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ARTICLE

Contextual cues do not facilitate spontaneous face recognition

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Abstract

Most studies examining face recognition have used explicit recognition tasks, ignoring our ability to spontaneously recognize familiar faces when they are unexpected. The current study examined spontaneous recognition of a minor and major actor from the TV show *Friends*, and the extent to which spontaneous recognition is facilitated by contextual cues. In Experiment 1, we presented images of the minor actor in the context of an ongoing face-rating task. The background scene became increasingly informative across blocks. Only half of the participants spontaneously recognized the minor actor, with no influence of context. In Experiment 2, we primed the minor actor with images of a major actor from the same show. Participants were more likely to recognize the major actor than the minor actor, both spontaneously and when explicitly asked to do so. Neither the major actor prime nor the background context increased spontaneous recognition of the minor actor. We discuss constraints on spontaneous recognition and the implications of our findings for theoretical models.

KEYWORDS

contextual cues, face recognition, priming, spontaneous recognition

It is estimated that on average people are familiar with over 5000 faces (Jenkins et al., 2018). Abundant evidence suggests that familiar face recognition is robust and highly reliable even in otherwise challenging situations (e.g. Jenkins et al., 2011; Hancock, 2021; Young & Burton, 2018). In laboratory studies, familiar faces are recognized even when distorted or disguised, after years of aging, when the images are of poor quality, or when the familiar face is of a different race than the observer (e.g. Bruck et al., 1991; Burton et al., 1999; Hole et al., 2002; Noyes & Jenkins, 2019; Zhou & Mondloch, 2016). However, most estimates of familiar face recognition are based on tasks in which participants are explicitly asked to identify whether a face is familiar, to provide the corresponding name for the person in the image, or

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to determine whether a newly learned face was previously seen in the experiment (e.g. see Bruce et al., 2001; Deveu et al., 2018; Laurence & Mondloch, 2016; Mishra et al., 2019; Russell et al., 2009). As such, these studies might overestimate our ability to spontaneously recognize familiar faces in the real world (e.g. when familiar faces are encountered unexpectedly). Here we examine spontaneous recognition of major and minor characters from a TV show and the extent to which spontaneous recognition is facilitated by contextual cues.

One previous study reported that recognition of actors who play minor characters is surprisingly poor, even in an explicit recognition task. Devue et al. (2019) examined recognition of faces from *Game of Thrones* among participants who had watched each of the eight seasons as the show unfolded. Recognition differed across levels of familiarity, such that there was better recognition for main characters, and decreased over time (i.e. was worse for actors who appeared only in early episodes) and with changes in appearance. Whereas main heroes (characters with the highest level of exposure) were almost always recognized, actors playing support roles were recognized by about 50% of participants. Devue et al. explicitly asked participants *Have you seen this face before?* As such, their findings might overestimate the ability to recognize familiar faces spontaneously (i.e. when a face is wholly unexpected). It is important to examine spontaneous face recognition as this is the task we perform in daily life (e.g. when encountering a neighbour while on vacation).

There is some evidence that speaks to spontaneous face recognition. For example, in the diary study conducted by Young et al. (1985), participants were tasked with reporting their experience in recognizing faces over the course of a week. Participants reported incidents wherein they misidentified an unfamiliar individual as being familiar; this often occurred when viewing conditions were poor. Participants also reported incidents in which they failed to recognize a familiar person; this often occurred when seeing the familiar individual in an unexpected context. These incidents were resolved when the participant spontaneously recognized their mistake, was informed that they failed to recognize someone or was greeted by the unrecognized individual.

More controlled laboratory-based experiments investigating spontaneous recognition support these findings. For example, when tasked with watching a video, which unbeknownst to participants contained their lecturer in the background, all participants failed to spontaneously recognize their lecturer immediately (Laurence et al., 2021). Recognition rates increased only slightly after watching the same video a second time and increased to merely 50% when participants were explicitly told that one of the individuals in the video was a lecturer (Experiment 2). In short, spontaneous recognition of familiar faces is fallible – especially when these faces occur outside of one's immediate attention. Here, we examined spontaneous recognition of a minor actor in each of two experiments in which participants were required to look at the actor's face as part of an ongoing task. Whereas the familiar identity in Laurence et al.'s study was presented in the background of an ongoing task, we presented the target identity among a series of faces presented one at a time. Participants were required to rate each face on trustworthiness. The target identity was James Michael Tyler who played Gunther (the coffee barista) in *Friends*. Gunther appeared throughout the 10 seasons of *Friends* and was typically seen in the context of a coffee shop, *Central Perk*. All included participants recognized Tyler when later shown an array of images of him taken from the *Friends* set. We examined how many did so spontaneously.

