams... only if I've ever been abroad." (Molly, age 51, Skin Type 2)

Although most women were aware they should be using more sun protection than they were currently doing, they employed a number of strategies to bridge this cognitive gap, including a self-attributed laziness and a tendency to forget, which emphasised contradictions between their attitudes and behaviour:

> "I get it wrong all the time like I forget" (Harper, age 55, Skin Type 2)
>
> "I'm a bit lazy; I don't always put it on as soon as I should" (Naomi, age 51, Skin Type 2)

The women also indicated that they were happy with their current level of sun protection (whilst simultaneously identifying gaps or demonstrating situations that could objectively be perceived as high-risk), particularly through health-related downward comparison with smokers and "sun-worshippers". This resulted in women at times contradicting themselves, further emphasising the conflicting nature of their attitudes to UV exposure and sun protection:

> "I don't really sit in the sun like a sun worshipper so I... I'll probably be alright" (Toni, age 46, Skin Type 2)
>
> "I've never smoked" (Sadie, age 48, Skin Type 3)

Relating to the above, this was also achieved through extreme case formulation where they justified their current level of UV exposure by formulating a hypothetical, extreme-case scenario with which to compare their relatively less extreme behavior:

> "I don't go on the sunbeds every week and I don't lie out in the sun with nothing on anyway" (Judith, age 44, Skin Type 3)

Theme 2: Change and continuity

These women's attitudes to UV exposure were dynamic. Many had experienced significant life-events that had served to change, and in some cases reinforce, how they perceived sun protection and spending time in the sun; this is likely to be a difference between this sample and those younger than 35 years of age. Life events included experiencing severe burns or knowing someone who had been diagnosed with skin cancer, and was evident among both younger and older women in the sample:

> "I got really really really painful burns on my shoulders and it was it was quite bad um... and I think, I think I think that did make me more careful" (Molly, age 50, Skin Type 3)
>
> "I think... I've become more aware as I've got older of the... (..) potential risk and having known people who've actually developed skin cancer" (Alice, age 35, skin type 2)

There was a general sense among these women of an increased awareness of the dangers of UV exposure, both due to an increased self-awareness and a shift in priorities (e.g. having children) resulting from the general ageing process, but also because they felt that there is more information available to them now, than there was earlier in their lives. There was a

definite sense of a 'previous self' for these women, who they refer to as more risk-taking than their current self, for instance in using tanning booths, lack of sun protection use, and even in using olive oil whilst sunbathing:

> "we used sort of like olive oil and different… things to… to… help us get a better colour" (Laurie, age 56, Skin Type 3)"
>
> "I think when you're young (.) you know when you're going on holiday (.) you're quite naive about the sun, you just think oh I'll look much better with a sun tan, I'll go out in the sun, get myself a suntan" (Eva, age 61, Skin Type 3)

Important information sources had impacted on the process of change, which can be broadly categorised into personal and public sources. Aside from the aforementioned life events, these women cited having children as one of the main factors in developing a more careful approach to UV exposure:

> "Because you become aware when you're a mother that you got to have your baby covered up from that, from the sun, so you're covering them up and putting them in them safe suits um and things like that and t-shirts on hats on um so yeah (.) you're more aware of the sun and what it can do" (Naomi, age 51, Skin Type 2)

They also cited public information sources such as the media, or information campaigns as a key influence in being more careful in the sun, suggesting that there is more awareness about the dangers of UV exposure today, compared to when they were younger. This was evident among both older and younger women in the sample, indicating similarities in the impact of information campaigns. This suggests that although older women may not have had the same access to information in their youth as younger women did, the information presented to them throughout their adult years has increased their their knowledge on the dangers of UV exposure.

