

**Cyberpsychology,
Behavior, and
Social Networking**

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**Multivariate Testing Confirms the Effect of Age and Gender
Congruence on Click-Through Rates from Online Social
Network Digital Advertisements**

Journal:	<i>Cyberpsychology, Behavior, and Social Networking</i>
Manuscript ID	CYBER-2018-0197.R1
Manuscript Type:	Original Article
Keyword:	Facebook, Internet Advertising, Internet Gender Issues, Internet age issue, Quantitative Research
Manuscript Keywords (Search Terms):	congruence, personalisation, online advertisements, online social network, Facebook, digital advertising

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Title:

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Running head:

Age and Gender Congruence Confirmed in Online Advertising



Introduction

A key benefit of web-based technology is the computational ability to target users and customise communication using context-aware approaches and explicit or implicit personalisation techniques.¹ This study uses multivariate testing to assess the extent to which an online ad treatment, that has been designed to be age and gender congruent with the target audience, increases the likelihood of the ad being clicked on. A particularly important feature of this study is that the data are derived from a real-life, real-time digital advertising campaign. This study used the execution of an ad campaign with users whose authentic reactions to the ads were captured. The time bounded ad campaign was hosted on the online social network Facebook, in one region of the United Kingdom.

Background

Personalised messages can be defined as messages that are ‘delivered to each individual user through paid media based on personal information (such as user names, past buying history, demographics, psychographics, locations, and lifestyle interests)’.² Online social media ‘provide web services which facilitate users maintaining a public or semi-public profile within a bounded system’ and through which they can ‘articulate a list of other users with whom they share a connection’.³ On the basis of number of active users worldwide, Facebook remains the largest online social network (Statista, 2017).⁴ According to a 2015 social media marketing industry report only 45% of marketers think that their Facebook efforts are effective.⁵ A particular attribute of advertising on Facebook is its capability to target users of specific gender, age and other criteria. Demographics are the most common variables used to target online users, and age and gender are the most common demographic

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3 variables used due to the ease with which an online user's gender and age can be determined
4 and used.^{6,7} Tailoring ad content to reflect the demographic profile of the target audience
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6
7 relates to the concept of user congruence.
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11 Congruence is defined as the extent to which content expressions coincide with self-concept⁸
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13 and developing advertising appeals that are congruent with the target's self-concept is
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15 thought to be more effective than appeals which might be deemed incongruent.⁹ Such
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17 appeals are considered to reinforce self-concepts¹⁰ and generally "for-me" self-congruent
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19 messages are more persuasive than "not-for-me" self-incongruent messages".¹¹
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24 Hypotheses

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29 The study addresses a number of hypotheses that deal with gender congruence, age
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31 congruence and gender and age congruence combined. The hypotheses are grouped
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33 according to these variables and the first hypothesis relates to gender congruence solely. As
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35 outlined previously, the gender of the central figure in an ad is one factor that effects a
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37 process of self-categorising^{12,13} and is one of a number of factors that contributes to overall
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39 self-congruence. As such, the H1 hypothesis and its associated hypotheses are shown in
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41 Table 1(a).
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46 [Table 1 about here]
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50 Similar to gender congruence, age congruence is another variable contributing to overall self-
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52 congruence. And so, the congruency between the model's age and the audience's age may
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3 also influence the effect the ad has on the audience.¹¹ Therefore, the H2 hypothesis and its
4 associated hypotheses are shown in Table 1(b).

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7 While it is proposed that gender and age, respectively, will have positive effects on
8 advertising effectiveness, what is of further interest is the combined effect of these two
9 variables. It can be assumed that an ad exhibiting both age and gender congruence will
10 produce the best effects, leading to the H3 hypotheses in Table 1(c).

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16 Leading on from these hypotheses emerges the further proposition that either gender or age
17 congruency is better than neither variable being congruent. This extends to the H4 hypotheses
18 dealing with firstly, gender congruency but not age congruency as shown in Table 1(d) and
19 secondly, age congruency but not gender congruency, shown in Table 1(e).

20 21 22 23 24 25 26 Methodology

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31 The broad design principle of this study is the manipulation of a direct response advertising
32 campaign to allow ad treatments to be varied along two variables: gender and age (of model)
33 and to be served to a population that had been segmented by the same two variables. A two-
34 by-two consumer profile design was combined with multivariate testing to address the
35 hypotheses just outlined.
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44 For this study, in Facebook, we created four campaigns each containing four ad sets. Four ads
45 containing facial imagery reflecting a different age and gender persona were shown equally
46 to four similar populations of cohorts that were targeted at an ad set level within each
47 campaign. We displayed only one ad, reflective of a specific age range and gender persona,
48 in each of the four campaigns.
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3 In order to maximise external validity, it was important to use a real business. The product
4 offering needed to be appropriate to all ages and to both men and women. It was also
5 important that the product offering was such that its depiction within the ads was the same in
6 all four treatments, while ensuring that each resultant ad was realistic. With this in mind, a
7 teeth whitening procedure was selected to be the focus of the ads. The ads were created such
8 that their creative execution differed only by gender or age of the model. Further details on
9 the targeting criteria are provided later. The overall design of the experiment is presented in
10 Figure 1 below.
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22 [Figure 1 about here]
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26 Designing content for the experiment 27 28 29 30

