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Differential effects of makeup on perceived age

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Makeup accentuates three youth-related visual features – skin homogeneity, facial contrast, and facial feature size. By manipulating these visual features, makeup should make faces appear younger. We tested this hypothesis in an experiment in which participants estimated the age of carefully controlled photographs of faces with and without makeup. We found that 40- and especially 50-year-old women did appear significantly younger when wearing makeup. Contrary to our hypothesis, 30-year-old women looked no different in age with or without makeup, while 20-year-old women looked *older* with makeup. Two further studies replicated these results, finding that makeup made middle-aged women look younger, but made young women look older. Seeking to better understand why makeup makes young women look older, we ran a final study and found evidence that people associate makeup use with adulthood. By activating associations with adulthood, makeup may provide an upward bias on age estimations of women who are not clearly adult. We propose that makeup affects social perceptions through bottom-up routes, by modifying visual cues such as facial contrast, facial feature size, and skin homogeneity, and also through top-down routes, by activating social representations and norms associated with makeup use.

Makeup is worn everyday by millions of people around the world. It is one of the most prominent expressions of the ancient (Jablonski, 2006) and universal (Brown, 1991) human practice of decorating the face and body. However, the psychological causes, mechanisms, and consequences of makeup use remain poorly understood. For example, little is known about how wearing makeup changes how people are perceived.

However, the effect of makeup on one attribute – attractiveness – has been studied extensively. Numerous studies using carefully controlled before and after photographs have found that face images are rated as more physically attractive when wearing makeup (Batres *et al.*, 2018; Cash, Dawson, Davis, Bowen, & Galumbeck, 1989; Cox & Glick, 1986; Etcoff, Stock, Haley, Vickery, & House, 2011; Graham & Jouhar, 1981; Huguet, Croizet, & Richetin, 2004; Jones, Russell, & Ward, 2015; Law Smith *et al.*, 2006; Mulhern,

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Fieldman, Hussey, Leveque, & Pineau, 2003; Osborne, 1996) and that they more strongly activate reward centres in the brain (Ueno *et al.*, 2014). Several other studies have found evidence from field experiments consistent with the notion that makeup makes faces appear more attractive (Guéguen, 2008; Guéguen & Jacob, 2011; Jacob, Guégen, Boulbry, & Ardiccioni, 2009).

Given the consistent finding that makeup makes faces appear more beautiful, recent work has begun to investigate the visual features that are modified by makeup to make the face appear more attractive. Makeup is known to modify at least three visual features – skin homogeneity, facial contrast, and facial feature size. Skin homogeneity (i.e., skin evenness) is presumed to increase through the use of makeup products such as foundation and concealer, and is positively associated with attractiveness and perceived health, but negatively associated with age (Fink, Grammer, & Matts, 2006; Matts, Fink, Grammer, & Burquest, 2007; Samson, Fink, & Matts, 2010). Facial contrast – the colour and luminance contrast between the facial features and the surrounding skin – is positively associated with attractiveness (Russell, 2003; Störmer & Alvarez, 2016) and is increased through typical makeup use (Etcoff *et al.*, 2011; Jones *et al.*, 2015; Russell, 2009; Stephen & McKeegan, 2010). Aspects of facial contrast are sexually dimorphic, being greater in female than male faces (Jones *et al.*, 2015; Russell, 2009; Russell, Kramer, & Jones, 2017), while other aspects decline with age and are used as cues for perceiving age and health from the face (Porcheron, Mauger, & Russell, 2013; Porcheron *et al.*, 2017; Russell *et al.*, 2016, 2017). Theorists have proposed that facial feature size mediates the effect of makeup on attractiveness (Bruce & Young, 1986; Morris, 1977, 2002; Perrett, 2010; Zebrowitz, 1997), and recent work has shown that makeup does indeed make the eyes and eyebrows appear larger (Morikawa, Matsushita, Tomita, & Yamanami, 2015). Makeup can also make the nose appear smaller, through the use of contouring, but typically does not make the lips appear any larger (Jones, Porcheron, & Russell, in press). Thus, there is evidence that makeup makes faces appear more attractive at least in part by making facial skin appear more even, increasing the contrast between facial features and the surrounding skin, and changing the apparent size of some of the facial features.

