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The Influence of Intelligence on the Endorsement of the Intelligence-Attractiveness Halo

Sean N. Talamas, Kenneth I. Mavor and David I. Perrett

School of Psychology and Neuroscience, University of St Andrews

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Address for correspondence:

Sean N. Talamas,

School of Psychology and Neuroscience,

University of St Andrews,

St Mary's Quad, South Street,

St. Andrews, Fife, KY16 9JP

Email: st87@st-andrews.ac.uk

Ph.: +44 1334 463044, Fax: +44 1334 463042

Abstract

While some theories emphasize the influence of the ‘attractiveness halo’ on perceptions of intelligence, empirical evidence suggests that perceptions of attractiveness themselves can be influenced by perceptions of other desired traits such as intelligence. In an educational context, the effect of impressions of intelligence on teachers’ expectations of students gives them particular significance. Research on kin selection and cognitive biases highlight the possibility that intelligent people endorse the intelligence-attractiveness relationship more strongly than less intelligent people. We investigated how a perceiver’s intelligence can influence the association between perceived intelligence and attractiveness of others. We asked 126 participants to rate 48 children’s faces for perceived intelligence and attractiveness and then asked them to complete the International Cognitive Ability Resource (ICAR) intelligence test. Ratings by participants who scored higher on the intelligence test showed a stronger relationship between perceptions of intelligence and attractiveness than participants who scored lower on the intelligence test. This effect was significant even after controlling for differences in participants’ scale use. These findings, while preliminary, illuminate an individual difference that influences perceptions of intelligence with potentially concerning implications regarding expectancy effects in educational settings.

The Influence of Intelligence on the Endorsement of the Intelligence-Attractiveness Halo

The widely studied halo effect suggests that certain traits function as a metaphorical halo, casting an overly positive light on other traits. Thorndike (1920) defined the halo effect as a tendency to form a general evaluation of someone as good or bad and to base future judgments of a person based on this general feeling. In a comprehensive analysis of the halo effect, Asch (1946) asserted that impression formation of individuals involves a holistic process of attempting to form an impression of the *entire* person, based on dynamic interactions of various traits, rather than isolated traits forming the impression of a *part* of a person. In turn, the halo effect can lead to *general* impression formation, centered on insufficient or *limited* information from isolated traits.

The halo effect has been studied extensively in the context of education because of the influence that general impressions may have on expectations of students (Rosenthal & Jacobson, 1968) and the consequences of expectancy effects on student performance (de Boer, Bosker, & van der Werf, 2010). This study further explores the halo effect by investigating the influence that an individual's intelligence may have on the degree to which they endorse the intelligence-attractiveness relationship in facial images of children. It is useful to recognize the various potential origins of the intelligence-attractiveness halo to understand the potential role of own intelligence as an individual difference related to the endorsement of the intelligence-attractiveness association.

Individual Differences

The difference in an individual's inclination to rate a child's face that is perceived to be intelligent as attractive can be interpreted as either: being more susceptible to the attractiveness halo or having a stronger preference (reflected in higher ratings of attractiveness) for intelligent-looking faces. Many studies address the question of attractiveness in the context of theories of assortative mating and mate value (see Buss, 1985; Regan, 1998). Yet, a number of the findings can be interpreted more broadly in terms of preferences for similar others. We therefore briefly consider these findings with that broader interpretation in mind.

Indeed, it has been argued that, given sufficient time, people are more likely to rely on relevant information about personality or ability to form impressions of others, rather than attractiveness (Eagly, Ashmore, Makhijani, & Longo, 1991; Felson & Bohrnstedt, 1979). Further, previous research has found that non-physical factors (e.g., information about personality, previous academic achievement) can have a significant influence on perceptions of attractiveness (Kniffin & Wilson, 2004; Zhang, Kong, Zhong, & Kou, 2014). In an analysis of human mate preferences across 37 cultures, intelligence ranked among the top four desired characteristics in potential mates (Buss, 1989). Cross-cultural research has also found that the strength of the attractiveness effect on various trait impressions varies with the cultural valuation of those traits (Shaffer, Crepaz, & Sun, 2000; Wheeler & Kim, 1997), implying that some individuals or groups of individuals may value intelligence more and find it more attractive than others. Further, while previous research suggests people may estimate personality from faces with some accuracy (Penton-Voak, Pound, Little, & Perrett, 2006), Little et al., (2006) found that *perceptions* of personality alone can influence attractiveness and that people who consider a particular personality preferable will have different perceptions of attractiveness based on that liking. Such differences in the *perception* of preferred traits influencing attractiveness may extend to the *perception* of intelligence, such that those who are more intelligent value intelligence more as a trait and thus perceive faces that look intelligent as more attractive.