31 The ad content was identical in every respect except for the image. Four different images
32 were used which represented one of four different age and gender personas: older female;
33 younger female; older male; younger male. The age and gender of the models included in the
34 images were objectively verified using a publicly available face detection application
35 program interface (API) developed by 'Face++'.¹⁴ A recent study investigating engagement
36 rates on Instagram found the 'Face++' API to show high accuracy.¹⁵ One of the ad
37 treatments ('older female') is shown in Figure 2 below.
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48 [Figure 2 about here]
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52 Configuring targeting criteria 53 54 55 56 57 58 59 60

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3 A region of the United Kingdom (UK) was selected; the Glasgow metropolitan area
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5 (encompassing the surrounding area within a radius of 20 miles). In this region, Facebook
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7 can reach 1.2M people aged 18-65+ of a population of 2.3M people. To evaluate the effect of
8
9 both age and gender congruence, we configured four target groups for each of our ad sets
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11 within each Facebook campaign: (1) females aged between 25 and 39, (2) males aged
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13 between 25 and 39, (3) females aged between 50 and 64, and (4) males aged between 50 and
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15 64. The campaign was configured to only present ads to recipients along their central line of
16
17 vision on both desktop and mobile platforms.
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22 We chose an option for ad delivery referred to as 'Daily Unique Reach'. The rationale for
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24 choosing this ad delivery option was to ensure that ads were served only once to any
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26 Facebook user and not repeatedly, again holding constant another influencing factor on ad
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28 effectiveness: number of exposures.¹⁶ The ads within each ad set were configured to run
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30 within a scheduled period: a four-hour slot from 14.00 to 18.00 UK time on a Sunday.
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35 Management of the experiment

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40 An overall lifetime budget was set based on the indicated potential population reach
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42 (impressions) and a manual bid amount was requested per 1000 impressions i.e. for every
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44 1000 unique members of the population shown an ad. We determined that the total number of
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46 ad clicks for all four ad sets within each campaign had to reach a minimum of 400. Since this
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48 campaign was for a real business and a real product offering, anyone who clicked on the ad
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50 was directed to a landing page that offered more details about the brand and presented them
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52 with the opportunity to request a consultation or book an appointment for the procedure.
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Results

This study set out to investigate if ad effectiveness is influenced by the extent to which the gender and age of the model depicted in an ad execution was congruent with the target audience. In order to test the hypotheses, 95% confidence intervals and an 'N - 1' chi squared test, as originally proposed by Pearson¹⁷ and recommended by Campbell¹⁸, were used to determine statistical significance ($\alpha = 0.05$). Accordingly, differences in click-through ratios with a p value less than 5%, were regarded as representing significant differences.

In the experiment, a total of 659,522 Facebook users were exposed to the ads (number of impressions). We recorded 1733 unique clicks on the ads, representing an overall click-through ratio for the whole campaign of 0.26%. The click-through ratios across the 16 combinations is shown in Table 2. Before turning to the hypotheses individually, some initial observations can be made.

Firstly, older users exhibited almost twice the click-through-rate of ads (0.36%) of younger users (0.18%). Furthermore, females clicked on a greater proportion of ads (0.31%) than males (0.23%). As shown in Table 2, older females are more likely than any other cohort to click-through the ad, regardless of which ad was being presented (0.47%). Further analysis shows that the difference between this CTR and the CTRs of the other three audiences is statistically significant ($p < 0.05$).

[Table 2 about here]