These three visual features that are modified by makeup use are also all cues for age perception. Moreover, typical makeup modifies each of these cues in the direction to appear more youthful – smoother skin, higher contrast around the facial features, and larger features are all youth-related. These findings suggest the hypothesis that makeup should make faces appear younger. This would be an important finding for understanding the effects of makeup on person perception, because age is a major dimension of human social interaction and person perception (Uleman, Saribay, & Gonzalez, 2008). Indeed, how old we look influences how others treat us in a wide variety of contexts (Montepare & Zebrowitz, 1998), including legal and hiring decisions (Zebrowitz & McDonald, 1991; Zebrowitz, Tenenbaum, & Goldstein, 1991) and judgements of attractiveness (Ebner, 2008; Henss, 1991; Kwart, Foulsham, & Kingstone, 2012).

Here, we sought to test the hypothesis that makeup makes faces look younger, by conducting experiments in which participants estimated the age of faces from carefully controlled photographs of the same target women with and without makeup. We predicted that women would look younger with makeup than without makeup.

STUDY 1

In the first study, participants estimated the age of women in carefully controlled photographs with and without makeup. The target women were from four different age bands – approximately 20, 30, 40, or 50 years old. We predicted that faces from all age bands would be perceived as younger when wearing makeup than when not wearing makeup. Because different intensities of makeup application (Etcoff *et al.*, 2011) and makeup applied to different features (Mulhern *et al.*, 2003) can have different effects on trait perception, we used four different makeup conditions that varied the intensity of the makeup application and features to which makeup was applied.

Method

One hundred thirty-two female participants aged 19–55 years (M = 33.4, SD = 10.4) were recruited from the community in the region of Grenoble, France and paid €15 for their participation. Our goal in this and subsequent studies was to test the largest number of participants that was feasible given budgetary or time constraints. The research was conducted according to the principles expressed in the Declaration of Helsinki, and written informed consent was obtained from all participants. Consistent with French regulations, approval from an ethics committee was not sought because the research was non-interventional and involved exclusively non-invasive methods.

We took frontal photographs of the faces of 32 Caucasian women in four age bands (20 years [eight women between 18 and 22 years old], 30 years [eight women between 28 and 33 years old], 40 years [eight women between 38 and 42 years old], 50 years [eight women between 48 and 52 years old]). The women were made up by a professional makeup artist. The artist was instructed to apply makeup to make the women more beautiful and was blind to the hypothesis of the study. Each face was first photographed with bare skin ['no makeup']. The other four conditions all included concealer, foundation, blush, and powder applied to the facial skin. One condition also included lipstick and lip liner ['skin and lips'], another also included eye liner, eye shadow, mascara, and eyebrow pencil ['skin and eye region'], another included all of the products applied to appear somewhat natural ['full face natural'], and the final condition included all of the products applied more strongly ['full face intense']. Written informed consent was obtained from all subjects allowing the use of their photographs for research studies.

Critically, the lighting and photographic conditions were identical for all of the women photographed, and for all of the conditions. The photographs were acquired using a closed photographic system that allows accurate and reproducible positioning of the subjects as well as controlled lighting conditions and colour calibration. The height of the camera (Canon EOS-1 Ds Mark II, 17 MP) was adjusted to the height of the face. Each face was illuminated by three flashes: one in front of the face (diffuse light), the height of this flash was adjusted to the height of the subject's face; and two flashes illuminating the face from a 45° angle (direct light), the height of these flashes was fixed. These lighting conditions were defined to avoid cast shadows and to minimize variation from shading on the faces. Subjects' eyes were open, and they were asked to keep a neutral expression and gaze directly into the camera. The images were cropped to leave the face contour visible. Figure 1 shows images that are similar to the stimuli used in the experiment. Each of the faces in the figure is the morphed average of all eight faces in each condition. We present