> "We're probably going back about 20 years ago where it wasn't as (.) shall we say publicised (.) some of the the impact that it would have on your skin (.) um (.) and so it was probably around (.) you know a certain campaign that happened at that time that sort of raised my awareness" (Maya, age 40, Skin Type 4)
>
> "I just think that it's... I've just read so much about them over the years" (Kristin, age 61, Skin Type 3)

Interestingly, there was a sub-group of women who described themselves as extremely pale or with sensitive skin; their attitudes to UV exposure have remained relatively static throughout their life, and they had consistently employed extreme sun protection strategies such as using factor 50 sun cream or avoiding the sun altogether:

> "I burn... and...um... I just don't enjoy it; I get really hot really quickly... and I can feel my skin prickling... so I would never lie in the sun, but I'm outdoors quite a lot... but I would always put factor 30 or 50 on" (Sylvia, age 40, Skin Type 1)

Theme 3: Shock, surprise and negative reactions to UV photo

The three key aspects of the women's reactions to the facial morphing intervention were shock, surprise and negative feelings towards the UV photo, as compared to the non-UV photo. Older and younger women were equally shocked, and this was conveyed through dramatic language such as "Oh bejesus!" (Naomi, age 51, Skin Type 2) and "Oh my Gosh!" (Alice, age 35 skin type 2) throughout the morphing process. Shock and surprise appear to link with group's partial confusion about the dangers of UV exposure as outlined above; it is possible the women thought they were more aware of the dangers than they actually were, thus being surprised when faced with the level of skin damage caused by the sun. This is an important aspect of the intervention as the initial shock prompts relevance of the issue whilst still being informative, something that traditional health literature interventions may fail to do (Williams *et al*., 2013).

> "I am surprised, even I'm surprised by the level of damage (.) I'm surprised by the visible level of damage yes (.) even though I know that going out in the sun's not good for you, I still find that difference quite startling" (Doris, age 54, Skin Type 1)

There was a general consensus that the photo that had been aged as if they had been exposing their skin to UV rays without using sun protection (the UV photo), looked worse than the naturally aged photo, and this was mainly commented on in terms of the skin. The main features of the UV exposed photos that were commented on were "skin colour, skin pigmentation" (Eva, age 61, Skin Type 3), "level of the skin damage" (Simone, age 43, Skin Type 2), and that the skin was "really wrinkled" (Sadie, age 48, Skin Type 3). Women were encouraged to compare the two photos; providing the participant with two photos presented side by side is a key advantage of this type of intervention, and the difference between them was described as "striking" (Sylvia, age 40, Skin Type 1) and "remarkable" (Alice, age 35, Skin Type 2). This, according to the women, will be a crucial factor in prompting behaviour change: they wished to avoid looking like the high-UV photo and suggested ways to achieve this, including staying in the shade and using sun protection. The women mainly focused their attention on the high-UV photo; this was expected as this photo normally demonstrates significantly more changes to their current self than the photo aged naturally. The women felt that the high-UV photo looked unnatural (comparing it to fictional characters) and older, and provided colourful imagery to illustrate this:

> "Good Grief, that's awful! (.) I look like Yoda!" (Emily, age 40, skin type 1)

> "The skin looks really wrinkled and leathery and (.) yeah (.) just (.) much much older than the one on the left (.) much (.) (Virginia, age 47, Skin Type 1)

The importance of the visual information was highlighted by several women, both in regards to anecdotal evidence about people they knew who had suffered sun damage, and in how they perceived the facial morphing intervention's efficacy. Sometimes they compared the impact

of visual information to theoretical knowledge about the dangers of UV exposure, again suggesting that this type of intervention can convey health messages in a novel and convincing manner. It also appeared to provide them with a sense of self-efficacy, as they had two clear options for their future appearance:

> "I'm fully aware that... sun damage and overexposure is bad, but it's just seeing it kind of makes you think... you know, they're the two options" (Alice, age 35, Skin Type 2)

A key benefit of this type of intervention is its ability to personalise the issue of skin cancer, by demonstrating potential damage to participants' own face. This was directly commented on by the women, and they regarded this as an important factor in increasing susceptibility to the negative consequences of UV exposure:

> "It's not... It's not something remote. It's something very personal then. That makes you think about it as well" (Margaret, age 51, Skin Type 2)

Theme 4: Positive outcomes of the intervention

Within the reactions to the facial morphing, there were also positive outcomes to be found, which included positive reactions to the naturally aged photo and motivations to change behaviour, or motivations to continue with behaviours already in place. That participants' experience of the facial morphing process was largely positive suggests that this type of intervention can be an empowering experience for women of this age group. The women described the experience as "interesting" (Sadie, age 48, Skin Type 3) and "powerful" (Harper, age 55, skin type 2).