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3 Secondly, as per Table 3, the ad treatment which elicited the greatest click-through, across
4 user profiles, was the ad depicting a younger male model (0.32%) and again this CTR was
5 significantly higher than that generated by the other three ad treatments ($p < 0.05$).
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11 [Table 3 about here]
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16 Turning now to the hypotheses, the first hypothesis of the study was that gender congruence
17 will have a positive effect on advertising effectiveness (H1) and within this, two separate
18 hypotheses were presented. The findings in relation to these hypotheses are presented in
19 Table 4 below. It is shown that H1a was supported, in that men clicked on a significantly
20 greater proportion of ads featuring a male model compared to a female model but that H1b
21 was not supported, in that female users did not click on a significantly greater proportion of
22 ads featuring a female model compared to a male model. As such, H1 cannot be fully
23 supported.
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35 [Table 4 about here]
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40 The second hypothesis was that age congruence will have a positive effect on advertising
41 effectiveness (H2). From Table 5 it can be seen that the first of the two associated
42 hypotheses, H2a, was supported in that older users clicked on a significantly greater
43 proportion of ads featuring an older model compared to a younger model. Similarly, H2b was
44 supported in that younger users clicked on a significantly greater proportion of ads featuring
45 a younger model compared to an older model. As such, the second hypothesis was supported.
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54 [Table 5 about here]
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5 The next hypotheses considered age and gender congruence together. It was firstly proposed
6 that when the ad is both age and gender congruent, the click through rate is higher than with
7 any other ad treatment (H3). Findings in relation to the sub-hypotheses contributing to H3 are
8 shown in Table 6 and Figure 3. H3a was that older, female users will click on a significantly
9 greater proportion of ads featuring an older, female model compared to any of the other three
10 ad treatments. This was fully supported. H3b proposed that younger, female users will click
11 on a significantly greater proportion of ads featuring a younger, female model compared to
12 any of the other three ad treatments and this was also fully supported. H3c held that older,
13 male users will click on a significantly greater proportion of ads featuring an older, male
14 model compared to any of the other three ad treatments and it too was fully supported. Lastly,
15 H3d was that younger, male users will click on a significantly greater proportion of ads
16 featuring a younger, male model compared to any of the other three ad treatments and it also
17 was fully supported. Overall, therefore, there is full support for H3, indicating that the most
18 effective ad is one that is both age and gender congruent.
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37 [Table 6 about here]
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41 [Figure 3 about here]
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46 The last set of hypotheses proposed that either gender or age congruency (but not both) is
47 better than neither variable being congruent (H4). Within this, the first hypothesis is that
48 when the ad is gender congruent but not age congruent, the click through rate is higher than if
49 the ad is neither age nor gender congruent (H4a). The findings in relation to the associated
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3 hypotheses are presented in Table 7 where it can be seen that none of four sub-hypotheses
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5 was supported and as such H4a cannot be supported.
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9 [Table 7 about here]
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13 The second hypothesis associated with H4 is that when the ad is age congruent but not gender
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15 congruent, the click through rate is higher than if the ad is neither age nor gender congruent.
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17 Findings in relation to this are shown in Table 8.
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22 [Table 8 about here]
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26 As per Table 7, none of the associated hypotheses find support. Indeed, one of the differences
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28 is significant but in the opposite direction to that proposed. So instead of older, male users
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30 clicking on a significantly greater proportion of ads featuring an older, female model than a
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32 younger, female model (H4biii) they clicked on a significantly greater proportion of ads
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34 featuring the younger, female model. As such, H4b cannot be supported. And moreover, the
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36 fourth hypothesis (H4) is not supported by the findings, thus indicating that gender
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38 congruency alone, without age congruency, does not produce better results. These findings
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40 are discussed next.
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44 45 46 Discussion 47 48 49

50 The findings have yielded important new insights about the topic of personalisation in online
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52 advertising and content presentation and specifically on the effect of age and gender
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54 congruence on ad click through rates. The findings showed that older users proportionately
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3 clicked on almost twice as many ads as younger users (0.36% vs. 0.18%). This may support
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5 other research that found that older people are more drawn to faces on a Web page than
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7 younger users .^{19, 20, 21} Also revealed was that older females, with a click-through rate of
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9 0.47% are more likely than any other cohort to click-through the ad, regardless of which ad
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11 was being presented. The gender aspect of this finding supports previous studies that revealed
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13 that females showed a more positive attitude toward online ads and indicated a greater
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15 intention to click through and learn more than males.^{22, 23} Similarly, other research found that
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17 females were more likely to be drawn to photos on a Web page.¹⁹ Again, the results from our
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19 study appear to corroborate these past studies as our female cohort were statistically
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21 significantly more likely than our male cohort to click on an ad with facial imagery. And
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23 from both a gender and age perspective, it supports other research that found that females
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25 aged 50 and over have a 31.2% higher click through rate on ads than younger females (age
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27 18-29).²⁴
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33 A second key finding is that the ad treatment which elicited the greatest click-through
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35 (0.32%) across all user profiles was the ad depicting a younger male model. This would seem
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37 to support other researchers who argue that older models are less appealing than younger
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39 models²⁵ and relates to a belief held by some that featuring elderly models in advertising can
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41 alienate users.²⁶
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46 Turning to the hypotheses of the study, the findings indicated that age congruence, regardless
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48 of gender congruence has a positive effect on advertising effectiveness. However, the
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50 proposition that gender congruence, regardless of age congruence, would have a positive
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52 effect was rejected. It was therefore instructive to drill down further into these variables to
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54 explore their individual effects and their potential cumulative effects.
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5 There was clear, definitive support for the hypothesis that age and gender congruence
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7 together will have the most positive effect. It was found that an age and gender congruent ad
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9 was the most clicked on compared to any other treatment across the four audience segments.
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11 The last hypothesis is perhaps the most interesting and potentially useful. It was proposed
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13 that when the ad is either gender or age congruent, but not both, the click through rate would
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15 be higher than if neither variable is congruent. The clear conclusion is that this is not the case.
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17 Specifically, gender congruency with age incongruency does not produce better results and
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19 equally, age congruency with gender incongruency did not lead to higher click-through rates.
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21 Taken together, this study provides compelling evidence that age and gender congruence are
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23 not just complementary but actually require each other to serve any significant benefit.
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28 Conclusion

