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Similarity Between Actual and Possible Selves and Its Relationship to Self-esteem

A Thesis

Presented in

Partial Fulfillment of the

Requirements for the Degree of

Masters of Science in General Psychology

DePaul University

By

Christopher A. Shorten

August 2017

Department of Psychology

College of Science and Health

DePaul University

Chicago, Illinois

Thesis Committee

Kimberly Quinn, Ph.D.

Pablo Gomez, Ph.D.

Biography

The author was born in Los Angeles, California on February 1, 1993. He graduated from Monroe High School in Monroe, Ohio in 2011. He received his Bachelors of Science in psychology from the Ohio State University in 2015.

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Abstract

Prior research has shown that people who hold negative beliefs about a group of people (e.g., that they're untrustworthy) will tend to hold more negative mental images of members of that group (Dotsch et al., 2008; 2013). Additional research has extended this idea further, suggesting that beliefs about the self (*self-esteem*) relate to how attractive a person imagines their own face (a *self-face representation*; Epley & Whitchurch, 2008; Shorten et al., 2017). Within the current study, we sought to expand this research further by demonstrating a positive relationship between participants' scores in self-esteem and the positivity of their self-face representations. Additionally, we attempted to replicate previous findings describing a positive relationship between participants' self-esteem scores and their self-face representation's attractiveness. However, observed relationships proved low in magnitude, providing little to no support for our hypotheses. Given the lack of support, we identify several alterations to the original method that may aid further research.

Introduction

Our beliefs influence how we see the world. Expectations of negative events can lead to altered interpretations of ambiguous objects (Balcetis & Dunning, 2006). Negative beliefs about groups of people can alter how we picture (*mentally represent*) those peoples' faces in our minds (Dotsch, Wigboldus, Langner, & van Knippenberg, 2008; 2013). Even our political affiliations can affect how we remember someone's face (Young, Ratner, & Fazio, 2013). In a world in which people constantly gain new information and form new opinions, how they process the world may also change due to newly acquired information (e.g., Dotsch et al., 2013).

Similarly, how people view themselves may also change due to how they think themselves (*self-esteem*; e.g., Shorten, Zunick, & Fazio, 2017). Initial evidence suggests that, when people picture themselves in their mind (a *self-face representation*), the face they imagine is typically more attractive than reality, given that people tend to hold more positive beliefs about themselves (Epley & Whitchurch, 2008; Zell & Balcetis, 2012; Shorten et al., 2017). Given that held beliefs relate to how people mentally represent their surroundings (Balcetis & Dunning, 2006) and the faces of others (Dotsch et al., 2008; 2013), self-esteem could influence more about person's self-face representations than just their attractiveness. For example, a person who views themselves very positively may maintain a self-face representation exemplifying positive or *ideal* attributes about themselves (e.g., happy, intelligent, trustworthy) while deemphasizing negative or *feared* attributes about themselves (e.g., depressed, disliked, unconfident; Markus & Nurius, 1986). To test this idea, the current study observes how self-esteem relates to similarities between a person's actual self-face representation and possible feared or ideal self-face representations.

Beliefs and Representations of Others

An individual's beliefs shape how they process the world around them. Given an established attitude toward an *attitude object* (e.g., a subject, an individual, or a group), a person's cognitive processing of that object will change based on the valence of the attitude. This change brings processing and judgmental outcomes of the attitude object into line with attitude valence. Historically, these changes to processing have led to a multitude of social outcomes, including intended denial of service to Chinese customers due to employees' negative attitudes toward Chinese people (LaPiere, 1934) and excusing the behavior of football players' behaviors due to positive attitudes toward the players' team (Hastorf & Cantril, 1954). More recently, researchers have investigated the degree to which positive and negative attitudes reflect mental representations of individuals' faces. Often, people's mental representations of others' faces will change—becoming more positive- or negative-looking—depending upon the strength and valence of their attitudes toward the target (Dotsch et al., 2008; 2013; Young et al., 2013).

To demonstrate this relationship, Dotsch et al. (2008) had participants view hundreds of image pairs and choose the image from each pair that looked more Moroccan (an image comparison task).¹ When the researchers later aggregated each participant's choices into a composite image, the composite appeared more untrustworthy and criminal to independent raters if the participant had more versus less negative attitudes toward Moroccans (Dotsch et al., 2008).

¹ The study was conducted in the Netherlands, where negative attitudes toward individuals of Moroccan descent are high.

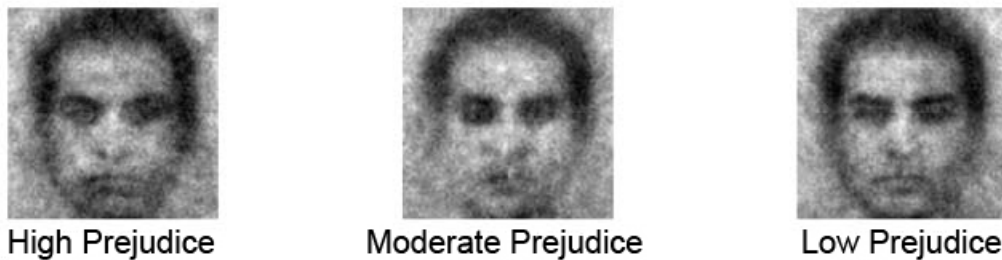


Figure 1. Composite images from Dotsch et al. (2008) indicating participants' mental representations of a typical Moroccan person's face.

In a later study, Dotsch et al. (2013), the same researchers then tested the effect experimentally. They presented participants with novel groups (Groups X and Y) and had participants form stereotypes about the groups by presenting positive or negative exemplar behaviors regarding each group (e.g., “A member of Group X returns the wallet they found.”). Then, the participants completed the same image comparison task from Dotsch et al. (2008) except targeting the new groups (e.g., the images looking more like Group X). As in the first study, composite images created from participants' choices in the image comparison task were rated more negatively (specifically, more untrustworthy) when participants had been presented with negative behaviors performed by the group, and more positively (more trustworthy; Dotsch et al., 2013) when participants had been presented with positive behaviors performed by the group. Together, these studies demonstrate that held beliefs can influence image-based mental representations about groups and group members, even if the groups are fabricated and the beliefs are new (Dotsch et al., 2013).