The current study did not examine the direction of the perceived intelligence-attractiveness relationship or the influence of context (i.e., information about the perceived stimuli) on attributions, but focused on individual differences that may be associated with a stronger tendency to rate a child perceived as intelligent, also as more attractive. We review the theories of kin selection and anchoring effects that may explain the potential for individuals who score higher on an intelligence test to find faces of children perceived to be intelligent as more attractive than children perceived to be unintelligent.

Kinship

While assortative mating highlights the tendency for people to choose mates based on similarities, kin selection proposes that individuals will help others in a manner proportionate to genetic similarity (Hamilton, 1964). Indeed, DeBruine (2002) found that people are more altruistic towards self-resembling individuals, even when this resemblance is very subtle. Bressan and Martello (2002) found that similar-looking individuals are often considered more likely to be genetically related than dissimilar-looking people. They also found that belief in genetic relatedness (compared to actual genetic relatedness) was a stronger predictor of perceived similarity. While facial similarity is one mechanism of phenotype matching, belief in genetic relatedness may also stem from similarity on other heritable traits, like intelligence.

It might be considered surprising that similarity would be attractive if it is a cue to kinship, since people are generally averse to sexual relations with kin. A closer examination of the similarity-attraction effect reveals that similarity does not necessarily imply sexual attraction, but rather the liking of another person (Park, Schaller, & Van Vugt, 2008). Thus, people who score higher on intelligence tests may find perceived intelligence more attractive because of a similarity in intelligence (a potential cue to kinship that has been shown to influence ratings of likability or attractiveness; Byrne, London, & Reeves, 1968; Byrne, 1961).

Anchoring effect

The anchoring effect describes the tendency to make decisions that are biased toward the initial judgment (Tversky & Kahneman, 1974). Essentially, the anchoring effect suggests that individuals get stuck on initial attributions when no other information is available (i.e., when rating perceived intelligence from just a face). While some may reason that more intelligent people should be less susceptible to cognitive biases like anchoring effects, a thorough review by Stanovich and West (2008) found that various cognitive biases (including anchoring effects) are unrelated to cognitive ability. A targeted attempt to investigate individual differences influencing performance on anchoring tasks, namely personality and intelligence, also failed to replicate any benefits of cognitive ability on the susceptibility to anchoring effects (Furnham, Boo, & McClelland, 2012).

Conversely, Kahneman and Frederick (2002) argued that while high intelligence respondents have the resources to assist in overcoming easy or typical mistaken intuitions, when problems become more difficult, the correlation between intelligence and cognitive bias "is likely to reverse because the more intelligent respondents are more likely to agree on a plausible error than to respond randomly" (p.14). Thus, the improved ability to make logical connections and rationalize may actually prove counterproductive to overcoming cognitive biases. Taylor (1923) concurs generally that "intelligence is not always a protection against rationalization. Indeed intelligence is what makes rationalization possible" (p. 415). Thus, people who score higher on intelligence tests may be no less or even slightly more susceptible to cognitive biases such as the perceived intelligence-attractiveness halo.

Research Question

Various theories may account for a strong relationship between perceptions of intelligence and attractiveness. Our research sought to establish if the intelligence-attractiveness perceptual association varies across observers in a systematic way. We reasoned that the strength in the endorsement of the intelligence-attractiveness relationship may depend on individual differences that stem from a general self-similar bias. Based on literature suggesting cues to kinship can influence liking of others (Byrne et al., 1968; Byrne, 1961) and the observation that high intelligence does not limit susceptibility to anchoring bias (Stanovich & West, 2008) and may actually exacerbate it (Kahneman & Frederick, 2002), we predicted that individuals who score higher on intelligence tests would be more likely to rate faces they perceive as intelligent also as attractive.