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33 This study clearly demonstrates that marketers who wish to improve click-through rates on
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35 social media or just indeed design content for users of their content ought to take into account
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37 both the age and gender congruency of the content and the target audience. Rather than
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39 having a single ad or content that all the target audience sees, it is recommended that a
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41 number of treatments are created with imagery tailored to reflect the age and gender of the
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43 recipient. In our study, ensuring the ad was both age and gender congruent led to almost a
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45 doubling in click-through rates for most of our cohorts. Using age or gender alone cannot be
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47 relied on to improve performance.
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52 This study used multivariate testing of an advertisement campaign on the online social
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54 network Facebook to investigate the extent to which digital advertising, personalised to
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3 specific age and gender groups demographics (age and gender congruent) influences user
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5 engagement and increases click through rates.
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9 The study achieved a total of 659,522 impressions (i.e. number of users who were exposed to
10 the personalised advertisements and had the opportunity to engage). Moreover, a total of
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12 1,733 unique clicks were recorded. Using N-1 Chi-square testing, this study found that a
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14 combined age and gender congruency yielded statistically significantly greater click-through
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16 ratios in comparison to non-congruent (non-personalised) online advertisements ($p < 0.05$).
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22 As an example, the click through rates by younger male users increased by over threefold
23 when a young-male model appeared in the imagery. The implication is that online content
24 that is personalised to the user's age and gender demographic increases active user
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26 engagement.
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33 This study indicates that the additional time taken by digital marketers and web developers to
34 personalise content to reflect the age and gender of each user is a worthwhile and useful
35 investment, given the relative computational ease with which online content can be
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37 customised for different user groups on an interactive platform.
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43 Study Limitations

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48 This study benefited from being based upon a real-life, real-time, online advertising
49 campaign and thus, avoided the limitations of similar studies that rely on 'indirect findings'.
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52 ²⁷ Care was taken to ensure like-for-like comparisons could be made within the two-by-two
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ad treatment/audience profile design. However, there are a number of factors that may be considered limitations.

First, while there is no reason to believe that the geographical location of the study - the Glasgow metropolitan area, a region of the UK - is atypical, the fact that the sample was drawn from such a specific region could be construed as limiting. Related to this, all the people featured in the ads were white. It is the case that the vast majority of people residing in the area chosen for this experiment are white; according to 2011 census data, over 88% of people living in 'Glasgow City' are white.²⁸

Our experiment was scheduled during a four-hour time period on a Sunday. Being limited to any single time period could inadvertently introduce bias by favouring one age or gender group over another. That said, all cohorts in our study did receive equal ad impressions, and so this issue was, to a great extent, legislated for.

This study used click-through rates as a measure of ad effectiveness. Previous studies have shown that women are more likely to click on ads to gather information, whereas males, being more task oriented, are more likely to click only when there is a 'pressing need'.^{29,30}

References

1. Quinn S, Bond R, Nugent C. Ontological modelling and rule-based reasoning for the provision of personalized patient education. *Expert Systems* 2015; 34(2): e12134.
2. Baek TH, Morimoto M. Stay away from me: examining the determinants of consumer avoidance of personalized advertising. *Journal of Advertising* 2012; 41(1): 59-76.
3. Boyd, D.M. and N. B. Ellison. "Social Network Sites: Definition, History and Scholarship." *Journal of Computer-Mediated Communication* 13, 1 (2008): 210-230.