Although commenting extensively on the photo aged with UV damage, the women also focused their attention on the naturally aged photo. They were overwhelmingly content with the natural ageing process, describing the photo aged without UV exposure as "fresh-faced" (Virginia, age 47, Skin Type 1), making them feel "pleased" (Sanne, age 55, Skin Type 4). They did in some cases express surprise at looking better than they had anticipated:

"I'm amazed that I can actually look that good when I'm that old" (Toni, age 46, Skin Type 2)

Combined with the aforementioned negative reactions to the sun damaged photo, this fed into their motivation to either change, or maintain their current level of sun protection, where the comparison aspect between the two photos was a crucial factor, a key benefit of this type of intervention. Motivations could be classified into two types. Where gaps in sun protection were identified, the women wanted to increase their level of sun protection, which was often regarded as valuable feedback, giving them control over the choices for their future. This suggests that this type of intervention can increase self-efficacy surrounding sun protection use:

"I'm not sad, I sort of look at it and I think I can do something about it and I'm happy I came today... so I can do something about it hopefully" (Laurie, age 56, Skin Type 3)

The women commented on the intervention increasing their personal awareness of the dangers of the sun, which was regarded as something positive and useful. This would suggest that participants are willing to rectify the aforementioned confusion and unawareness of certain sun safety recommendations, and are open to new information:

"It's a bit of an eye-opener" (Toni, age 46, Skin Type 2)

"Makes me realise I want to take that knowledge and show my friends! Don't keep going out in the sun! Gosh… that's amazing" (Marie, age 53, Skin Type 3)

Among the group of women who already employed rigorous sun protection (primarily, but not exclusively, women with sensitive or pale skin) this translated into a feeling of already having the right course of action. This increased motivation to continue their current level of sun protection:

"yeah I mean, think I've got a highly motivated anyway but that has made me... I think... that's increased my degree of motivation" (Doris, age 54, Skin Type 1)

It is, however, difficult to establish whether these motivations would be translated into action without implementing post-intervention measurement, as it is possible that the women's mental defences (i.e. self-attributed laziness and downward comparison) might reactivate barriers to sun protection given time.

Discussion

This study provides a unique insight into motivations and barriers for UV exposure and sun protection, as well as reactions to a facial morphing intervention, among women aged 35 years and older. Through qualitative analysis, a number of relevant themes emerged which are informative in enabling an understanding of attitudes to UV exposure and sun protection among this population, and how women aged 35 years and older react and relate to one particular facial ageing intervention to reduce UV exposure.

Attitudes to UV exposure and sun protection

Although public knowledge about the dangers of UV exposure is generally on the rise (Miles *et al*, 2005), the women experienced substantial confusion about tanning and sun protection, being simultaneously aware of costs and benefits of sun exposure. The most prominent confusion was that sun in the UK did not warrant sun protection, a belief refuted by UK National Health Service recommendations about sun safety (2016). It is highly likely that the UV tanning industry itself contributes to this confusion by distributing contradictory messages about the benefits and costs of UV exposure. Following thematic analysis of advertisements and media messages, Prior and Rafuse (2016) argue that the tanning industry itself perpetuates the idea of UV exposure (without distinguishing between natural and artificial sources of UV) being safe and enhancing well-being.