Method

All data collection was approved by the University School of Psychology and Neuroscience ethics committee (PS1087). All participants provided informed written consent and were debriefed accordingly. The ethics committee approved this consent procedure. Data available upon request.

Facial stimuli

Stimuli consisted of 48 photographs of children aged 5 to 16, 24 of whom were boys (M_{age} = 10.08, *SD* = 1.79 years) and 24 of whom were girls (M_{age} = 9.87, *SD* = 3.10 years). Stimuli were obtained from the Dartmouth Database of Children's Faces (Dalrymple, Gomez, & Duchaine, 2013). All photographs were taken under standardized lighting conditions and camera set-up; individuals wore a black cap, did not wear make-up or jewelry, and posed with a neutral facial expression and head posture in front of a black background. Face images were aligned in size and position based on left and right pupils. Images were then resized and cropped (1608 x 2584 pixels) so that an equal proportion of head and neck was shown in each image.

Participants

After exclusions[1], a total of 126 participants (47 males, 79 females) aged 18 to 30 (M_{age} 21.12, *SD* = 2.46 years) were recruited to take part in a study entitled "Influences in the perception of intelligence in faces – in-lab study." Participants were recruited through the university's subject pool consisting of Psychology students and community members. Participants (n = 21) who reported their ethnicity as different from 'white Caucasian' were excluded, as stimuli presented were Caucasian and judgments of other ethnicities may be more susceptible to stereotypes (Zebrowitz, Bronstad, & Lee, 2007).

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[1]Four participants (two 34-year-olds, one 41-year-old, and one 56-year-old) were excluded from the analysis as outliers in age. Re-running the analysis with these participants did not change the pattern of findings.

Face-rating task

Participants first previewed all stimuli with each image displayed for one second. Then participants rated the perceived intelligence of each face on a 7-point Likert type scale with endpoints *not at all intelligent* to *very intelligent*. The stimuli were then re-presented to rate the attractiveness of each face on a similar 7-point scale with endpoints *not at all attractive* to *very attractive*. Participants had no indication that they would rate the same faces for attractiveness after ratings for intelligence. Given that the study's title explicitly mentions rating intelligence of faces, it made sense to rate intelligence first and then attractiveness. This minimized any priming effects which may have suggested that attractiveness and intelligence could be linked or that we were measuring the link between the two ratings. In both rating blocks, faces were presented in a random order. The minimum viewing time for each image was one second, but no maximum response time was enforced.

Intelligence measure

After rating the perceived intelligence and attractiveness of each image, participants took a short intelligence test drawn from the International Cognitive Ability Resources (ICAR) test, which has been shown to be moderately to strongly correlated with measures of cognitive ability and achievement (Condon & Revelle, 2014). The ICAR assessment is administered online and is an untimed assessment consisting of 16 items divided into four item types labeled as: verbal reasoning, letter and number series, matrix reasoning, and three-dimensional rotation. An average score was calculated for every participant based on the number of questions answered correctly, so that the score therefore represents the proportion of the test items answered correctly (out of 1) and is hereafter referred to as 'intelligence score' .

Statistical analysis

At the stimulus level, averaged ratings of attractiveness and intelligence were calculated for each face (48 total faces) based on the 126 raters. We compared averaged ratings of attractiveness and perceived intelligence, expecting a strong correlation based on the 'halo effect'. Averaged ratings of attractiveness and perceived intelligence were also compared to the age and gender of the face.

Monin and Oppenheimer (2005) highlight the important distinction between the correlations of averaged ratings versus averaging individual correlations, thus we computed correlations at the individual level. A correlation between participants' ratings of intelligence and ratings of attractiveness for all 48 faces was calculated for each participant; the correlation value is hereafter named the 'individual halo'. The stronger this correlation, the more an individual's ratings for perceived intelligence resembled their ratings of attractiveness for the facial stimuli presented (see Figure 1). While we expected a strong correlation between ratings of attractiveness and perceived intelligence based on the halo effect, we investigated whether individuals' intelligence (measured by ICAR) could predict differences in the halo (i.e., the strength of the perceived intelligence-attractiveness correlation across 48 faces).