Beliefs and Representations of the Self

Similar to how a person's beliefs influence their how they mentally represent others' faces, the person's beliefs about themselves may influence their self-face representations (Epley & Whitchurch, 2008; Zell & Balcetis, 2011; Shorten et al., 2017). Due to the degree of exposure

a person has with themselves, they often have more solidified, extensive beliefs about themselves than about others. When a person gains new information about themselves which conflicts with prior information, they will seek to rectify the difference—either by accepting the most positive option (Taylor & Brown, 1988) or rejecting the conflicting information (Swann & Read, 1981)—to obtain a greater sense of stability. Additionally, to further consolidate the complexity of knowledge available about themselves, a person will tend to use cues from their environment (e.g., how attractive others find them or how much they're accepted or liked by others; Crocker, Luhtanen, Cooper, & Bouvrette, 2003) or their relation to others (e.g., how much they fit in within a group or the similarity between their behaviors and another person's behaviors; Luhtanen & Crocker, 1992; Lumsden, Miles, & Macrae, 2014) to form a coherent sense of self. Through this process, different people will base their self-identity on different factors. While one person may base their identity on their physical appearance (e.g., how attractive they are), another person may base their identity on how much their god loves them (Crocker et al., 2003).

Because people's self-identities may become intertwined with a variety of different factors, how they imagine themselves (whether in the past, the present, or the future) may differ greatly between individuals (Markus & Nurius, 1986; Know et al., 1998; Frazier et al., 2000). Yet, the type of person someone may prefer to become in the future (their *ideal* self) and the type of person they would dislike becoming in the future (their *feared* self) change little over time (Frazier et al., 2000). In a longitudinal study, Frazier et al. (2000) compared participants' beliefs about their feared and ideal future selves on various domains (e.g., health, independence, physicality) across five years. The researchers discovered that how people imagined themselves changed only slightly within that time span. Thus, while individuals' mental representations of

others' faces may be subject to change based upon accumulated knowledge (e.g., Dotsch et al., 2013), the general face representations people have of themselves may remain more stable over time (Frazier et al., 2000). The stability noted by Frazier et al. (2000) mirrors individuals' want for stability in mental representations regarding the self described within prior literature (e.g., Taylor & Brown, 1988; Swann & Read, 1981).

Similarly, how individuals imagine their possible selves (whether feared or ideal) relate to the attitudes they maintain about themselves (self-esteem; Know et al., 1998). Given this relationship between self-esteem and a possible self, how individuals imagine themselves physically may vary in accordance with their self-esteem. Initial evidence for this relationship comes from studies investigating self-esteem in relation to self-face representations (e.g., Shorten et al., 2017). For example, Epley and Whitchurch (2008) took photos of participants and morphed them to varying degrees with symmetrical and asymmetrical faces (one indicator of attractiveness). After randomizing the order of the morphed faces, the researchers presented them to participants and asked them to choose which face looked more like them. In doing so, the researchers discovered that participants scoring higher in self-esteem tended to choose faces morphed to a greater degree with the symmetrical faces. Thus, they concluded that self-esteem shared a positive relationship with how attractive participants viewed themselves (Epley & Whitchurch, 2008). This effect was later conceptually replicated by Zell and Balci (2012).

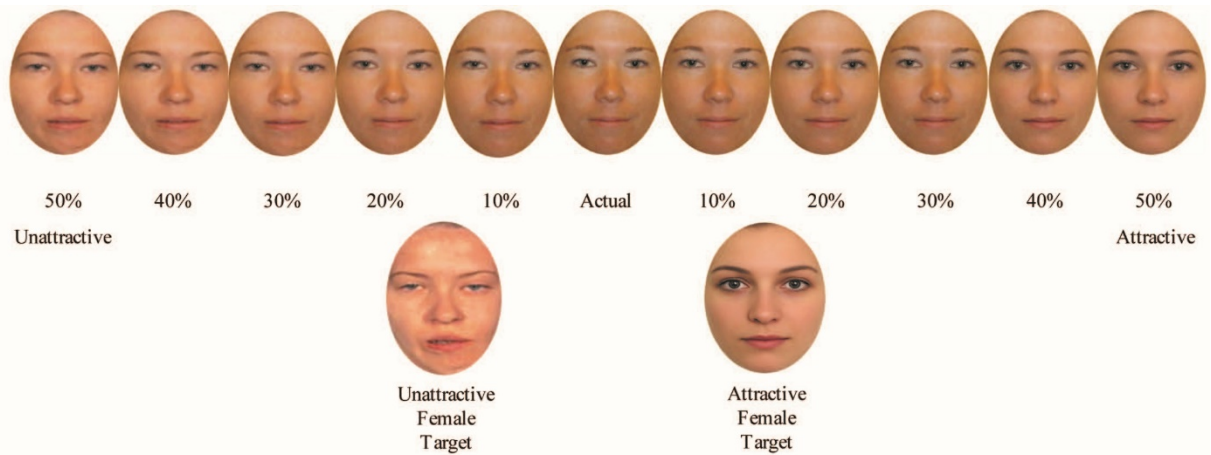


Figure 2. Array of female face morphs used in Epley and Whitchurch (2008) to assess participants' views of themselves.

While an initial indication of a relationship between self-esteem and self-face representation attractiveness, the studies were not without their flaws. To identify with a face within these face morph studies, participants had to explicitly choose a face as their own from a line-up of sometimes unflattering faces (see Figure 2). The social desirability of not wanting to appear unattractive could have influenced participants' decision-making—as demonstrated in Epley and Whitchurch (2008), in which participants overall chose attractive morphs more often. To address the potential response biases, Shorten et al. (2017) used an implicit methodology in which participants recreated their self-face representation through a reverse correlation image comparison task (RCIC). Within the RCIC, participants were presented with multiple face pairs constructed by applying various noise patterns to a single base image (see Figure 3) and chose which image appeared more like them (left or right) as well as their confidence in the decision (a “guess” to “very confident”). Following hundreds of trials, the chosen images were combined to create a representation of each participant's face. Subsequent attractiveness ratings on the composite images by independent raters yielded a positive relationship between participants' self-esteem and the attractiveness of the composite images (Shorten et al., 2017). Thus, the

agreement between the explicit (e.g., Epley & Whitchurch, 2008) and implicit (e.g., Shorten et al., 2017) methodologies suggests that individuals' beliefs about themselves (self-esteem) relates to the qualities of their self-face representations—at least in terms of attractiveness.