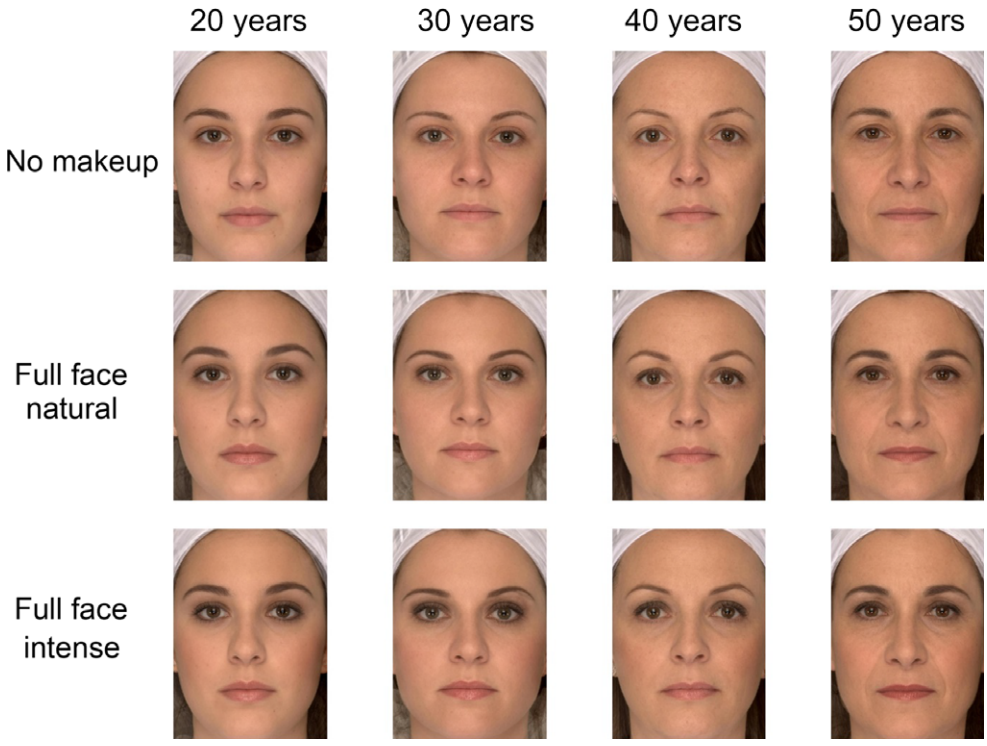

Figure 1. Averaged composite images of the stimuli. Each of the faces shown is the morphed average of the eight stimulus images from that particular age x makeup condition. Columns indicate the age band, while rows indicate the makeup condition. Because these are averaged faces they all have smooth, even skin. This obscures the smoothing effect that makeup has on skin homogeneity, which is presumably an important component of makeup. In the actual stimulus faces that were used in the experiment, the skin appeared more even in the makeup conditions than in the no makeup condition. [Colour figure can be viewed at wileyonlinelibrary.com]

morphed averages here to maintain the privacy of the women who were photographed. However, it must be noted that the morphing results in all the faces – including those in the no makeup condition – having smooth, even skin, thereby obscuring the difference in skin evenness between the makeup and no makeup conditions.

Participants estimated the age of each face by clicking on a visual analogue scale ranging from 10 to 70. While a 2AFC task may have been more sensitive, we used ratings of individual faces to reduce demand characteristics. The same procedure was used to estimate attractiveness with participants clicking on a visual analogue scale ranging from 0 to 100. The order of the two tasks was counterbalanced; within each task, the presentation order was completely randomized. The attractiveness ratings from two participants were lost due to error, leaving ratings from 130 of these participants. Participants were randomly assigned to one of two groups. Both groups estimated the age of the women photographed in the no makeup condition. Group 1 also estimated the age of faces in the skin and eye region condition and in the full intense condition, while Group 2 also estimated the age of faces in the skin and lips condition and in the full natural condition.