4. Statista "Social Media & User-Generated Content Statistics and Market Data on Social Media & User-Generated Content". [online] Available at: <https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide/>, (2017) accessed 13 March 2018.
5. Stelzner M. Social Media Marketing Industry Report [Blog] Social Media Examiner. Available at: <http://www.socialmediaexaminer.com/social-media-marketing-industry-report-2015/> (2015), accessed 20 February 2018.
6. Quinn D, Chen L, Mulvenna MD. Does Age Make A Difference In The Behaviour Of Online Social Network Users? Fourth IEEE International Conferences on Internet of Things, and Cyber, Physical and Social Computing (CPSCom-2011), Dalian, China, October 19-22, (2011): 266-272, doi:10.1109/iThings/CPSCom.2011.86.
7. Source P, Perotti V, Widrick S. Attitudes and age differences in online buying International Journal of Retail and Distribution Management 33, 2 (2005): 122-32.
8. Hong JW, Zinkhan GM. Self-concept and advertising effectiveness: The influence of congruency, conspicuousness, and response mode. Psychology & Marketing 12, 1 (1995) : 53-77.
9. Wang CL, Mowen JC. The separateness-connectedness self-schema: Scale development and application to message construction, Psychol. Mark. 14, 2 (1997): 185-207.
10. Chang C. Ad-Self-Congruency Effects: Self-Enhancing Cognitive and Affective Mechanisms. Psychology and Marketing, 22, 11 (2005): 887-910.
11. Chang C. Chronological age versus cognitive age for younger consumers: implications for advertising persuasion. Journal of Advertising 37, 3 (2008): 19-32.
12. Forehand MR, Deshpandé R. What we see makes us who we are: Priming ethnic self-awareness and advertising response. Journal of Marketing Research, 38, 3 (2001): 338-346.
13. Maldonado R, Tansuhaj P, Muehling DD. The Impact of Gender on Ad Processing: A Social Identity Perspective Academy of Marketing Science Review 3 (2003): 1-15.
14. En.faceplusplus.com (2016) Face++: Leading Face Recognition on Cloud. [online] Available at: <http://en.faceplusplus.com/>, accessed 20 February 2018.
15. Bakhshi S, Shamma DA, Gilbert E. Faces Engage us: Photos with Faces Attract more Likes and Comments on Instagram. In Proceedings of the SIGCHI conference on Human Factors in computing systems (2014)
16. Schmidt S, Eisend M. Advertising Repetition: A Meta-Analysis on Effective Frequency in Advertising. Journal of Advertising 44, 4 (2015): 415-428.
17. Pearson K. On the criterion that a given system of deviations from the probable in the case of a correlated system of variables is such that it can be reasonably supposed to have arisen from random sampling Philosophical Magazine Series 5 50, 302 (1992): 157-175.
18. Campbell I. Chi-squared and Fisher-Irwin tests of Two-by-two Tables with Small Sample Recommendations. Statistics in Medicine 26, 19 (2007): 3661-3675.
19. Tullis T, Siegel M. Does Ad Blindness on the Web Vary by Age and Gender? CHI'13 Extended Abstracts on Human Factors in Computing Systems, ACM, (2013): 1833-1838.
20. Tullis T, Siegel M, Sun E. Are People Drawn to Faces on Webpages? CHI'09 Extended Abstracts on Human Factors in Computing Systems ACM (2009): 4207-4212.
21. Djamasbi S, Siegel M, Tullis. T. Faces and Viewing Behaviour: An Exploratory Investigation AIS Transactions of Human-Computer Interaction, 3, 4 (2012): 190-211.

22. Coursaris CK, Sung J, Swierenga SJ. Effects of Message Characteristics, Age, and Gender on Perceptions of Mobile Advertising – an Empirical Investigation among College Students. *Mobile Business and 2010 Ninth Global Mobility Roundtable (ICMB-GMR)*, Ninth International Conference on, Athens, 2010: 198-205.
23. Krystynak J. How do Gender and Platform Predict Mobile Advertising and Mobile Commerce Behaviour? [Blog] APplovIn. Available at: <https://blog.applovin.com/how-do-gender-and-platform-predict-mobile-advertising-and-mobile-commerce-behavior/> (2014) accessed 20 February 2018.
24. MarketingProfs Women on Facebook Click Ads More, Younger Adults 'Like' More [Online] <http://www.marketingprofs.com/charts/2011/5912/women-on-facebook-click-ads-more-younger-adults-like-more>: (2011) accessed 20 February 2018.
25. Carrigan M, Szmigin I. The portrayal of older characters in magazine advertising. *Journal of Marketing Practice: Applied Marketing Science*, 5, 6/7/8 (1999): 248 – 261.
26. Greco AJ. Representation of the Elderly in Advertising: Crisis or Inconsequence? *Journal of Services Marketing* 2, 3 (1988): 27 – 34.
27. Barreto AM. Do Users Look at Banner Ads on Facebook? *Journal of Research in Interactive Marketing* 7, 2 (2013): 119–39.
28. Glasgow City Council (2013, October 17). “Briefing Paper 2011 Census – Release 2A – Results for Glasgow City” [Online] <http://www.glasgow.gov.uk/CHttpHandler.ashx?id=16943&p=0>, Accessed 26 March 2018.
29. Bae S, Lee T. Gender Differences in Consumers’ Perception of Online Consumer Reviews. *Electronic Commerce Research* 11,2 (2011): 201-214.
30. Wolin L, Korgaonkar, P. Web Advertising: Gender Differences in Beliefs, Attitudes and Behavior. *Internet Research*, 13, 5 (2003): 375-385.