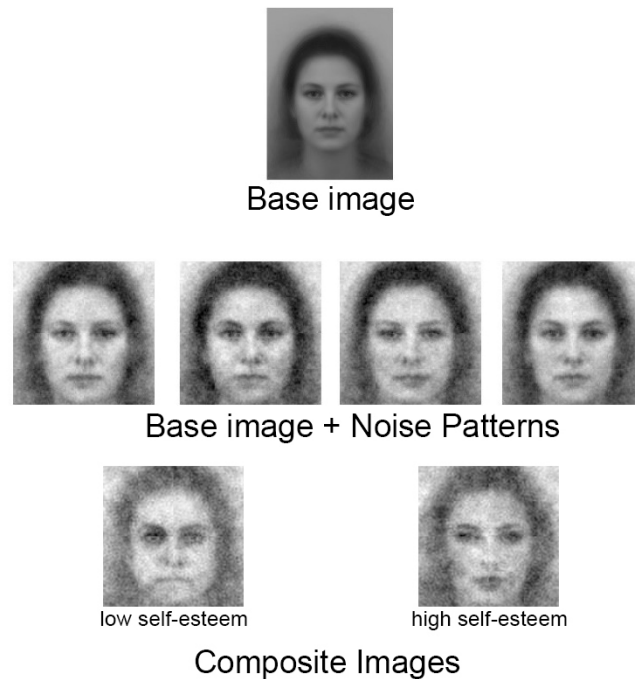


Figure 3. RCIC image processing from Shorten et al. (2017) in which various noise patterns are added to a single base image. Composite images are then created based on responses during the image comparison task and separated based on a correlated metric--in this case, self-esteem.

Need for Further Exploration

While mounting evidence suggests that beliefs play a role in how people represent others (Dotsch et al., 2008, 2013; Young et al., 2013), the evidence available to directly implicate self-esteem as an influencer in self-face representations remains indirect due to researchers' heavy focus on attractiveness (e.g., Epley & Whitchurch, 2008; Shorten et al., 2017). To provide solid evidence for the relationship between self-esteem and self-face representations, researchers would need to demonstrate that individuals scoring low in self-esteem generate more negative

self-face representations overall. Given that some individuals have self-worth more contingent upon their physical appearance than others (Crocker et al., 2003), using attractiveness as a determinant of negativity in self-face representations may not always prove sufficient. Furthermore, any rating focusing on surface characteristics of the face representations (e.g., happiness, confidence) instead of considering the faces holistically may result in similar methodological errors, in which the true influence of self-esteem varies due the relative importance of target characteristics to the participant. While these individual differences may become a non-factor with sufficiently high sampling, the complexity of methods used to extract self-face representations may make large sample sizes logistically prohibitive for many researchers—as noted by Epley and Whitchurch’s (2008) average sample size of 24 participants across three studies.

Additionally, the degree to which gender and ethnicity play a role in qualifying ratings (e.g., “How attractive is this face?”) could further decrease the reliability of attractiveness ratings as an indicator of self-beliefs. Shorten et al. (2017) demonstrated this possibility by finding that women tended to vary more than men in terms of how attractive their composite images were rated as well as how they scored in self-esteem. Additionally, prior studies failed to account for varying skin tone or apparent ethnicity within their methods. This absence of representation fails to describe whether noted effects remain constant if a portion of the sample is not white. Thus, an ideal test of the relationship between self-esteem and self-face representation should consider faces holistically and account for potential differences rooted within demographic information.

Possible selves: Self-esteem, the ideal self, and the feared self. Examining the similarity between a person’s actual self and their possible ideal or feared selves could provide a more holistic measurement of self-face representation than allowed by attractiveness ratings

alone. Self-esteem and its correlates (e.g., self-worth) tend to focus on the degree to which an individual likes who they are in the present (e.g., Tatarodi & Swann, 2001). When an individual with high self-esteem envisions their own face in the present, they would likely feel more comfortable with and desire fewer changes to themselves. Thus, self-face representations of a high self-esteem person should look more similar to possible, ideal versions of themselves, because both representations reflect something which the person likes and prefers. Alternatively, self-representations of a low self-esteem person should look more similar to potential, feared versions of themselves, because (in contrast to a high self-esteem person) the person would dislike both representations and desire not to appear like either representation. Unlike the attractiveness ratings used by previous studies, similarity ratings between actual and possible (ideal and feared) selves would allow for direct comparisons between the shape, the structure, and the displayed emotion of several self-face representations rather than the sole assessment of a potentially biased characteristic (e.g., attractiveness).

Overview and Hypotheses

Within the current study, we addressed the deficits in the current literature by relating self-esteem and the degree to which participants' current self-face representations appear similar to ideal and feared possible selves. If the relationship between self-esteem and self-face representation exists as noted by prior research (e.g., Epley & Whitchurch, 2008), then assessing possible selves would allow for us to directly assess whether participants' current self-face representations reflect more of their most positive or most negative versions of themselves. Additionally, by gauging the faces on a more general concept (similarity), we obtain a more holistic way to compare faces with less potential for bias. Furthermore, to replicate and expand upon previous findings, we also collected attractiveness ratings of current self-face

representations and participants' scores on the Fundamental Needs Questionnaire (FNQ; modified from Zadro, Williams, & Richardson, 2004). With these measures, we hoped to obtain a broader picture of relations between self-esteem, attractiveness, and self-face representation positivity while exploring additional aspects of the self measured by the FNQ.

Hypothesis I. Participant self-esteem will correlate positively with their self-face representation, such that lower [higher] self-esteem scores will be associated with greater similarity between average self-face representations and feared [ideal] self-face representations.

Hypothesis II. Participant self-esteem will correlate positively with the attractiveness of their self-face representation, such that lower [higher] self-esteem scores will be associated with a less [more] attractive self-face representation.

Method

Study 1: Image Comparison Task

Participants. Fifty-five introductory psychology students (48 female, 7 male; 31 white, 13 Latino/a, 6 Asian, 5 Black) from DePaul University completed Study 1 online through Qualtrics and were compensated with research credit. In accordance with ethical approval, all participants received information on the experimental procedure and provided informed consent prior to participating. Following the completion of all tasks, participants were debriefed and compensated accordingly.

Procedure. Participants first completed a modified version of the Fundamental Needs Questionnaire (FNQ; Zadro et al., 2004) and provided demographic information (age, gender, and ethnicity). Based on the participants' reported gender and ethnicity, they were sorted into image comparison tasks containing images with similar skin tone and gendered appearance (see

Figure 3). When finished with the image comparison task, participants gave short responses as to the strategies they used to complete the task.

Fundamental Needs Questionnaire. The FNQ (Zadro, Williams, & Richardson, 2004) includes four subscales: *belonging* (e.g., “I don’t tend to feel accepted by others”), *control* (e.g., “I feel in control of my life”), *meaningful existence* (e.g., “My actions tend to have an impact on my environment”), and *self-esteem* (e.g., “Most days, I feel good about myself”). The original measure was created to assess participants’ responses to a specific event; we modified the items’ wording for application to everyday life and add a fourth item to each subscale to equate the number of positive and negative items in each (see Appendix). Participants rated the extent to which they agreed with each of the 16 statements on a 7-point scale (-3, *disagree strongly*, to +3, *agree strongly*).