Results and Discussion

Figure 2 (and Table S1) shows the differences in estimated ages between the various makeup conditions and the no makeup condition. To compare perceptions of the faces wearing makeup with the faces not wearing makeup, we conducted Wilcoxon matched-pairs signed-ranks tests on these differences, using the image as the unit of analysis. We used this non-parametric test because the sample ($N = 8$) was too small to assume a normal distribution. While the 40- and especially the 50-year-old faces generally did appear younger with makeup, the 20-year-old faces appeared *older* with makeup, specifically for the two full face makeup conditions. The 30-year-old faces appeared no younger or older in any of the makeup conditions. Thus, the way that makeup affected the apparent age of the face depended upon how old the face was to begin with. In contrast, faces of all age bands were rated significantly more attractive in all the makeup conditions than in the no makeup condition, $p < .05$ for all comparisons (Figure 3 and Table S2).

Despite making only superficial changes to the face, makeup had large effects on apparent age. Makeup made the 50-year-old women appear around 1.5 years younger and made the 20-year-old women look around 1.4 years older. In comparison, surgical interventions that profoundly and permanently alter facial appearance only reduce apparent age by a few years (e.g., middle-aged and older women look 2.5 years younger after laser resurfacing and 4.6 years younger after complete facelifts (Swanson, 2011)).

Makeup applied only to the skin and eye region had significant effects on perceived age, but makeup applied only to the skin and lips did not. This is similar to the finding that the effect on perceived attractiveness of eye makeup alone is larger than the effect of lip makeup alone (Mulhern *et al.*, 2003). Also, typical makeup makes the eyes look larger but not the lips (Jones *et al.*, In press); it is likely that this effect of makeup on apparent eye size partly mediates the effect of makeup on apparent age.

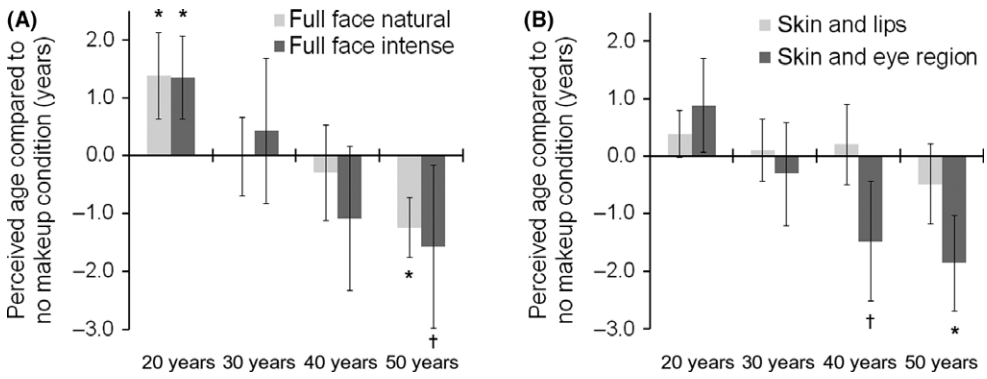

Figure 2. The difference in estimated age (years) between faces wearing makeup and faces not wearing makeup. Positive values indicate that the face is perceived as older when wearing makeup, while negative values indicate that the face is perceived as younger when wearing makeup. Asterisks indicate significant differences between the particular makeup condition and the no makeup condition ($^{\dagger}p = .0547$, $^{*}p < .05$). Error bars represent the 95% confidence interval. Panel A shows the two full face makeup conditions. Panel B shows the two conditions with skin makeup and makeup on either the lips or the eye region. Across both panels, the light bars show data from Group 1 participants while the dark bars show data from Group 2 participants.

