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The Continuity Effect in Facial Attractiveness Assimilation

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Date: 2021-02-18T00:00:00+00:00

Abstract

Previous research has demonstrated that attractiveness evaluations of target faces tend to shift toward background faces, producing an assimilation effect. However, the calculation of assimilation effects often involves comparing attractiveness ratings of target faces across different contextual backgrounds without considering the attractiveness ratings of target faces when presented in isolation, potentially yielding spurious assimilation effects. The present study calculated assimilation effects using attractiveness ratings of target faces presented alone as a baseline value, and examined the influence of presentation duration and the difference in attractiveness between target and background faces on evaluations of target face attractiveness. The results revealed that individuals' ratings of target face attractiveness shifted toward the attractiveness of background faces, exhibiting a continuity effect of assimilation, such that the greater the difference in attractiveness between target and background faces, the smaller the assimilation effect.

Full Text

Continuum Effect in the Assimilation Process of Facial Attractiveness

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Abstract

Previous research has demonstrated that evaluations of target faces tend to shift toward the attractiveness level of contextual faces, producing an assimilation effect. However, calculations of this assimilation effect typically compare attractiveness ratings of target faces across different contexts without considering the baseline rating of the target face when presented in isolation, potentially yielding spurious assimilation effects. The present study calculated assimilation effects using isolated target face ratings as baseline values and examined how presentation duration and the difference in attractiveness between target and contextual faces influence attractiveness evaluations. Results revealed that individual ratings of target facial attractiveness shifted toward the attractiveness of contextual faces, exhibiting a continuum effect in assimilation—specifically, the greater the difference in attractiveness between target and contextual faces, the smaller the assimilation effect.

Keywords: facial attractiveness, similarity, assimilation effect, continuum effect

Introduction

How individuals perceive facial attractiveness has attracted considerable scholarly attention, with facial averaging, symmetry, and sexual dimorphism identified as primary factors influencing the attractiveness of individual faces (Shang et al., 2018; Kou et al., 2013). However, faces encountered in daily life rarely appear in isolation; instead, they are typically presented within social contexts alongside other faces. Numerous studies have found that attractiveness evaluations depend not only on the intrinsic features of a face but are also influenced by the attractiveness of other faces in the context, creating systematic biases in target face evaluation—known as context effects (Cogan et al., 2013; Geiselman et al., 1984; Kondo et al., 2012; Lei et al., 2020; Luo & Zhou, 2018; Pegors et al., 2015; Van Osch et al., 2015; Wedell et al., 1987).

Specifically, context effects manifest as evaluations of target attractiveness shifting toward the attractiveness level of contextual faces, producing an "assimilation effect" (Geiselman et al., 1984; Wedell et al., 1987). For example, Geiselman et al. (1984) found that target faces received significantly higher attractiveness ratings in high-attractiveness contexts compared to medium-attractiveness contexts, while ratings were significantly lower in low-attractiveness contexts (Wedell et al., 1987). However, some studies have observed that when target faces appear alongside other faces, evaluations deviate away from the attractiveness level of contextual faces, producing contrast effects (Kenrick & Gutierres, 1980). These divergent findings indicate that the influence of contextual faces on target attractiveness evaluation yields inconsistent results that warrant further clarification. Critically, through analysis of previous research designs and data analysis methods, we propose that these seemingly contradictory findings may stem from two methodological problems that confound assimilation and

contrast effects.

First, according to the definition of assimilation effects, target evaluations in context should shift toward the contextual level, showing positive correlation (Bless & Burger, 2016; Bless & Schwarz, 2010). Facial attractiveness represents a quantifiable characteristic, with each face possessing an objective baseline value to some degree. Consequently, assimilation effects in facial attractiveness evaluation should manifest as directional rating deviations from this baseline value under contextual influence (Comparison Logic 1). However, previous research has not compared baseline versus contextual ratings of target faces; instead, it merely compared ratings across different contexts (Comparison Logic 2; see Geiselman et al., 1984; Kenrick & Gutierres, 1980; Wedell et al., 1987).