Image comparison task. The image comparison task included three blocks (average, feared, and ideal) containing 150 trials each (450 trials total). Each block contained the same set of 150 image pairs (i.e., two images) and differed only by the provided prompt: In the *actual-self* block, participants responded to the question, “Which looks more like you?”; in the *feared-self* block, to the question, “Which do you fear you look like?”; and in the *ideal-self* block, to the question, “Which is an ideal version of you?”. Each trial contained a single pair of faces. For each image pair, participants rated which image (left or right) along a scale that combined the binary choice with their confidence in their decision (i.e., “I would guess the image on the [left/right] looks more like [me/my feared self/my ideal self]”, “I am confident the image on the [left/right] looks more like [me/my feared self/my ideal self]”, and “I am very confident the image on the [left/right] looks more like [me/my feared self/my ideal self]”). The order in which

each participant completed the blocks was randomized, and participants could take breaks between blocks.



Figure 4. Trials seen by participants within the image comparison task, separated by trial type: A. Actual self; B. Feared self; and C. Ideal self. For each trial, the images either represented a white, black, Latina/o, or Asian face, based on the ethnicity indicated by each participant.

Apparatus. All participants completed Study 1 through Qualtrics. Image presentation used Qualtrics' native Loop & Merge function. Choices during the image comparison task were completed by monitoring keyboard presses with JavaScript, and response times were indicated by the length of time participants took to make their first keypress on each trial.

Stimuli. Base images were created in Photoshop CC (Adobe Systems, 2016) by averaging images within the Chicago Face Database (Ma, Correll, & Wittenbrink, 2015) for each gender-ethnicity combination (gender: male and female; ethnicity: white, black, Asian, and Hispanic). Further editing of images, including the addition of a Gaussian blur, were also accomplished via Photoshop CC (Adobe Systems, 2016), and all noise patterns were added using a pre-programmed MATLAB protocol (version R2013a; Mathworks Inc., MA, USA).

We first created averaged images by matching related photos (Female: 57 Asian, 48 black, 46 Latina, 37 white; Male: 52 Asian, 37 black, 52, Latino, 36 white) by key features (eyes, nose, and mouth). When aligned, the images' opacity was altered such that each image contributed

equally to the final image. Next, a grayscale filter and a Gaussian blur (radius = 6) was added to each image. The added filters helped to occlude extraneous features (e.g., blemishes and hair) and increase similarity to previously validated neutral face images (Lundqvist, Flykt, & Öhman, 1998) used in prior iterations of the reverse correlation image-comparison task (Dotsch et al., 2008).

Next, we superimposed noise patterns ($N = 600$) onto each edited image (see Figure 4). Added noise patterns included 4,092 superimposed truncated sinusoid patches, with a length of two sine waves per patch. Summation of patches in six orientations (0° , 30° , 60° , 90° , 120° , and 150°), two phases (0 and $\pi/2$), five spatial frequencies (1, 2, 4, 8, and 16 cycles per image), and random amplitudes generated the 100 unique noise patterns applied to each image (for a more detailed description, see Mangini & Biederman, 2004).

Qualtrics image display. Using HTML in each row queried by Qualtrics’s Loop & Merge function, we formed image pairs by displaying each generated image with an image using the same base pattern but an inverse noise pattern (see Figure 4).

Composite image generation. For each participant, composite images were created by averaging together all the parameters of the 150 noise patterns from the images selected by the participant during the image comparison task (3 blocks of 150 trials), and superimposing that average on the original base image. Within the averaged noise pattern, participants’ certainty indicated the weight of each decision. Decisions rated as “very confident” (± 3) were treated as 3 decisions in favor of the selected image, those rated as “confident” (± 2) were treated as 2 decisions, and those rated as “guesses” (± 1) were treated as a single decision. In this way, a block containing 150 confident decisions would generate the same composite image as a block with 300 guesses in the same direction.

All images were generated using a similar MATLAB protocol to the original stimuli generation. Accordingly, each participant ended up with 3 composite images, representing how they viewed themselves in the present (actual-self), how they would fear to look (feared-self), and how they would ideally like to look (ideal-self).

Study 2: Composite Image Ratings

Participants. One hundred and fifty-four raters rated composite images from Study 1 online through Qualtrics. Raters came from two sources: 52 from DePaul University's undergraduate psychology subject pool (35 female, 17 male; 23 white, 15 Latino/a, 7 black, 1 East Asian, 4 South Asian, and 2 Middle Eastern); and 102 from MTurk (32 female, 66 male, 1 other, 3 gender unspecified; 73 white, 10 Latino/a, 7 black, 1 East Asian, 7 South Asian, 1 Alaskan Native or Pacific Islander, and 3 race unspecified). Participants from DePaul University received course credit for their participation, whereas MTurk participants received \$2.00 compensation. In accordance with ethical approval, all participants received information on the experimental procedure and provided informed consent prior to participating. Following the completion of all tasks, participants were debriefed and compensated accordingly.

Procedure. Raters viewed 55 trios of composite images (one trial for each Study 1 participant), with each trial containing the actual-self composite image in the center, the feared-self composite image left-of-center, and the ideal-self composite image right-of-center (see Figure 5A). For each trio, participants rated whether the center image appeared more similar to the image on the left or the right. After the similarity ratings, raters viewed each of the actual-self composite images once more and rated them for attractiveness. In this way, raters made 110 total judgments. Finally, raters provided basic demographic information (age, gender, and ethnicity).

Similarity ratings. For each image trio, raters responded to the prompt: “Which looks more like the center image?” on a 7-point scale (-3: “I am very confident the image on the left looks more like the center image” to +3: “I am very confident the image on the right looks more like the center image”).

Attractiveness ratings. Raters indicated the attractiveness of each average composite image on a 7-point scale (0: *Not at all attractive* to 6: *Very attractive*).



Figure 5. Similarity (A) and attractiveness (B) rating trials, as seen by raters.

Apparatus. All participants completed their ratings through Qualtrics. Image presentation occurred through Qualtrics’s native Loop & Merge function.

Stimuli. Composite images were generated based on participants’ responses to the image comparison task in Study 1. Image trios were created in Photoshop CC (Adobe Systems, 2016) and were loaded into Qualtrics’s Loop & Merge function via HTML entered into each queried row.