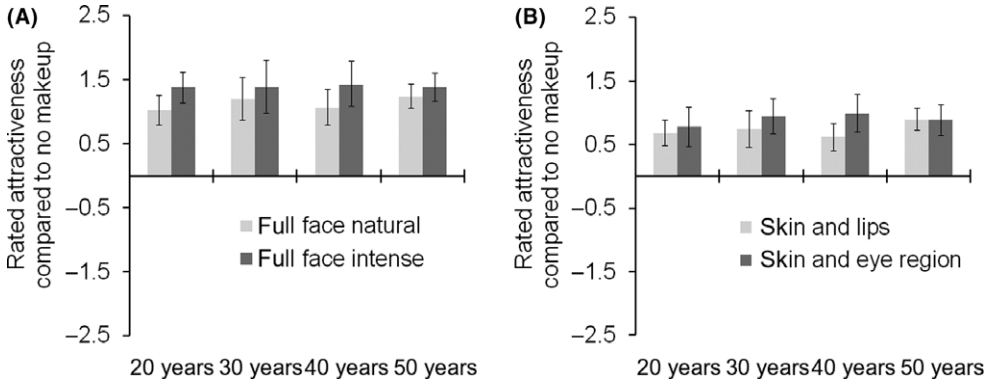

Figure 3. The difference in perceived attractiveness between faces wearing makeup and faces not wearing makeup. Positive values indicate that the face is perceived as more attractive when wearing makeup, while negative values indicate that the face is perceived as less attractive when wearing makeup. In every condition, faces were more attractive with makeup than without, *p*s all <.05. Error bars represent the 95% confidence interval. Panel A shows the two full face makeup conditions. Panel B shows the two conditions with skin makeup and makeup on either the lips or the eye region. Across both panels, the light bars show data from Group 1 participants while the dark bars show data from Group 2 participants.

Replication

The finding that young faces looked older when wearing makeup was surprising. Because of this, we replicated Study 1 with a slightly different task and with a larger sample of 189 participants that included men as well as women and came from a different cultural background. We found the same pattern of results. The 20-year-old faces looked significantly older with makeup, the 30- and 40-year-old faces looked no different in age (but there was a clear trend towards the 40-year-old women looking younger), and the 50-year-old women looked significantly younger with makeup. The method and results of this replication study are described in detail in the Supporting Information.

STUDY 2

While the finding from Study 1 that makeup makes middle-aged women look younger was expected, the finding that makeup makes young women look older was contrary to our hypothesis. Although we replicated the results with a larger participant sample size, the replication used the same stimulus sample of 32 faces with makeup applied by the same makeup artist. Because of this, we designed Study 2 to further replicate the unexpected portion of the results – that young women look older when wearing makeup. In Study 2, we used a stimulus set with only young women, but many more of them (44 young women, in contrast to the eight young women in Study 1). Also, while the women in the Study 1 stimulus set had their makeup professionally applied, the women in the Study 2 stimulus set applied their own makeup. Although makeup applied by a single professional makeup artist has the advantage of greater skill and greater uniformity of application across different faces, self-applied makeup is more representative of makeup in general, as the vast majority of women who wear makeup apply it themselves.

Method

Participants in Study 2 were university students of both genders who were recruited from the Gettysburg College Introductory Psychology study pool. Eighty-four participants (33 male, 51 female) aged 18–21 years (M = 18.4, SD = 0.8) completed the study. The research was conducted according to the principles expressed in the Declaration of Helsinki, and written informed consent was obtained from all participants. The research was approved by the Gettysburg College Institutional Review Board.

We used a set of carefully controlled photographic images of young women with and without makeup (for details see Jones *et al.*, 2015, Experiment 2). Photographs were taken of 44 Caucasian women (18–27 years, M = 21.2, SD = 1.9). In one condition, the women were photographed without any makeup. In the other condition, the women were photographed after they had self-applied makeup as they would for a 'night out'. In both conditions, the women wore no other adornments (e.g., jewellery or glasses) and maintained a neutral, closed mouth expression. Lighting and photographic conditions were held constant across the two conditions and across the models. This resulted in a total of 88 images, with each of the 44 female faces appearing with a no makeup and a 'night out' makeup condition. Each participant saw each identity only once either with makeup or without makeup, with this assignment randomized. The goal of this presentation was to prevent carry-over effects. This differed from Study 1 and its replication, for which participants viewed each identity in multiple conditions. Participants viewed one image at a time and responded to the question 'How old does this person look?' by clicking on a visual analogue scale ranging from 10 to 70. Responses that were ±3 standard deviations from the mean age rating of the particular image were removed as outliers.

Results

Faces in the no makeup condition were given a mean age estimate of 22.3 years old (SD = 2.0), while those in the makeup condition were given a mean age estimate of 23.5 years old (SD = 2.3). A paired-samples t-test using the image as the unit of analysis found this to be a significant difference, t (43) = 5.43, $p < .001$, Cohen's d = .56. As in Study 1, young adult faces were perceived as looking older with makeup than without.