Consider a medium-attractiveness face (rated T_0) as the target and a high-attractiveness face (rated C, where $T_0 < C$) as the context. If evaluation yields a target rating (T_1) higher than its original attractiveness (T_0)—that is, $T_0 < T_1 < C$—this indicates assimilation of the target evaluation toward the high-attractiveness context. If $T_1 < T_0 < C$, a contrast effect occurs. However, previous definitions of assimilation were not based on pre-post comparisons (T_1 vs. T_0), but rather on comparisons between target ratings across contexts. Specifically, if a set of targets (rated T_0) received ratings T_1 in a high-attractiveness context (C) and T_2 in a medium-attractiveness context, $T_1 > T_2$ was interpreted as assimilation, while $T_1 < T_2$ was deemed contrast—without considering the relationship between T_1, T_2, and T_0. In reality, if $C > T_1 > T_2 > T_0$, results indeed support assimilation; but the pattern $C > T_0 > T_1 > T_2$ is also possible, which actually reflects contrast effects of varying magnitude across contexts rather than assimilation. Thus, previous analytical approaches may have erroneously interpreted contrast effects as assimilation, necessitating further validation of assimilation conclusions. Additionally, beyond misinterpreting certain contrast effects ($C > T_0 > T_1 > T_2$) as assimilation, the reverse error—misinterpreting assimilation (e.g., $C > T_2 > T_1 > T_0$) as contrast—is also possible. Both possibilities suggest that the magnitude of assimilation or contrast effects varies with contextual attractiveness.

Second, previous attractiveness research has simply categorized facial attractiveness into high, medium, and low levels without systematically manipulating the continuous difference between target and contextual attractiveness, reporting only singular assimilation or contrast effects. The Inclusion/Exclusion Model (IEM) of social comparison-based assimilation/contrast effects posits that similarity between target and context influences how individuals categorize them, thereby affecting assimilation and contrast outcomes (Bless & Burger, 2016; Bless & Schwarz, 2010). This model applies to numerous comparison-related domains, including decision-making (Seta et al., 2017), self-evaluation (Bosch & Wilbert, 2020), and elections (von Sikorski et al., 2020), yet these studies have not incorporated target-context similarity (or difference) when examining context effects.

Furthermore, presentation duration influences attractiveness perception, with

shorter exposure durations yielding significantly higher attractiveness ratings than longer durations (Liu & Chen, 2018; Rashidi et al., 2012). Does contextual influence on attractiveness evaluation similarly diminish under brief presentation? If so, according to Comparison Logic 1, assimilation/contrast effects should still exist in brief conditions; yet according to previous Comparison Logic 2, brief presentation would more likely suggest absence of such effects. Therefore, we included stimulus presentation duration as an additional independent variable, with 3s as the long-duration condition and 100ms as the brief condition (100ms has proven sufficient for perceiving facial attractiveness; Willis & Todorov, 2006).

In summary, both methodological problems in previous research may confound assimilation and contrast effects. To advance understanding of facial attractiveness evaluation mechanisms from a novel perspective, this study examined how the attractiveness difference (AD) between target and contextual faces and presentation duration influence target face evaluation. Building on prior work, we tested two hypotheses: (1) facial attractiveness assimilation effects genuinely exist rather than representing misinterpreted contrast effects; and (2) assimilation effects are influenced by target-context similarity, manifesting as a continuum effect whereby assimilation magnitude progressively decreases as the difference increases, with this decreasing trend being significantly more pronounced in long-duration versus brief conditions.

Method

Participants

Using G*Power 3.1 with parameters of power = 0.8, f = 0.25, and five repeated-measure levels, the minimum required sample size was estimated as N = 21 (Faul et al., 2007). We recruited 31 university students in Beijing (15 female,* M *g = 22.52,* SD* g = 2.5). Data from one male participant who failed to follow instructions were excluded.