Results

Manipulation Check

At the end of Study 1, participants indicated any strategies they used during the image comparison task. Participants' descriptions along with response invariance during the image comparison task were used to indicate whether or not participants followed directions during the task. One participant was removed from data analyses due to indicating that they failed to take the study seriously and pressed the same key throughout the study.

Reliability and Scoring

Scoring. Appropriate items within the FNQ subscales were reverse-scored prior to any analyses (see Appendix). Following scale validation through reliability and CFA model tests, the FNQ subscales were each averaged into mean scores. Additionally, the attractiveness and similarity ratings were averaged for each participant across each rater. Higher scores within the similarity ratings indicate that the ideal composite image appeared more similar to the average composite image than the feared composite image. The opposite is then true for lower scores.

Scale reliability. Cronbach's alpha for self-esteem ($\alpha = .83$) and belonging ($\alpha = .84$), subscales of the FNQ proved relatively large, suggesting high consistency among each subscale's items. The Cronbach's alpha for the control subscale ($\alpha = .69$) was below the conventional threshold of .70, but examination of the alpha with items deleted did not clearly indicate any items to be deleted from the subscale. The Cronbach's alpha for the meaningful existence subscale ($\alpha = .68$) proved inadequate due to a potential increase of +.18 if we removed Item 1 (see Appendix). Given the large increase, we removed the problematic item and recalculated the Cronbach's alpha for the reduced subscale ($\alpha = .86$). In addition to large alpha

values, subscale items were also moderately correlated ($r_{average} = .423$), indicating high relatedness both within and between subscales.

Table 1

Interitem Correlations for the Fundamental Needs Questionnaire

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	-														
2	0.427	-													
3	0.610	0.449	-												
4	0.807	0.374	0.614	-											
5	0.668	0.316	0.426	0.481	-										
6	0.313	0.172	0.216	0.224	0.236	-									
7	0.332	0.362	0.267	0.287	0.446	0.138	-								
8	0.734	0.433	0.683	0.540	0.653	0.265	0.347	-							
9	0.694	0.472	0.576	0.620	0.447	0.391	0.468	0.633	-						
10	0.358	0.529	0.295	0.357	0.244	0.088	0.222	0.272	0.417	-					
11	0.739	0.497	0.655	0.620	0.508	0.378	0.348	0.712	0.816	0.442	-				
12	0.638	0.374	0.401	0.499	0.462	0.181	0.378	0.589	0.595	0.475	0.659	-			
13	0.034	-0.109	0.061	0.075	0.051	-0.395	0.079	0.043	0.098	0.121	0.031	0.013	-		
14	0.682	0.344	0.444	0.511	0.627	0.144	0.379	0.601	0.628	0.346	0.704	0.651	0.086	-	
15	0.755	0.498	0.514	0.550	0.583	0.278	0.297	0.766	0.598	0.429	0.683	0.591	0.017	0.668	-
16	0.702	0.268	0.441	0.553	0.504	0.314	0.313	0.655	0.736	0.331	0.738	0.475	-0.017	0.658	0.694

Table 2

Cronbach's alpha by Subscale

Subscale	Item Range	Alpha
Belonging	1 - 4	.84
Control	5 - 8	.69
Self-Esteem	9 - 12	.83
Meaningful Existence	14 - 16	.86

Confirmatory factor analysis. All 15 remaining items from the FNQ were entered into a CFA model with each item loading onto their predicted subscales (either self-esteem, belonging, control, or meaningful existence) and each subscale loaded onto a single *Fundamental Needs*

factor. Fit indices indicate adequate but not ideal model fit ($\chi^2(86) = 125.298, p = .004$; CFI = .927; TLI = .910; RMSEA = .091; SRMR = .067)². Given the previous reliability estimates (alpha scores and interitem correlations), we sided with the majority of considered fit indices and interpreted the items as loading appropriately onto their predicted subscales.

Descriptive Statistics

Correlations and means. The FNQ subscale means correlated highly with each other ($r_{average} = .743$; see Table 3), reinforcing prior estimates regarding high relatedness between the subscales. Correlations between self-esteem and similarity ($r = -.026, p = .889$) as well as between self-esteem and attractiveness ($r = .0192, p = .889$) were very low. Furthermore, the correlation between similarity and attractiveness was also low ($r = .1511; p = .271$). Among the measured constructs, the strongest relationships were between meaningful existence and attractiveness ($r = .1892, p = .167$), attractiveness and similarity, and belonging and similarity ($r = .121, p = .380$). Given the low magnitude of these relationships, the observed relationship between self-esteem, similarity, and attractiveness suggests low relatedness between the key constructs measured within the current study.

Multilevel effects. Because we varied base image gender and ethnicity, we examined potential group-level differences. We did not observe large group-level differences³ for average similarity with regards to either ethnicity ($ICC(1) = .015$) or gender ($ICC(1) = -.014$). However, we did observe large group-level differences for average attractiveness with regards to ethnicity ($ICC(1) = .292$) but not gender ($ICC(1) = -.038$). To address the observed group-level effects, the test for Hypothesis II was altered to a multilevel model with participants nested within ethnicity.

² Ideal fit for CFA would be indicated according to a combination of the following fit indices: $p > .05$ (χ^2 test); CFI $> .90$; TLI $> .90$; RMSEA $< .08$; and SRMR $< .08$.

³ A standard of $ICC(1) > .05$ was used to determine whether the observed interclass correlation warranted further action.

Table 3

Measure Correlations, Means, and Standard Deviations

	1	2	3	4	5	6	Mean	Std. Dev
1 Belonging	-						.81	1.30
2 Control	.702	-					.50	1.07
3 Meaningful existence	.779	.673	-				1.21	1.48
4 Self-esteem	.780	.708	.692	-			.75	1.38
5 Similarity	.121	.029	.018	-.026	-		.25	.51
6 Attractiveness	.019	.114	.189	-.056	.151	-	2.31	.58

Confirmatory Hypotheses Tests

Hypothesis I. To test the hypothesis that higher scores in self-esteem related to more similarity between the actual-self and ideal-self versus feared-self composite images, we regressed averaged similarity onto self-esteem. The resultant relationship was weak ($b = -.010$, $p = .849$). As a result, we cannot conclude that self-esteem relates to how participants constructed their self-face representations.

Hypothesis II. To test the hypothesis that higher scores in self-esteem related to more attractive average composite images, we regressed averaged attractiveness onto self-esteem. Given the observed group-level effects, we utilized a multilevel model with participants nested within ethnicity. The resultant relationship was weak ($b = -.003$, $p = .945$). As a result, we cannot conclude that self-esteem relates to the attractiveness of participants' self-face representations.