INTERIM DISCUSSION

Using a very different stimulus set, Study 2 replicated the finding from Study 1 that makeup makes young women look older. In Study 1, we also found that makeup makes middle-aged women look younger. Because makeup increases three youth-related features – facial contrast, skin homogeneity, and feature size – this 'rejuvenating' effect of makeup on middle-aged women is readily explained. However, this cannot explain the finding that makeup makes young women look older, because makeup increases facial contrast, skin homogeneity, and feature size in younger as well as older faces. We considered two possible explanations for why makeup makes young women look older.

One possible account relies on the existence of an ideal age for female beauty that is closer to 30 years of age. In this account, makeup affects perceived age because it affects attractiveness. This notion is roughly consistent with findings that while heterosexual men in their 30s or older prefer younger women, men in their 20s prefer similarly aged

women, and teenaged boys are attracted to *older* women (Kenrick, Gabrielidis, Keefe, & Cornelius, 1996). By making a 20-year-old face appear more beautiful, makeup may make it look closer to this 'ideal age' for beauty. Critical to this account is the prediction that 30-year-old faces are more attractive than 20-year-old faces. We tested this prediction by comparing the attractiveness ratings of the 20-year-old and 30-year-old faces in the no makeup condition of Study 1. Contrary to the prediction, 20-year-old faces (M = 5.6, SD = 2.2) were rated as significantly more attractive than 30-year-old faces (M = 4.6, SD = 2.1), t (14) = 2.25, $p < .05$. Although these data were collected with only female participants, similar results with participants of both genders have also been published elsewhere (Kwart *et al.*, 2012; Perrett *et al.*, 2002). On the basis of these findings, we are disinclined towards the idea that makeup makes young women look older because it makes them look more attractive.

Another possible account of why makeup makes 20-year-old women look older is premised upon the notion that there are perceptual and cognitive associations between makeup and adulthood. Similar to this notion, recent work has found important links between makeup and femininity at the level of social representations (Loegel, Courrèges, Morizot, & Fontayne, 2017). In many contexts, there are rules regulating when a girl can begin wearing makeup. To the extent that women are more likely than girls to wear makeup, people may learn to implicitly associate makeup with adulthood. Such associations between makeup and maturity could provide a top-down input to perceptions of facial age, causing women who are near the threshold of adulthood to appear older when wearing makeup. In this account, the presence of makeup on the face of a 20-year-old is a cue that she is a woman, not a girl, thus providing an upward bias on the perceiver's age estimate. This account suggests that people associate makeup with mature adulthood.

STUDY 3

To test the hypothesis that people associate makeup use with adulthood, we designed text-only vignettes describing a female target going shopping with relatives. Participants read one of these vignettes and then estimated the target's age. The primary between-subjects independent variable was whether or not the target was described as buying makeup. We also varied the likely age of the target by varying the relatives with whom she went shopping. Targets were depicted as shopping with their dad and older brother, dad and younger brother, husband and eldest son, son and his newborn child, or grandson and his wife. We predicted that when the target was depicted as a teenager, she would be perceived as older when she bought makeup, but that when the target was depicted as an adult, she would be perceived as no different in age whether purchasing makeup or not.

Method

Participants

We sought a minimum of 30 participants for each of ten vignette conditions. Three hundred four participants located in the United States (174 male, 128 female, 2 other) aged 20–70 years (M = 35.3, SD = 10.3) were recruited from Amazon Mechanical Turk and paid $0.50 upon completion of the study. The research was conducted according to the principles expressed in the Declaration of Helsinki, and written informed consent was obtained from all participants. The research was approved by the Gettysburg College Institutional Review Board.