Stimuli

Thirty female neutral faces were initially selected from the Chinese Affective Picture System (CAPS; Wang & Luo, 2005) and internet searches, then morphed using FantaMorph 5 (www.fantamorph.com) to create a final set of 180 facial stimuli. All faces were grayscale images measuring $260\$\times300pixels, presentedona24-inch1920\times1080pixelmonitor.Twentyuniversitystudents(10female, *M*_{a}g_{e} = 20.54, *SD*_{a}g_{e} = 2.17)whodidnotparticipateinthemainexperimentratedthe180facesona0-100attractivenessscale(0 = leastattractive, 100 = mostattractive).Basedontheseratings, facesweredividedinto3groups(*M* = 76.88, *SD* = 4.42), medium(*M* = 60.40, *SD* = 5.10), andlow(*M* = 42.31, *SD* = 6.93)attractivenessgroupsof60faceseach, withsignificantdifferencesamonggroups(*F* (2, 165) = 533.18, *p* < .001, *\eta*_{p}^{2}\$ = 0.87)$.

Fifteen faces from the medium-attractiveness group served as target stimuli (M = 57.93, SD = 0.93). Using the target attractiveness values as a baseline, we

selected contextual faces with attractiveness levels 5, 10, 15, 20, and 25 points higher than the targets (AD5: $M = 63$, $SD = 1.81$; AD10: $M = 68.07$, $SD = 1.22$; AD15: $M = 73.13$, $SD = 1.41$; AD20: $M = 77.60$, $SD = 1.18$; AD25: $M = 82.60$, $SD = 1.35$).

Design

The experiment employed a 5 (attractiveness difference between target and context: 5, 10, 15, 20, 25) × 2 (presentation duration: 100ms, 3s) within-subjects design. The dependent variable was participants' attractiveness ratings of target faces.

Procedure

The trial procedure is illustrated in Figure 1 [Figure 1: see original paper]. Each trial began with a 500ms fixation point, followed by a 500ms cue arrow (← or →) indicating the target face among two faces presented on the left and right sides of the screen (the other being the contextual face) (Walker & Vul, 2014). Target position was randomized. Participants rated target attractiveness on a 0-100 scale. The experiment comprised 150 trials (5 AD levels × 2 durations × 15 targets) with block-randomized presentation duration order. Following these 150 trials, each target face was presented individually for baseline rating (T_0).

Results

To assess contextual influence on target attractiveness evaluation, we calculated T d as the difference between each participant's baseline rating of isolated target faces (T_0) and their rating of the same target in context (T_1). A T d significantly less than 0 indicated that the high-attractiveness context shifted target ratings toward the contextual level (assimilation effect); conversely, values greater than 0 indicated contrast effects.

As shown in Figure 2 [Figure 2: see original paper], under 3s presentation, significant assimilation effects emerged for AD5 and AD10 conditions, while AD15, AD20, and AD25 conditions showed non-significant but progressively decreasing negative T d values. Under 100ms presentation, all difference conditions yielded T d values significantly less than 0. Overall, target attractiveness ratings shifted toward high-attractiveness contexts, demonstrating assimilation effects.

A 2 × 5 repeated-measures ANOVA (Greenhouse-Geisser corrected) on T d revealed a significant main effect of AD, $F(2.65, 76.79) = 7.63$, $p < .001$, $^2 = .21$, indicating that target-context difference influenced evaluations. Post-hoc comparisons (Figure 2) showed that assimilation in AD25 (-2.45) was significantly smaller than in AD20 (-3.30), AD15 (-3.58), AD10 (-4.63), and AD5 (-4.93); AD20 (-3.30) was significantly smaller than AD10 (-4.63) and AD5 (-4.93); and AD15 (-3.58) was significantly smaller than AD5 (-4.93). The main effect of presentation duration was marginally significant, $F(1, 29) = 3.67$, $p = .065$, ^{2}

= .11, with stronger assimilation under 100ms (-4.85) than 3s (-2.7). The AD × Duration interaction was significant, $F(2.53, 73.48) = 5.29$, $p = .004$, $^2 = .15$.

Simple effects analysis for the 3s condition showed assimilation in AD25 (-0.51) was significantly smaller than AD20 (-1.73), AD15 (-2.30), AD10 (-4.39), and AD5 (-4.56); AD20 (-1.73) was significantly smaller than AD10 (-4.39) and AD5 (-4.56); and AD15 (-2.30) was significantly smaller than AD10 (-4.39) and AD5 (-4.56). This pattern can be summarized as AD5 (-4.56) = AD10 (-4.39) > AD15 (-2.30) = AD20 (-1.73) > AD25 (-0.51), demonstrating progressively decreasing assimilation as AD increased. No such trend emerged in the 100ms condition.