Exploratory Analyses

Other fundamental needs subscales. Given the larger magnitude of correlations between the non-self-esteem FNQ subscales (belonging, control, and meaningful existence) and

attractiveness and similarity, we also entered each subscale into the same regression models described for the hypotheses tests.

Belonging. First, we regressed averaged similarity onto belonging ($b = .047$; $p = .380$). Then, we entered belonging into a multilevel model (with subjects nested within ethnicity) predicting averaged attractiveness ($b = .009$; $p = .862$). The low magnitude of both relationships suggest that the degree to which participants felt they belong in their lives did not relate strongly to either the attractiveness of participants' self-face representations nor the similarity between representations.

Control. First, we regressed averaged similarity onto control ($b = .014$; $p = .835$). Then, we entered control into a multilevel model (with subjects nested within ethnicity) predicting averaged attractiveness ($b = .064$; $p = .312$). The low magnitude of both relationships suggest that the degree of control participants felt in their lives did not relate strongly to either the attractiveness of participants' self-face representations nor the similarity between representations.

Meaningful existence. First, we regressed averaged similarity onto meaningful existence ($b = .006$; $p = .895$). Then, we entered belonging into a multilevel model (with subjects nested within ethnicity) predicting averaged attractiveness ($b = .072$; $p = .111$). The low magnitude of both relationships suggest that the degree to which participants derived meaning from their existence did not relate strongly to either the attractiveness of participants' self-face representations nor the similarity between representations.

Distance scores. Following the lack of confirmation for the hypotheses, we observed the similarities in relationships between the behavioral data of the image comparison task, the ratings, and the FNQ subscales. To make the comparison, we reduced the behavioral data down to a binary choice—whether they chose the left or the right image. Then, we calculated the city-block

distance between participants' feared-self block choices and actual-self block choices as well as ideal-self block and actual-self block choices. For each calculation, we compared the binary choices between each block to indicate matched—a participant chose the same image during comparable trials containing the same images (two right or two left choices between blocks)—and mismatched trials—a participant chose a different image during comparable trials (a right choice in one block and a left choice in another). We then scored each match as a 0 and each mismatch as a 1 and summed the scores across all trials. The resultant calculation indicated the number of comparable trials between blocks for which a participant made different choices. For example, a score of 0 would indicate that a participant made the exact same choices between two blocks, whereas a score of 150 would indicate that they made completely opposite choices between two blocks.

On-average, participants made 72.65 different choices between feared-self and actual-self blocks (feared–actual distance), 67.47 different choices between ideal-self and actual-self blocks (ideal–actual distance), and 74.16 different choices between feared and ideal blocks (feared–ideal distance). These distances indicate that participants' choices during the ideal-self and the actual-self blocks were most similar—similar to the ratings, $M_{\text{similarity}} = .25$ —and their choices during the feared-self and the ideal-self blocks were most distant. To examine whether or not these distances provided additional information with regard to the ratings and the FNQ subscales, we calculated correlations between the distances, the ratings, and the subscales (see Table 4).

Table 4 Correlations between Distances, Ratings, and Fundamental Needs Scores

	Belonging	Control	Meaningful Existence	Self-Esteem
Feared–actual distance	-.031	.058	-.009	.182
Ideal–actual distance	-.031	.094	-.004	.182
Similarity	.121	.029	.018	-.026
Attractiveness	.019	.114	.189	-.056

Table 5 Correlations between Distances and Ratings

	1	2	3
1 Feared–actual distance			
2 Ideal–actual distance	.117		
3 Similarity	-.048	-.059	
4 Attractiveness	-.157	.120	.151

Similarity did not relate strongly to either feared–actual ($r = -.048, p = .723$) nor ideal–actual distances ($r = -.059, p = .668$). However, the magnitude of the relationship between average attractiveness and feared–actual ($r = -.157, p = .253$) and ideal–actual ($r = .120, p = .383$) distances proved much larger and in the direction we would expect if an ideal image were more attractive to a person than a feared image.⁴ Furthermore the correlations between self-esteem and feared–actual ($r = .182, p = .185$) and ideal–actual ($r = .182, p = .184$) distances were much larger than the correlation between self-esteem and average similarity ($r = -.026, p = .889$).

⁴ Note that the conditional probabilities (p -values) are still much too high to definitively gauge the relationship between these metrics and the subscales with the current analyses.

These results could suggest that the true relationship between self-esteem and how participants view their self-face representations could be stronger than indicated by the observed ratings.

While we may compare correlation magnitudes within the context of this study, the high conditional probabilities indicate that correlations could differ greatly across studies. As a result, concrete interpretations of the correlations may require further research and an acknowledgment of the results' potential ambiguity.