It was evident from the analysis that the women did take precaution in the sun in scenarios where harmful UV exposure was made salient (i.e. sunbathing abroad). The analysis also revealed that there was a degree of self-deception involved in failing to use sun

protection, i.e. downward comparison (with smokers or "sun-worshippers") or mental barriers (e.g. information avoidance) to accepting the sun in the UK as harmful. Interestingly, downward comparison has been found to completely negate any benefits of an appearance-focused intervention to reduce UV exposure, suggesting that these belief systems will need to be counteracted to ensure intervention efficacy (Mahler *et al.*, 2010).

It appears that, in line with goal-directed behaviour theory, the goal of sun protection was not sufficiently strong or salient in some of these situations, resulting in the women failing to monitor their sun safety behaviour, an essential aspect of goal-achievement (Carver & Scheier, 1982; 1990). This further relates to the "Ostrich Problem" (Webb *et al.*, 2013), where these women are possibly avoiding seeking out definitive information on the matter, partly because the issue is confusing, and partly to avoid having to make a decision regarding behaviour change. In contrast, the sub-group of women with self-described pale or sensitive skin, reported employing extreme sun-protection strategies. For these women, the goal of reducing UV exposure was salient at all times, and as such they were already highly motivated to monitor their behaviour to avoid sun-burn. It could be argued that the aspect of goal-monitoring was also easier for this group, as even the slightest degree of sun exposure resulted in immediate discomfort on the skin, thus making goal- related feedback immediately accessible - a form of passive feedback (Webb *et al.*, 2013). This may not be the case for women with darker skin who tan with ease; to obtain feedback on their progress on reducing UV exposure they would have to actively seek out feedback, i.e. by visiting a medical professional who could give information about their current level of skin damage and what precaution they should be taking in the sun. It may be worth noting that if there are high levels of dissonance between their current behaviour and what they expect to obtain, they are likely to simply avoid seeking out this information (Frey, 1982). It would, therefore, seem relevant for future intervention to take these aspects into account and increase the number of

situations where UV-protection is highly salient, thus increasing the likelihood of reducing UV exposure. This could for instance be achieved by including aspects of implementation intentions in appearance-focused interventions, e.g. "when the weather I go for a walk outside then I will wear sun protection" (Armitage, 2004). To encourage and facilitate effective self-monitoring, recommendations on sun safety would need to be clarified further, hence making information avoidance less likely.

There also emerged what appeared to be sample-specific characteristics in regards to these women's attitudes to UV exposure; there was a sense of a dynamic process with key events that had served to change or reinforce their attitudes and behaviours. Although public information sources such as media campaigns evidently only go some way towards prompting behaviour change, women of all ages did cite these as having had a profound effect on their sun protection use. This suggests that health information can prompt behaviour change, albeit up to a certain point; there might be a threshold when people have the available information but still do not have the motivation to increase health conscious behaviour, a common criticism towards heath-promotion strategies (Hardeman *et al*, 2002). Hardly surprising, personal information sources such as friends or family getting skin cancer were cited as important reasons to take precaution in the sun.

Reactions to the facial morphing intervention

Facial morphing interventions benefit from personalising the message and potentially increasing susceptibility to the threat of skin cancer (Weinstein, 1982). The women's shock and surprise at the visible aging of the UV photo is similar to the findings of Williams *et al. 's* (2015) research on younger women. The shock and surprise at the level of skin damage caused by the sun suggests that public information campaigns about the dangers of UV exposure still have some way to go towards fully educating the population. It was evident that a key aspect of the women's shocked reactions to the facial morphing was its ability to

personalise the issue, which is becoming increasingly relevant in skin cancer interventions (Grogan *et al*., 2015; Mahler *et al*., 2013).

The women reacted overwhelmingly negatively towards the UV photo, and expressed how they did not want to look like that when older, highlighting that appearance is still a key concern among this age group. Interestingly, as compared to qualitative research on younger women, these women did not appear to be concerned about their appearance for the sake of significant others; however, they did express a similar motivation to change their behaviour (William's *et al*., 2015). The sub-group of paler women expressed feelings of having made the right choices to be careful in the sun and motivations to continue with their current levels of sun protection.