Given the need to get the same participant to rate perceived intelligence and attractiveness of the same stimuli, it was possible that one task would influence ratings on the next task. We believed having individuals rate intelligence first would mitigate this influence, yet we realize this does not eliminate potential bias. Thus, we calculated a separate halo metric between individual ratings of intelligence and the *average* attractiveness ratings (averaged across all 126 participants in the sample); the correlation value for this metric is hereafter named the 'average halo'[2].

A Kolmogorov-Smirnov test showed that measurements (ICAR) of intelligence (p = .091) and the perceived intelligence and attractiveness correlation (p = .200) across subjects

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[2]A third halo metric was also calculated in which individual ratings of intelligence were compared to the average ratings of attractiveness from 60 independent raters from a separate rating task (who had not rated intelligence) and can be referred to as 'individual halo'. There was no relationship between participant's intelligence and their 'individual halo' (r(126) = .104, p = .248). The relationship between the 'individual halo' was strongly correlated (r(126) = .98, p < .001) with 'average halo'; given their near indistinguishable correlation, only one metric is discussed.

were normally distributed. There were no problems with multicollinearity between these two variables (Variance Inflation Factor for all variables < 1.5). The 'average halo' metric (correlation between individual ratings of intelligence and *average* ratings of attractiveness) was not normally distributed (p = .028) so non-parametric statistics were used to analyze these data accordingly.

Additionally, the standard deviation (*SD*) and mean (*M*) rating of intelligence and attractiveness were calculated for each participant based on their ratings across the 48 faces. These measures of scale use provided a control for how they may influence the independent correlation halo. While the *M* and *SD* cannot influence the intra-individual correlation between attractiveness and intelligence, because Pearson's r correlation already controls for them, the differences in scale use between individuals could have an effect on group level analysis. For this reason, the *SD* and *M* ratings of attractiveness and intelligence were used in linear regression to ensure any effects observed would account for differences in scale use.

Results

As expected, a by-stimulus analysis found that averaged ratings of attractiveness and perceived intelligence were strongly correlated ($r(48) = 0.95$, $p < .001$). There were no significant correlations between gender of face (female coded as 0, male coded as 1) and attractiveness ($r(48) = -0.24$, $p = .105$) or perceived intelligence ($r(48) = -0.21$, $p = .146$). Similarly, there was no significant correlation between age[3] of the individual depicted in the facial stimuli and attractiveness ($r(48) = -0.03$, $p = .854$), nor between age and perceived intelligence ($r(48) = 0.01$, $p = .962$).

[3]To check that participants scoring higher on the intelligence test were not simply more likely to use the age of the stimuli to rate perceived intelligence or attractiveness, we also investigated the relationship between participants' actual intelligence and age biases. Specifically, an 'age halo' metric was calculated (similar to the individual halo metric) for perceived attractiveness-age and perceived intelligence-age, but there were no significant relationships observed between these metrics and the participants' intelligence scores. We note that the age range of the presented facial stimuli (5-16) may be too narrow to investigate this bias.

Correlation matrix

At the individual level, the zero-order correlation matrix presented in Table 1 shows that there was a significant positive correlation between the individual halo calculated for each participant and the participants' IQ score ($r(126) = 0.21$, $p = .018$) (see Figure 2). Variables related to scale use (*SD* and *M* of attractiveness and intelligence ratings) were not significantly correlated to participants' individual halo. Interestingly, there was a significant negative correlation ($r(126) = -.178$, $p = .047$) between participant age and the mean of intelligence ratings, suggesting younger participants ascribed higher ratings of perceived intelligence across all faces rated. Participants' individual halo was also not correlated with the participant age or gender. Participants' mean attractiveness and intelligence ratings were strongly correlated ($p < 0.001$). Similarly, the participants' standard deviation of ratings for attractiveness and intelligence were strongly correlated ($p < .001$).

There was no significant correlation (Spearman's rho[4]) between participant's intelligence and the 'average halo' ($r_s = 0.06$, $p = 0.504$), *M* of intelligence ratings ($r_s = -0.08$, $p = 0.389$), or *SD* of intelligence ratings ($r_s = 0.11$, $p = 0.210$).