Discussion

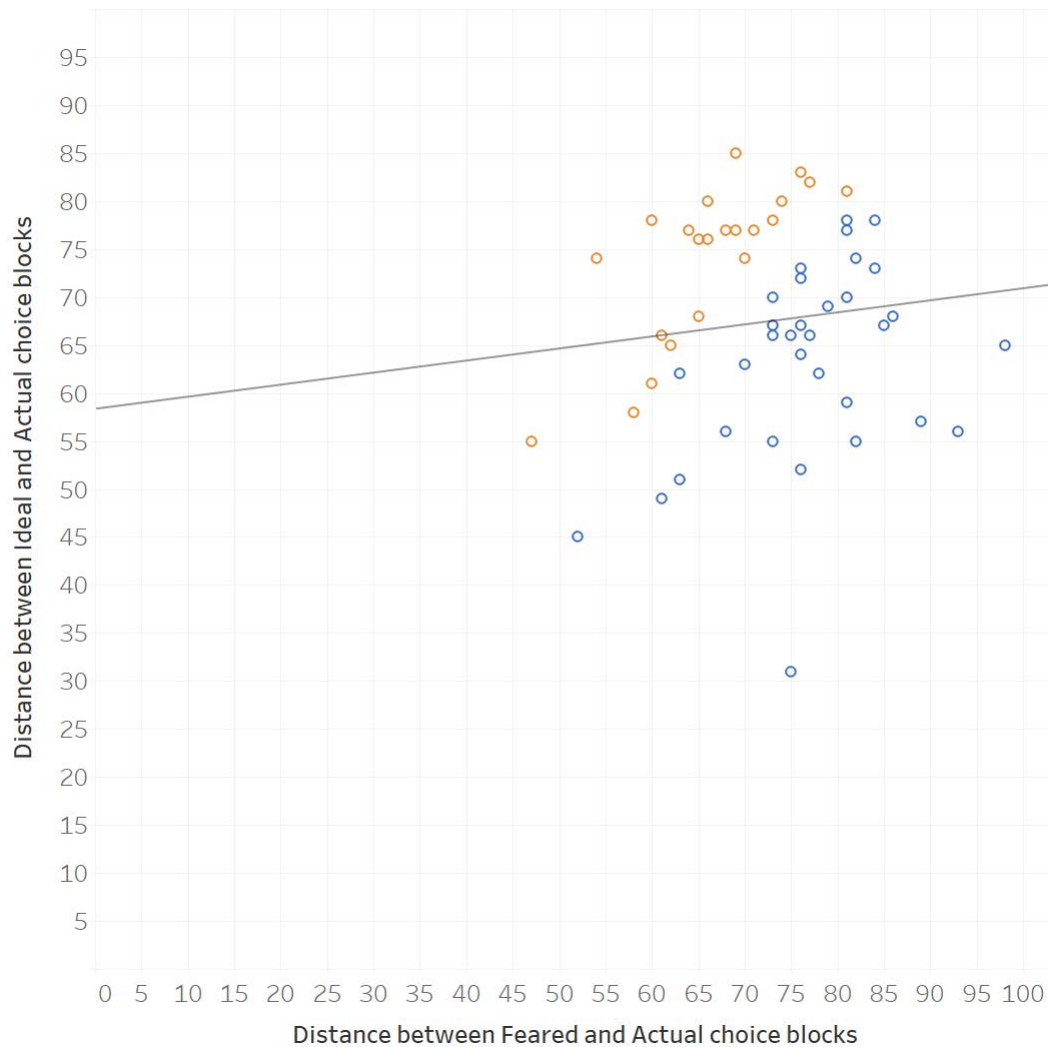
Similarity

Our results suggest a very low-magnitude relationship between self-esteem and participants' self-face representations' similarities. However, upon further exploration of behavioral data from the image comparison task, we observed larger relationships between self-esteem scores and the city-block distance between participants' actual-self, feared-self, and ideal-self blocks. While the conditional probability for these relationships was relatively high ($p = .185$ for both), the differing magnitudes suggests that the similarity ratings failed to pick up on the differences present within the behavioral data.

Part of the problem could originate from the ideal–actual distances being smaller than feared–actual distances. This factor resulted in actual-self composites that (from the start) were objectively more similar to the ideal-self composites than the feared-self composites. Additionally, 25 out of 33 participants (75.76%) with greater ideal-self composites closer to their actual-self composites had ideal–actual distances which differed more than 10% from their feared–actual distances.⁵ These trends might indicate that more people lack a concrete sense of an ideal self that differs greatly from their actual self. If so, ratings gauging whether an actual-

⁵ This compares to 7 out of 22 participants (45.45%) with feared-self composites closer to their actual-self composites.

self composite is more similar to a feared-self or ideal-self composite could be inherently biased—as more actual-self composites are objectively similar to ideal-self composites. Furthermore, raters rated ideal composites more similar to actual composites more often (37 out of 55). This may suggest that raters picked up the ideal-actual bias present in the behavioral data or else had a difficult time completing the task (leading to a bias toward right-side responding).



As a result, our current methodology may not have adequately tested our initial hypothesis regarding a positive relationship between similarity and self-esteem. To rectify the noted problems, future iterations could have raters indicate the similarity between actual-self composites and each of the other two composites independently. Doing so could allow for independent assessments of the similarity between each of the composite images. Additionally, comparing two images at once instead of three could decrease the difficulty of the task and reduce the chance of repeating the current right-side bias.



Figure 7. Rating trials used by the current study (left) compared to the proposed rating trials (right). The new rating scheme would use separate trials to compare ideal composites to actual composites (top-right) as well as feared composites to actual composites (bottom-right).

Existence of feared and ideal self. We hypothesized the existence of concrete feared and ideal self-face representations on the basis that people have an idea of the kind of person they would and would not like to be (e.g., Markus & Nurius, 1986). Yet, participants may have found imagining their feared and ideal self-face representations too difficult. When asked if there were any problems with the study, one participant stated: “It was also hard to decide which image did I fear looking like because I don't know if I really feared any of the faces.” Additional participants noted that they were unsure about their choices or had to guess at some point during the study. Though the implicit nature of the methodology allows for occasional guessing from participants, we might also consider the possibility that the ideal and feared selves are not so concrete that everyone has an established self-face representation for each.

To solve the dilemma that some people have more concrete representations of their possible selves than others, future studies could ask participants to generate idealized or imperfect versions of themselves within the study. To do this, following the actual-self trials, we could ask participants to list a series of characteristics (physical and non-physical) that they like and dislike about themselves. Prior to the image comparison task for an ideal self, we would then ask participants to imagine how they would look if the disliked characteristics disappeared. Likewise, prior to the imperfect (“feared”) ICT, we would ask participants to imagine how they would look if the liked characteristics disappeared. In this way, we could actively lead participants to focus on either positive or negative self-representations of themselves and gauge which representation appears more similar to their initial, average self-representation. Accordingly, this method could allow for better composite images and less frustration for participants who feel their self-face representations are too vague.

Attractiveness

We also failed to observe the previously established relationships between self-esteem and rated attractiveness. The lack of observed effects could indicate low true effect sizes, sampling error, or a non-existent relationship. Without further information, we cannot adequately suggest one of these possibilities over the other. However, we do note that, unlike the previous studies investigating the same relationship, we utilized faces with different skin tones and apparent ethnicities. Accordingly, we observed ethnicity-level effects for attractiveness ratings. Given a more representative sample, we may observe additional, interesting effects related to participants' ethnicity.

Composite images. Within the study, we used 150 image pairs to create each of the composite images. This compares to the 400+ image pairs typical for other studies using the reverse correlation image comparison task (e.g., Dotsch et al., 2008; Young et al., 2013; Shorten et al., 2017). Even while using fewer image pairs, we were able to generate composites with varying appearance, but the clarity and extra variation gained from using additional image pairs could influence how raters approach each image. To this extent, further investigation of attractiveness effects may benefit from the use of additional image pairs to generate composite images.