A contributing factor to the potential success of a facial-morphing intervention is that women can compare the sun damage to a photo that has aged naturally (William's *et al*., 2012); this is particularly relevant as a number of the women expressed being content with the naturally aged photo, and in some instances, surprised how good they looked when older (potentially, providing them with an appearance related approach-type goal). This suggests that a facial morphing intervention does not only emphasise aging and appearance in a negative way, but can also be a tool to promote positive body image among older women, an issue that is increasingly in the focus of body image research (Grogan, 2016). Encouragingly, many women found the facial morphing experience interesting and informative - a key benefit of this type of intervention. If facial-morphing booths were installed at airports or GP waiting rooms, there is a strong possibility people will engage fully as they are likely to find the experience rewarding.

Reflexive Analysis

As researchers, we have tried to present the women's accounts accurately and fairly. The first author is a PhD researcher in Health Psychology, with a personal interest in body image and

behaviour change. She has also herself experienced the facial morphing intervention in regards to UV exposure, and has reflected upon that experience in relation to barriers and motivation for sun protection use. However, she is under the age of 35 and will thus have had different experiences as compared to the current sample, and will have related to the facial morphing differently, something that can be considered a limitation to the current study. It is also possible that the women may have reacted differently to the intervention, as a result of the interviewer being a younger woman, which is a limitation of the study. As there is no comparison group available, is not possible to establish if participants would have behaved differently if the interviewer was older. The remainder of the research team are women over the age of 30, all with interests in health promotion and behaviour change. They were able to relate to the sample age-wise, and provided insight into the design and analysis of the study. The analysis produced has hopefully benefitted from an all-woman research team of varying ages, with strong academic interests in the research topic.

Strengths, limitations and future directions

This study benefitted from a relatively large sample size, and women appeared comfortable speaking to another woman about their UV attitudes and their experiences of the facial morphing intervention, disclosing a significant amount of detailed, personal information. However, there were also limitations inherent in the study. All women were UK-based, so results need to be generalised with caution. There was also a relatively wide age span (26 years) among the sample, which resulted in a more considerable morphing of the younger women than the older. It is therefore possible that individual differences in reactions to the intervention could be partially attributable these variations. However, the analysis confirmed a general spread of responses throughout the ages, suggesting that reactions are similar despite variations in years aged. Moreover, the types of motivation expressed by the women varied according to their already formed attitudes to UV exposure

and sun protection, and the importance they placed on appearance, highlighting the importance of investigating additional sample characteristics (e.g. investment in appearance, personality variables) in conjunction with specific interventions, as the efficacy on the former can be impacted by the latter (Vollrath *et al*., 1999). In addition, a key methodological limitation of the current study was the lack of diversity among participant ethnicity and skin type (none of the women described themselves as having type 5 or 6 skin), where future research would benefit from inclusion of a more diverse sample. Additionally, as skin cancer rates between men and women do not vary, future investigations into attitudes to UV exposure and facial morphing would also benefit from including older men. Finally, as the women were mainly employed at a British university, future research should also aim to include participants from a wider range of socio-economic backgrounds, particularly as lower SES is associated with a higher prevalence of heath-damaging behaviours and poorer health outcomes (Michie *et al*., 2011).

Conclusion

This study provides a unique insight into attitudes to UV exposure and sun protection among women aged 35 years and older, exploring, through qualitative interviews, barriers and motivations to adopt safer behaviour in the sun. Past studies have tended to focus on attitudes and intervention efficacy among younger samples. However, it is unlikely that a "one size fits all" approach will be successful in skin cancer prevention, so it is crucial to target a more varied age range, and to understand more about views of older women and men. Although this study specifically focuses on age-appearance facial morphing as a tool for possible behaviour change, the exploration of general attitudes to UV exposure means that study could lay the foundation for the design of other interventions targeting harmful UV exposure among women aged 35 years and older.

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Figure 1. Theme matrix