Regression

A multi-step hierarchical linear regression model was conducted to investigate whether a participant's IQ score would predict the strength of their individual halo (Table 2) with and without control for scale use variables in the model. In step 1 of the model, the participant's IQ score was entered as a predictor of the individual halo. In step 2 of the model, scale use variables (*SD* and *M* of attractiveness and intelligence ratings) were entered to account for any differences

[4] A standard Pearson's r correlation was also analyzed for the "average halo" metric, even though it was not normally distributed. The pattern of findings did not change; no significant correlations or non-significant trends were observed between any of the variables mentioned.

in scale use. Both models 1 and 2 indicated that participant's IQ score significantly predicted (p = .018) their individual halo (see Table 2).

Discussion

As predicted, perceived intelligence and attractiveness of facial stimuli were strongly correlated. The significant caveat to that finding is that participants varied in the degree of endorsement of the perceived intelligence-attractiveness relationship. Specifically, participants who scored higher on intelligence tests were more likely to endorse the perceived intelligence-attractiveness relationship. No significant relationship between individual intelligence and scale use (*SD* and *M* ratings for perceived intelligence and attractiveness) was found, and the relationship between participants' intelligence scores and their perceived intelligence-attractiveness halos remained significant after controlling for differences in participant scale use. We found no relationship between gender or age of participant and the individual halo.

We also found that there was no significant relationship between own intelligence and the average halo. The difference between the individual halo and average halo is salient; the individual halo is calculated by correlating individual ratings of intelligence and individual ratings of attractiveness, whereas the average halo correlation is calculated based on a correlation between an individual's ratings of intelligence and the average attractiveness rating (of all 126 participants in the sample) of stimuli. Indeed, literature has suggested that individual face preferences are unique and are primarily related to individual differences in learning what is attractive from their environment (Germine et al., 2015), but may also be related to differences in culture (Penton-Voak, Jacobson, & Trivers, 2004), self-similarity resemblance (Debruine, 2002), or self-evaluation (Little, Burt, Penton-Voak, & Perrett, 2001). Thus, measuring how similar individual's intelligence ratings are to average attractiveness ratings is more of a measure of conformity to what is considered by most as attractive, rather than a measure of how similar each person's perceptions of intelligence and attractiveness are.

Our findings highlight one particular individual difference that is related to the endorsement of the intelligence-attractiveness relationship. It is possible that people who score higher on intelligence tests are either more susceptible to a halo effect (perhaps due to the anchoring effect) or find faces they believe to be intelligent more attractive (perhaps due to a bias for self-similarity). One could also interpret the positive relationship between intelligence and the individual halo and null relationship with the average halo to suggest that intelligent people are more likely to use heuristics like the anchoring effect. If so, one would expect intelligent individuals to be more likely to give similar ratings for other pairs of attributes (e.g. trustworthiness, leadership, and so on). We suggest that future experimental designs should use more controlled and focused experiments to examine these and other possible explanations. For instance, the intelligence test used in this study (ICAR) was very short; a more comprehensive intelligence assessment may shed light on which cognitive abilities are most strongly related to the perceived intelligence-attractiveness halo, thus narrowing potential explanations. Future research could also benefit from comparing participants' intelligence-attractiveness halos to participants' use of anchoring (see Tversky & Kahneman, 1974 for a classic study on measuring anchoring), heuristics, and stereotypes. Conversely, research could investigate whether people who are rated by others as more attractive are more likely to endorse the perceived intelligence-attractiveness correlation (halo).

Regardless of explanation (e.g., kin selection or anchoring effect) or directionality (i.e., whether perceived intelligence influences perceptions of attractiveness or vice versa), our findings reveal that individuals differ in their vulnerability to this bias. Further studies on other individual differences potentially related to the endorsement of the perceived intelligence-attractiveness halo are necessary, especially in the context of expectations of children who are arguably most vulnerable to perceptions of intelligence, given the consequences of expectancy effects discussed. Robertson Davies (1951) said "the eye sees only what the mind is prepared to comprehend"; thus, we should strive for a better understanding of the root of biases in an effort to see past them.