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3 List of figure and table captions in order they appear in manuscript:
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7 Table 1. Study hypotheses relating to gender congruence, age congruence and combined age
8 and gender congruence.
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13 Figure 1. Design content for the experiment.
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18 Figure 2. Example ad treatments for 'older female'.
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22 Table 2. Click-through rate (CTR) by target audience profile across all ads.
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26 Table 3. Click-through rate by ad treatment across all user profiles.
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31 Table 4. Findings in relation to H1: Gender congruence will have a positive effect on
32 advertising effectiveness.
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37 Table 5. Findings relating to H2: Age congruence will have a positive effect on advertising
38 effectiveness.
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43 Table 6. Findings related to H3: When the ad is both age and gender congruent, the click
44 through rate is higher than with any other ad treatment.
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50 Figure 3. Click through rates for all ads.
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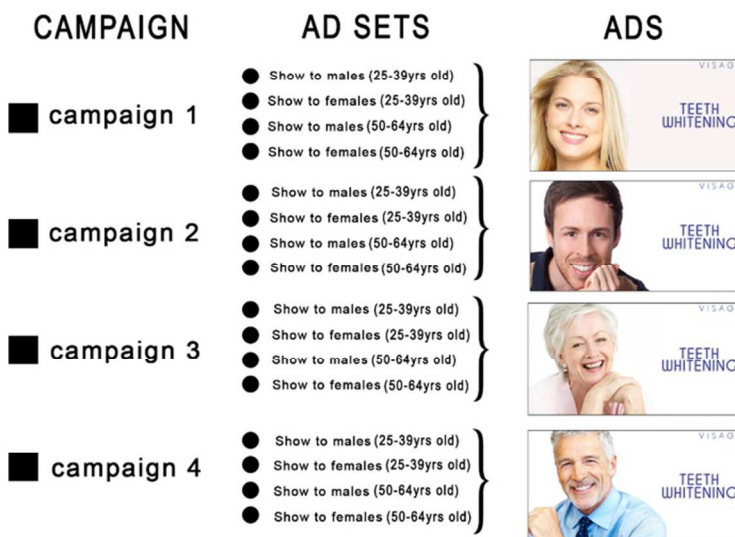
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3 Table 7. Findings related to H4a: When the ad is gender congruent but not age congruent, the
4 click through rate is higher than if the ad is neither age nor gender congruent.
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9 Table 8. Findings relating to H4b: H4b When the ad is age congruent but not gender
10 congruent, the click through rate is higher than if the ad is neither age nor gender congruent.
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<p>(a) H1 Gender congruence will have a positive effect on digital advertising effectiveness: H1a Male users will click on a significantly greater proportion of ads featuring a male model compared to a female model H1b Female users will click on a significantly greater proportion of ads featuring a female model compared to a male model</p>
<p>(b) H2 Age congruence will have a positive effect on digital advertising effectiveness: H2a Older users will click on a significantly greater proportion of ads featuring an older model compared to a younger model H2b Younger users will click on a significantly greater proportion of ads featuring a younger model compared to an older model</p>
<p>(c) H3 When the ad is both age and gender congruent, the click through rate is higher than with any other ad treatment :</p> <p>H3a Older, female users will click on a significantly greater proportion of ads featuring an older, female model compared to any of the other three ad treatments H3b Younger, female users will click on a significantly greater proportion of ads featuring a younger, female model compared to any of the other three ad treatments H3c Older, male users will click on a significantly greater proportion of ads featuring an older, male model compared to any of the other three ad treatments H3d Younger, male users will click on a significantly greater proportion of ads featuring a younger, male model compared to any of the other three ad treatments</p>
<p>(d) H4a When the ad is gender congruent but not age congruent, the click through rate is higher than if the ad is neither age nor gender congruent:</p> <p>H4ai Older, female users will click on a significantly greater proportion of ads featuring a younger, female model than a younger, male model H4aiaii Younger, female users will click on a significantly greater proportion of ads featuring an older, female model than an older, male model H4aaiii Older, male users will click on a significantly greater proportion of ads featuring a younger, male model than a younger, female model H4aaiiv Younger, male users will click on a significantly greater proportion of ads featuring an older, male model than an older, female model</p>
<p>(e) H4b When the ad is age congruent but not gender congruent, the click through rate is higher than if the ad is neither age nor gender congruent:</p> <p>H4bi Older, female users will click on a significantly greater proportion of ads featuring an older, male model than a younger, male model H4bii Younger, female users will click on a significantly greater proportion of ads featuring a younger, male model than an older, male model H4biii Older, male users will click on a significantly greater proportion of ads featuring an older, female model than a younger, female model H4biv Younger, male users will click on a significantly greater proportion of ads featuring a younger, female model than an older, female model</p>

Table 1. Study hypotheses relating to gender congruence, age congruence and combined age and gender congruence

FOR



Experiment design showing structure of campaigns, ad sets and ads

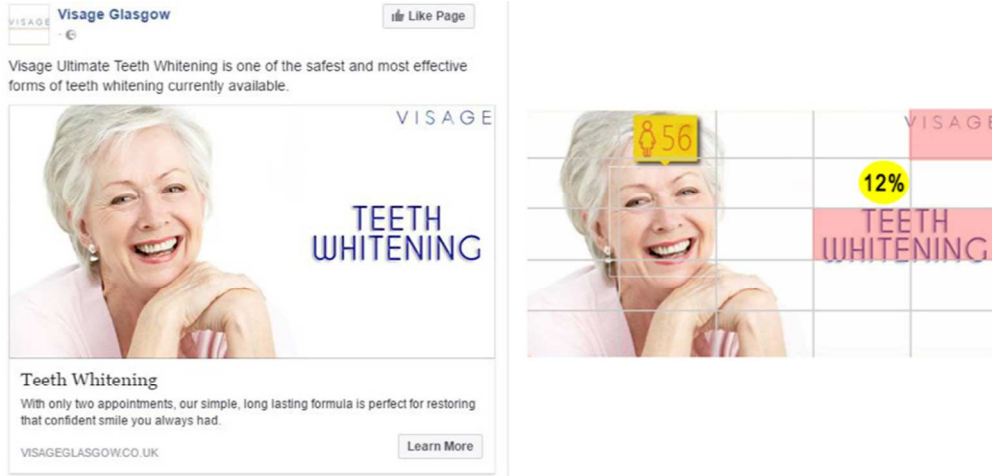
159x89mm (150 x 150 DPI)

Not for Distribution

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FOR



Example ad: older, female.