Procedure

Participants were instructed that they would read a short vignette where they would have to guess someone's age. After reading the vignette, they estimated the age of the female target by typing a numeric response. Five versions of the vignette were created to vary the age of the target, with each vignette presented in either a makeup condition or a no makeup condition, for a total of 10 vignettes. Each participant viewed only one vignette. One of the vignettes read as follows (*underlined* text varied between different versions; text in brackets appeared in the makeup condition but not in the no makeup condition): 'It's the weekend of July 4th and Emily has gone shopping with her *dad and older brother*. They first go to a home improvement store, where Emily's *dad* buys a new grill so that he can barbeque for the family. They then stop by a grocery store to buy all the ingredients they need. And lastly, they stop by a pharmacy, where Emily picks out a toothbrush [and some makeup]. They then all head home. How old is Emily?'

For the vignettes in which the target had children or grandchildren, responses which fell in the bottom 2% of ages at first birth in the United States (16 or younger as reported by the CDC's National Vital Statistics Reports) were removed as outliers under the assumption that the participant misread the vignette. Specifically, 10 responses for the vignettes in which the target shopped with a grandchild were trimmed because the target was estimated as being 32 years old or younger (eight responses in the 'son and his newborn child' condition and two responses were in the 'grandson and his wife' condition). After these exclusions, 294 participants remained for the data analyses.

Results

Results are presented in Table 1. We conducted independent samples *t*-tests comparing the no makeup and makeup conditions for each vignette condition. In the two vignette conditions where the target was perceived as a girl or teenager (she went shopping with her father and an older or younger brother), she was perceived as significantly older when described as buying makeup. However, in the three vignette conditions where the target was perceived as an adult woman (she went shopping her husband, son, or grandson), she was perceived as no different in age when described as buying makeup.

When the target was a girl or teenager, she was perceived as significantly older when described as buying makeup. This effect was not found for adult women. This indicates that makeup use is associated with older aged girls/teenagers, but that makeup use is unassociated with age in mature women. These results are consistent with the notion that people associate makeup with adulthood.

Table 1. Estimated age of vignette target

	Estimated age, *M* (*SD*)				
Vignette condition	With makeup	No makeup	*t*	*p*	Cohen's *d*
Dad and older brother	15.3 (2.8)	13.0 (4.3)	2.42	.018	0.62
Dad and younger brother	15.6 (2.1)	11.5 (3.4)	5.61	<.001	1.44
Husband and eldest son	34.9 (4.9)	35.1 (6.2)	−0.09	.927	0.02
Son and his newborn child	50.4 (7.9)	50.7 (7.4)	−0.18	.858	0.05
Grandson and his wife	67.1 (8.4)	67.5 (11.5)	−0.16	.876	0.04

Note. Degrees of freedom for the *t*-tests range from 50 to 59.

GENERAL DISCUSSION

Applying makeup is a widespread behaviour with important social consequences, yet the ways that makeup modulates social perception remain largely unexplained. We found that makeup affects apparent age in multiple ways. Forty- and 50-year-old women appeared *younger* when wearing makeup. However, 30-year-old women appeared no different in age whether wearing makeup or not, while 20-year-old women appeared *older* when wearing full face makeup.

Research from other literatures supports our finding that makeup can affect apparent age. In a recent cosmetic dermatology study, Dayan, Cho, Siracusa, and Gutierrez-Borst (2015) found evidence that makeup makes faces look *younger*, but did not report that young women appear older when wearing makeup. However, their sample of target faces, which ranged from 20 to 69 years of age, contained only three faces younger than 27 years. While they did not directly investigate the role of face age in the effect of makeup on perceived age, they analysed their results without the three faces under 27 and found a larger effect size. This is consistent with our finding that it is only middle-aged or older faces that appear younger when wearing makeup. In contrast, a study focused on the role of alcohol consumption in age perception by Egan and Cordan (2009) found that teenaged girls appeared *older* when wearing makeup. Indeed, this effect was larger for younger-looking teenaged faces than for older-looking teenaged faces. The results with teenaged target faces (Egan & Cordan, 2009) and middle-aged and older faces (Dayan *et al.*, 2015) combined with our results with young adult and middle-aged faces indicate that the effects of makeup on perceived age depend critically upon the age of the face. Faces in their teens and early 20s appear older with makeup, while faces in their 40, 50, and 60s appear younger with makeup. Around the age of 30 or so, makeup does not affect apparent age.