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Tables and Figures

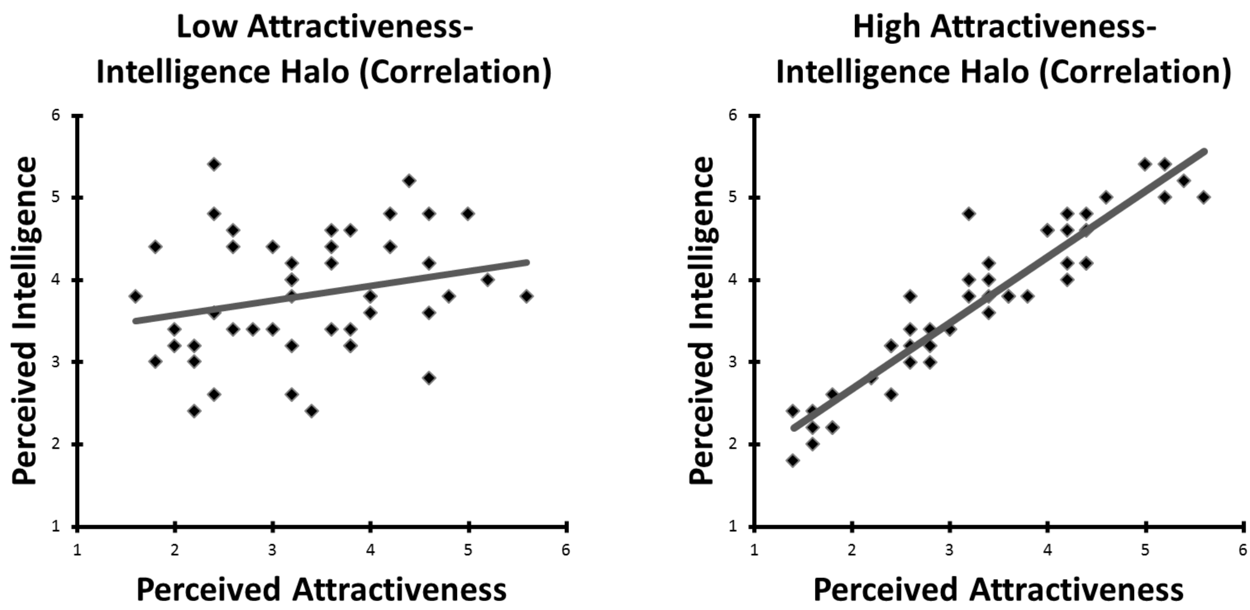

Figure 1. Variation in strength of the individual halo across individuals. Scatter plots visualizing the association of perceived intelligence and attractiveness ratings for an average of the five individuals with lowest attractiveness-intelligence halo (left, *r*(48) = .25) and the five highest (right, *r*(48) = .94) on the halo metric.

Table 1

Zero-order correlation matrix

	Halo	Age	Sex	IQ	*SD* Attract.	*M* Attract.	*SD* Intell.
Participant Age	.013	1					
Participant Sex	.033	.110	1				
Participant IQ Score	.210*	-.025	.121	1			
SD Attractiveness	.130	-.005	-.049	-.053	1		
M Attractiveness	.043	-.154	-.262**	.043	.120	1	
SD Intelligence	.111	.017	.089	-.033	.747***	-.059	1
M Intelligence	-.078†	-.178*	-.165	-.006	.064	.625***	-.091

***$p < .001$. **$p < .01$. *$p < .05$, †$p < .1$. Two-tailed probabilities.

Note: Sex is coded female = 0, male = 1. Correlations are based on 126 participants. ‘Halo’ is the correlation for participants’ ratings of intelligence and attractiveness.