These results confirm that when medium-attractiveness targets appear alongside high-attractiveness faces, target attractiveness ratings increase, supporting assimilation effects. More intriguingly, under 3s presentation, ratings in the high-attractiveness context (AD25) (T_0-T_{25} = -0.51, thus $T_{25} = T_0 + 0.51$) were significantly lower than in the less-attractiveness context (AD5, closer to medium attractiveness) ($T_5 = T_0 + 4.56$). If AD5 approximates the medium-attractiveness condition in previous studies (e.g., Kenrick & Gutierres, 1980), their logic would have inferred contrast effects. Similarly, for the 100ms condition, previous research logic would suggest no assimilation or contrast effects. Critically, as contextual attractiveness varied continuously, assimilation effects varied correspondingly, demonstrating a continuum effect.

Discussion

Using standardized assimilation calculations and continuously manipulating target-context attractiveness differences, this study systematically examined how contextual faces influence attractiveness evaluations. Findings revealed that when target faces appear with high-attractiveness contexts, ratings shift toward contextual levels, producing assimilation effects that decrease as target-context differences increase. Additionally, presentation duration affected assimilation magnitude, with briefer exposures producing larger effects.

Consistent with Rodway et al. (2013), we found that simultaneous presentation of medium and high-attractiveness faces shifts target ratings toward contextual levels, producing assimilation. Rodway et al. (2013) demonstrated that attractive faces are underestimated in low-to-medium attractiveness contexts. Our study, using medium rather than average faces as targets, further corroborates assimilation effects in attractiveness evaluation. Why does assimilation occur? Social psychological research indicates that when individuals evaluate targets against high standards, they tend to respond more positively, producing assimilation (Mussweiler & Strack, 2000; Pelham & Wachsmuth, 1995). This aligns with the IEM model, which posits that assimilation emerges when individuals perceive common features between target and context, categorizing them together when similarity is high (Bless & Schwarz, 2010; Schwarz & Bless, 1992).

In our study, the simultaneous presentation of target and context faces in close physical proximity likely focused attention on their shared features, increasing perceived similarity and producing assimilation.

Furthermore, our results offer a potential resolution to contradictory assimilation and contrast findings in previous research (Geiselman et al., 1984; Kenrick & Gutierres, 1980; Rodway et al., 2013; Strane & Watts, 1977; Wedell et al., 1987). Higher target ratings in medium-attractiveness versus high-attractiveness contexts would be interpreted as contrast effects under previous logic. However, applying standard definitions by comparing both conditions to baseline ratings reveals that both produce ratings higher than baseline, shifting toward contextual attractiveness—thus representing actual assimilation effects.

Assimilation magnitude decreased as target-context differences increased, demonstrating a continuum effect. Correction theories of priming help explain this phenomenon. Such theories propose that individuals form initial judgments rapidly but subsequently adjust them when cognitive resources are available to seek accurate answers (Srull & Wyer, 1979; Strack, 1992; Wróbel & Imbir, 2019; Wegener & Petty, 1997). Our finding that assimilation decreased as AD increased may reflect that larger differences made target-context distinctions more salient, prompting participants to allocate remaining attentional resources to correct initial judgments, thereby reducing assimilation. Nevertheless, contextual influence persisted, as background information could not be completely disregarded.

We also found that presentation duration influenced attractiveness evaluation and assimilation magnitude, with briefer exposures producing larger assimilation effects. Under short presentation, insufficient time to process facial flaws and details that reduce attractiveness hinders detection of such features. Consequently, individuals rely more on holistic facial features, tending to report faces as more attractive (Gerger et al., 2017; Liu & Chen, 2018; Rashidi et al., 2012; Stróżak & Zielińska, 2019).

Conclusion

This study demonstrates that: (1) simultaneous presentation of target faces with high-attractiveness contexts produces assimilation effects; (2) assimilation magnitude is influenced by target-context attractiveness differences, manifesting as a continuum effect that could be misinterpreted as contrast effects without baseline reference; and (3) briefer face presentation yields larger assimilation effects.

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