The finding that makeup changes apparent age has important real-world significance, for example in the realm of employment. Both younger and older adults are subject to ageism, and women are more likely than men to experience ageist attitudes concerning appearance (Duncan & Loretto, 2004). Older female workers face substantial entry barriers in many occupations (Hirsch, Macpherson, & Hardy, 2000). Looking too young can also be detrimental, as adults with a youthful appearance are perceived as naïve and are regarded as less competent (Zebrowitz, 1997). Because age discrimination is pervasive in employment contexts, particularly for women, the ability to manipulate perceived age through makeup may provide critical professional benefits.

Makeup increases three youth-related features – facial contrast, skin homogeneity, and facial feature size. Our results are consistent with the idea that by modifying these visual cues, makeup makes middle-aged and older female faces appear younger. However, the finding that young women appear *older* when wearing makeup cannot be explained by the manipulation of facial contrast, skin homogeneity, and feature size, because these cues are increased by makeup in younger faces as well. This indicates that there must be other factors in addition to the manipulation of these visual features that mediate the effect of makeup on perceived age. We proposed that makeup activates cognitive associations between makeup and maturity and that these associations cause the presence of makeup on a face to upwardly bias age perception for faces that are not clearly adult. Study 3 tested the hypothesis that makeup is associated with adulthood. When described in a vignette as purchasing makeup, an apparently teenaged female target was perceived to be older, but an apparently adult female target was perceived to be no different in age. This evidence from Study 3 that makeup is associated with maturity is also supported by other findings. Specifically, it is consistent with the observation that makeup increases ratings of

perceived status (Mileva, Jones, Russell, & Little, 2016; Nash, Fieldman, Hussey, Leveque, & Pineau, 2006; Richetin, Croizet, & Huguet, 2004) and perceived sociosexuality (Batres *et al.*, 2018; McKeachie, 1952; Mileva *et al.*, 2016; Osborne, 1996), both of which are associated with maturity.

Our finding that makeup is associated with adulthood and that the presence of makeup upwardly biases age estimates of targets on the cusp of adulthood is similar to findings that contextual cues can bias judgements of social identity (Freeman, Penner, Saperstein, Schuetz, & Ambady, 2011; Hess, Adams, & Kleck, 2004). More generally, our findings suggest that makeup affects perceptions of the wearer not only by changing the visual stimulus of the face, but by activating social norms, stereotypes, and attitudes. This notion is consistent with the general consensus that perception is the result not only of stimulus-driven bottom-up influences (i.e., the pattern of activation of the sensory receptors), but also of top-down influences of beliefs, knowledge, and other neural activity not directly caused by the sensory receptors (Bar *et al.*, 2006). It is also in line with recent theoretical accounts of person perception that foreground the interplay between the sensory stimulus and stereotypes, attitudes, and goals (Freeman & Ambady, 2011; Freeman & Johnson, 2016).

We propose that makeup modifies apparent age through both a bottom-up stimulus-driven route and a top-down cognitive route. By manipulating visual cues related to the biological ageing process, makeup provides a bottom-up cue biasing the perceiver towards perceiving the face as younger. However, makeup also activates social representations and norms relating makeup use and adulthood. For faces that are not clearly mature adults, the top-down cue predominates, making these young faces appear older. It should be noted that the top-down route is likely to be context dependent, as it is the result of social norms, stereotypes, and attitudes.

Our work shows that makeup changes the apparent age of a face, making faces younger than 30 appear older, and faces older than 30 appear younger. By manipulating social representations as well as visual cues related to the biological ageing process, makeup provides top-down as well as bottom-up cues to age. More broadly, the notion that personal decorations can modify impressions through both bottom-up and top-down routes holds the promise of a scientific understanding of the mechanisms by which these physical tools of self-presentation can influence social perceptions.

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Supporting Information

The following supporting information may be found in the online edition of the article:

Figure S1. Age ratings for replication study.
Table S1. Age ratings for Study 1.
Table S2. Attractiveness ratings for Study 1.
Table S3. Age ratings for replication study.