159x76mm (150 x 150 DPI)

ONLY Not for Distribution

Audience profile	CTR (%)
Older females	0.47
Younger females	0.15
Older males	0.24
Younger males	0.21

Table 2. Click-through rate (CTR) by target audience profile across all ads.

Ad treatment	CTR (%)
Older female	0.26
Younger female	0.21
Older male	0.28
Younger male	0.32

Table 3. Click-through rate by ad treatment across all user profiles.

Hypothesis	Click-through rates (%)	Significance	Conclusion
H1a Male users will click on a significantly greater proportion of ads featuring a male model compared to a female model	User: Male Ad: Male = 0.29 Ad: Female = 0.15	p<0.05	Supported
H1b Female users will click on a significantly greater proportion of ads featuring a female model compared to a male model	User: Female Ad: Female = 0.31 Ad: Male = 0.30	p=0.371	Not supported

Table 4. Findings in relation to H1: Gender congruence will have a positive effect on advertising effectiveness.

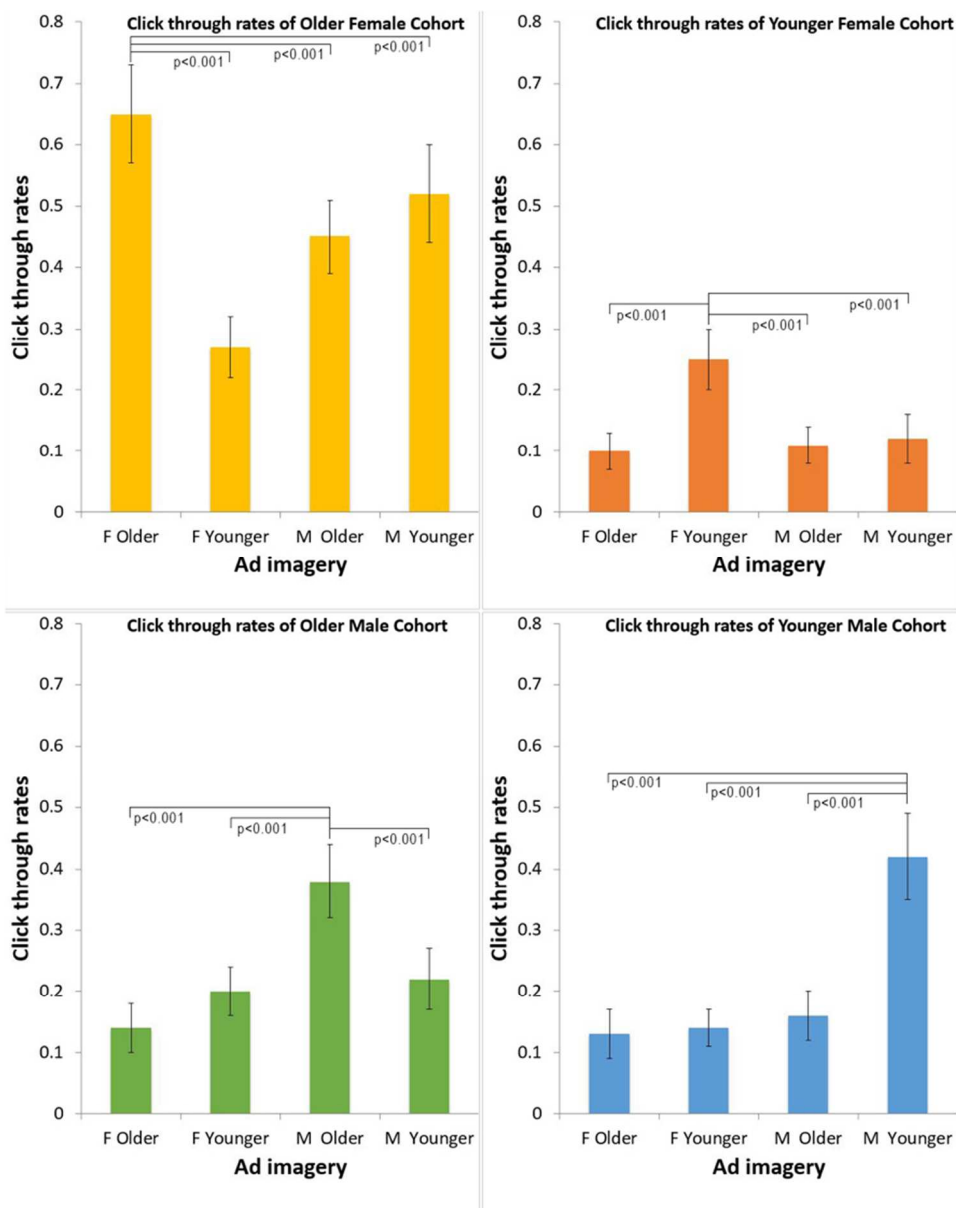
Hypothesis	Click-through rates (%)	Significance	Conclusion
H2a Older users will click on a significantly greater proportion of ads featuring an older model compared to a younger model	User: Older Ad: Older = 0.41 Ad: Younger = 0.29	p<0.05	Supported
H2b Younger users will click on a significantly greater proportion of ads featuring a younger model compared to an older model	User: Younger Ad: Younger = 0.23 Ad: Older = 0.12	p<0.05	Supported