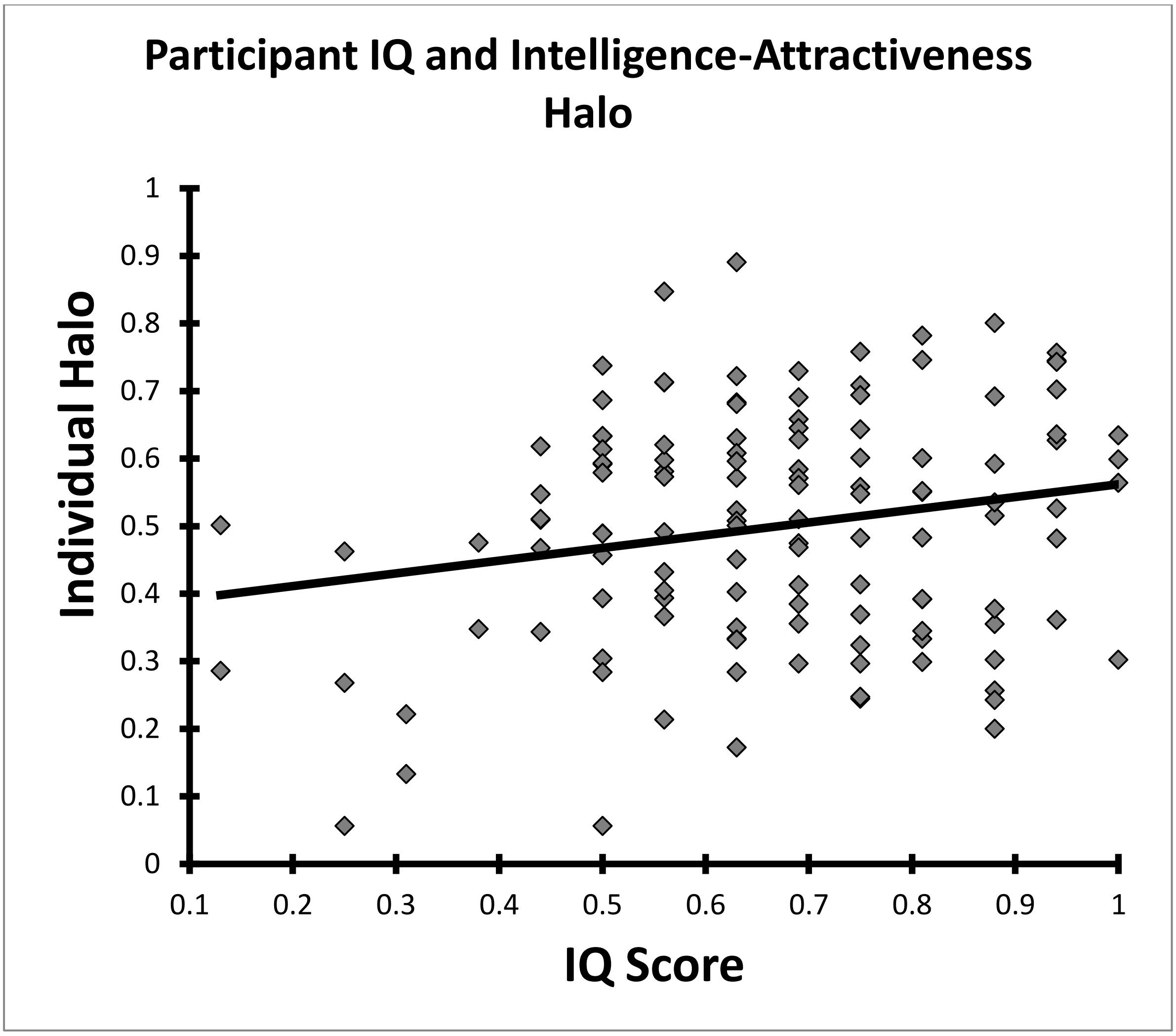

Figure 2. Participants' actual intelligence and individual halo scatter plot. This figure shows the positive correlation between participants' actual intelligence (1 = every question answered correctly) and the strength of their individual halo (correlation) in face judgements.

Table 2

Hierarchal linear regression

Steps	Variable	*B*	*SE*	*β*	*CI* Lower Bound	*CI* Upper Bound	R^2	*F* *(F-change)*	ΔR^2
1	IQ Score	.200*	.083	.210	.035	.365	.04	5.74	.044*
2	IQ Score	.201*	.084	.212	.036	.366	.08	2.09 (1.16)	.036
	SD Attractiveness	.068	.076	.123	-.082	.218			
	M Attractiveness	.039	.037	.119	-.035	.112			
	SD Intelligence	.011	.084	.018	-.155	.178			
	M Intelligence	-.066	.047	-.158	-.159	.027			

$^{***}p < .001$. $^{**}p < .01$. $^{*}p < .05$. Two-tailed probabilities.

Note: Dependent variable is the attractiveness-intelligence halo (correlation) calculated for each participant.