Fundamental Needs Subscales

Mirroring the observed effects for self-esteem, we observed low-magnitude relationships between the other FNQ subscales, attractiveness, and similarity. Out of these analyses, control ($b = .064$; $p = .312$) and meaningful existence ($b = .072$; $p = .111$) had the largest relation to attractiveness, while belonging ($b = .047$; $p = .380$) had the largest relation to similarity. However, these relationships have high conditional probabilities, making them less apt for

concrete interpretations. Because the FNQ subscales relate strongly to each other ($r_{average} = .743$; see Table 2), any methodological inconsistencies that affect self-esteem's relation to similarity or attractiveness may also affect self-esteem's relationships with the other FNQ subscales. As such, future studies using the FNQ in a similar fashion to the current study may still benefit from examining how the full FNQ relates to variables of interest.

Self-esteem. For the purpose of the study, we developed a novel version of the subscale, derived from Zadro et al. (2004). Our analyses regarding item consistencies within the subscale (Cronbach's alpha and interitem correlations) as well as a confirmatory factor analysis addressing consistency between subscales proved favorable and suggest adequate internal validity for our version of the FNQ. With this in mind, studies to which we have compared our results (with regards to attractiveness) used different measures to score self-esteem.⁶ Accordingly, the relationship between self-esteem and attractiveness may vary greatly depending on what measure a researcher uses. For example, Epley and Whitchurch (2008) and Zell and Balcetis (2011) had opposing evidence suggesting whether only explicit or implicit measures of self-esteem related to attractiveness, whereas Shorten et al. (2017) claimed both types of measures relate to attractiveness well. These inconsistencies, combined with our current lack of support for the hypothesis that self-esteem relates to the attractiveness of self-representation, could suggest that the effect in question is unreliable, at best. As such, future studies interested in this relationship may proceed with caution.

⁶ Epley and Whitchurch (2008) and Zell and Balcetis (2012) used the Rosenberg (1965) self-esteem scale as well as the name-letter preference scale (Gebauer, Riketta, Broemer, & Maio, 2008). Shorten et al. (2017) used the self-liking subscale of the Self-Liking Self-Competence scale (Tafarodi & Swann, 2001) as well as the name-letter preference scale.

Distance Scores

Through the distance scores, we observed that participants with higher scores in self-esteem tended to make different choices more often between blocks of the image comparison task (see Figure 8). Two caveats exist for this observation: 1. The conditional probability for the relationship between self-esteem and both distance scores is fairly large ($p = .185$ for each); and 2. The distance scores are scalar, lacking direction. Nonetheless, the observed relationship within the current data suggest that participants performed differently within each block with self-esteem explaining some of the resultant variance. Different performance between blocks supports our initial assumptions that participants' self-face representations would differ between their possible selves and their actual self. Similarly, a positive relationship between these metrics and self-esteem scores would suggest that participants' ideal and feared self-face representations differ more from their actual self-face representations as participants view themselves more positively. Due to the exploratory nature of these analyses and the previously stated caveats, we would require additional information to assess the validity of these claims. However, future iterations of this study may benefit from observing distance scores as an initial indicator that participants objectively perform differently between blocks.

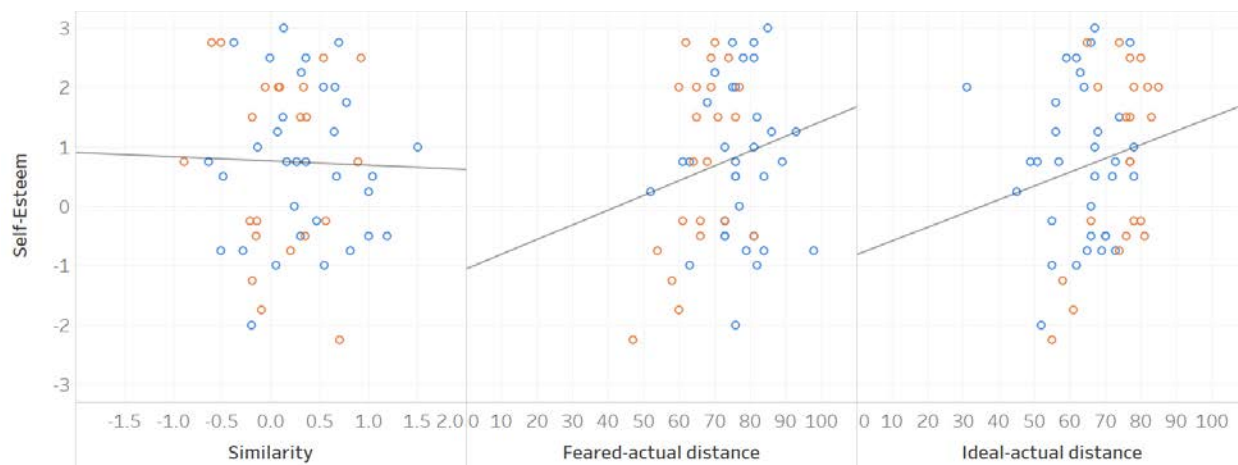


Figure 8 Graphs depicting relationships between rated similarity, feared-actual distance, and ideal-actual distance and participants' self-esteem scores.

Conclusion

Given our observations, we cannot confirm a relationship between self-esteem and participants' self-face representations. Additionally, our current evidence suggests small or non-existent relationships between self-esteem and attractiveness. As a result, we have failed to support either of our primary hypotheses. However, to rule out complications due to the method itself, we have proposed various alterations—changing the ratings structure, guiding participants' self-face representations, and increasing the image comparison task's number of trials—for a future study, which may help us further understand our current observations. If these alterations don't prove significant in changing the current results, then we may conclude that self-esteem's relationship with how participants represent themselves (with regards to similarity between possible selves and attractiveness) is small, at best. Regardless, more information is needed.

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Appendix A: Modified Fundamental Needs Questionnaire

Prompt

Please rate your agreeance with the following statements.

Scale points:

-3: Strongly Disagree

-2: Moderately Disagree

-1: Slightly Disagree

0: Neither Disagree or agree

1: Slightly Agree

2: Moderately Agree

3: Strongly Agree

Belonging Subscale

1. In general, I don't feel accepted by others. (RS)
2. I tend to make connections or bond with people I interact with.
3. I often feel like an outsider. (RS)
4. Within social settings, I feel like I belong.

Control Subscale

5. I feel like I usually have control over my life.
6. When I don't have control, I tend to get frustrated. (RS)
7. I generally have a say in my behaviors or actions.
8. Many days, I feel powerless. (RS)

Self-Esteem Subscale

9. I tend to feel good about myself.
10. In general, other people perceive me as an unworthy and unlikable person. (RS)
11. I often feel inadequate. (RS)
12. I have high self-esteem.

Meaningful Existence

13. My behaviors usually have an impact on my environment.
14. I often feel non-existent when around others. (RS)
15. Generally, I feel as if my existence is meaningless. (RS)
16. My life is worthwhile.