Table 5. Findings relating to H2: Age congruence will have a positive effect on advertising effectiveness.

Hypothesis	Click-through rates (%)	Significance	Conclusion
H3a Older, female users will click on a significantly greater proportion of ads featuring an older, female model compared to any of the other three ad treatments	User: older, female Ad: older female = 0.65 Compared to:		Supported
	Ad: younger female = 0.27	p<0.05	
	Ad: older male = 0.45	p<0.05	
	Ad: younger male = 0.52	p<0.05	
H3b Younger, female will click on a significantly greater proportion of ads featuring a younger, female model compared to any of the other three ad treatments	User: younger female Ad: younger female = 0.25 Compared to:		Supported
	Ad: older female = 0.10	p<0.05	
	Ad: older male = 0.11	p<0.05	

	Ad: younger male = 0.12	p<0.05	
<p>H3c Older, male users will click on a significantly greater proportion of ads featuring an older, male model compared to any of the other three ad treatments</p>	<p>User: older, male</p> <p>Ad: older male = 0.38</p> <p>Compared to:</p>		Supported
	Ad: older female = 0.14	p<0.05	
	Ad: younger female = 0.20	p<0.05	
	Ad: younger male = 0.22	p<0.05	
<p>H3d Younger, male users will click on a significantly greater proportion of ads featuring a younger, male model compared to any of the other three ad treatments</p>	<p>User: younger, male</p> <p>Ad: younger male = 0.42</p> <p>Compared to:</p>		Supported
	Ad: older female = 0.13	p<0.05	
	Ad: younger female = 0.14	p<0.05	
	Ad: older male = 0.16	p<0.05	

Table 6. Findings related to H3: When the ad is both age and gender congruent, the click through rate is higher than with any other ad treatment



Cohort click through rates on the four different ads

149x188mm (150 x 150 DPI)

Hypothesis	Click-through rates (%)	Significance	Conclusion
H4ai Older, female users will click on a significantly greater proportion of ads featuring a younger, female model than a younger, male model	User: older female Ad: younger female = 0.27 Ad: younger male = 0.52	$p < 0.05$	Not supported
H4aii Younger, female users will click on a significantly greater proportion of ads featuring an older, female model than an older, male model	User: younger, female Ad: older female = 0.10 Ad: older male = 0.11	$p = 0.659$	Not supported
H4aiii Older, male users will click on a significantly greater proportion of ads featuring a younger, male model than a younger, female model	User: older, male Ad: younger male = 0.22 Ad: younger female = 0.20	$p = 0.559$	Not supported
H4aiv Younger, male users will click on a significantly greater proportion of ads featuring an older, male model than an older,	User: younger male Ad: Older male = 0.16 Ad: Older female = 0.13	$p = 0.274$	Not supported

female model			
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Table 7. Findings related to H4a: When the ad is gender congruent but not age congruent, the click through rate is higher than if the ad is neither age nor gender congruent

Hypothesis	Click-through rates (%)	Significance	Conclusion
H4bi Older, female users will click on a significantly greater proportion of ads featuring an older, male model than a younger, male model	User: older, female Ad: older male = 0.45 Ad: younger male = 0.52	p=0.173	Not supported
H4bii Younger, female users will click on a significantly greater proportion of ads featuring a younger, male model than an older, male model	User: younger, female Ad: younger male = 0.12 Ad: older male = 0.11	p=0.639	Not supported
H4biii Older, male users will click on a significantly greater proportion of ads featuring an older, female model than a younger, female model	User: older, male Ad: older female = 0.14 Ad: younger female = 0.20	p<0.05 (but opposite to hypothesised direction)	Not supported
H4biv Younger, male users will click on a significantly greater proportion of ads featuring a younger, female model than an older, female model	User: Younger male Ad: younger female = 0.14 Ad: Older female = 0.13	p=0.693	Not supported

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3 Table 8. Findings relating to H4b: H4b When the ad is age congruent but not gender
4 congruent, the click through rate is higher than if the ad is neither age nor gender congruent
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