We also examined the influence of contextual cues on spontaneous face recognition. Young et al.'s (1985) diary study and Laurence et al.'s (2021) laboratory study both suggest that spontaneous recognition is especially fallible when a face is seen out of context (for discussions see Laurence et al., 2021; Young et al., 1985). Such contextual effects for familiar face recognition were described in the *Butcher On The Bus* thought experiment (see Mandler, 1980). The role of context also has been explored in the recognition of newly learned (familiarized) and familiar faces during explicit face recognition tasks (e.g. Brennen & Bruce, 1991; Davies & Milne, 1982). For example, familiar faces are named faster at test when participants are primed with related faces and names (Brennen & Bruce, 1991). Thus, if participants had seen Prince Andrew during a training phase, they were faster

at correctly naming Queen Elizabeth when presented with her face at test (Brennen & Bruce). Such findings are often conceptualized within the field by discussing neuroimaging findings wherein familiar faces activate areas associated with semantic or conceptual information (e.g. Bar et al., 2008; di Oleggio et al., 2021).

To examine the role of context on spontaneous recognition, we presented the to-be-rated faces on background images in each of the two experiments. Across four blocks, the backgrounds became increasingly informative – from a grey background (Block 1) to an image of *Central Perk* (i.e. a set which appears in most *Friends* episodes and with which the character Gunther is associated) with all cast members of *Friends* (Block 4). We hypothesized that spontaneous recognition would increase across blocks. The target identity would be unexpected in Block 1, but might be expected in Block 4. In Experiment 2, we also primed participants by presenting a major actor from the *Friends* television series: Matt LeBlanc, who played Joey – one of six main cast members. We hypothesized that (i) more participants would spontaneously recognize the target identity when they were vs. were not primed with another actor from the television series *Friends*, (ii) spontaneous recognition of the target identity would occur in a less informative context in the prime condition than in the no-prime condition, and (iii) spontaneous recognition would increase with familiarity with the TV show *Friends*. Both experiments received clearance from the Research Ethics Board at Brock University.

EXPERIMENT 1

Method

Participants

Our final sample comprised 48 American and Canadian participants ($N_{Female}=33$; $N_{Male}=15$; $M_{Age}=20.69$, $SD_{Age}=3.40$) who were familiar with the TV show *Friends* and recognized the target identity in a Familiarity check (see below). Participants were recruited from Brock University ($n=30$) and Prolific ($n=18$). We did not control for participant race (White: 72.9%, South Asian: 8.3%, East Asian: 4.2%, Black: 4.2%, Hispanic: 4.2%, Middle Eastern: 4.2%, Indigenous: 2.1%), as the other-race effect does not influence familiar face recognition (e.g. Zhou & Mondloch, 2016). We set out to test 52 participants who met our inclusion criteria based on an a priori power analysis ($\alpha=0.05$; $1-\beta=0.95$, chi-square goodness-of-fit test) on G*Power (Faul et al., 2007). Given our findings (see below), we stopped testing when our sample size reached 48. Participants were compensated for their time with psychology research participation credit (Brock University) or £2.25 (Prolific). To achieve a final sample of 48 participants, we recruited a total of 140 individuals with materials that did not mention familiar faces or the TV show *Friends*. Participants ($n=92$) who did not pass a Familiarity Check (see below) were excluded. All participants provided informed consent.

Stimuli

The Spontaneous Recognition Task comprised one target identity (James Michael Tyler) and nine filler identities. Tyler played Gunther in *Friends* – a character who appeared in 164 (70%) of *Friends* episodes but was not in the main cast as per the Internet Movie Database (IMDb; https://www.imdb.com/title/tt0108778/?ref_=nm_knf_c_1; retrieved on December 2025). The filler identities were White European athletes from lower-division professional leagues – prominent enough to obtain multiple face images from the internet, yet not so prominent that they would be recognized by North American participants. All face images were gathered using a Google search. We collected four images per identity

(target and fillers) for our Spontaneous Recognition Task; all were roughly front-facing ambient colour photographs that were free from any occlusions. We ensured that the images of the target identity were photographed off the set of *Friends* but taken within the final two years that the show aired on television (2003–2004).

These face images were photoshopped to 200×275 pix and fit naturally on a standardized torso wearing a plain black long-sleeved shirt. The face and torso were placed on each of four backgrounds (1200×800 pix): no context (plain grey background), low context (generic coffee shop), medium context (the *Central Perk* coffee shop set which appeared in 89% of *Friends* episodes; retrieved from IMDb on December 2025; <https://www.imdb.com/news/ni64536350/>) and high context (a still photograph from an episode of *Friends* with all six of the show's main characters present in *Central Perk*). All background images, other than the no-context background, were gathered using a Google search.

Using a Google search, we gathered five images of the target identity from scenes in which he was acting as Gunther on *Friends*. These in-character images were used to create a Familiarity Check, which directly assessed participants' familiarity with the target identity as he appeared in *Friends*. Participants who did not pass this Familiarity Check were excluded.

Procedure

Spontaneous Recognition Task

Participants were asked to rate the trustworthiness of faces on a scale from 1 (not at all trustworthy) to 9 (very trustworthy). Participants were told that we were only interested in their trustworthiness ratings of *unfamiliar* faces. They were instructed to withhold ratings and instead press a 'Familiar to me' option if they happened to recognize a face on a given trial.¹ Participants' use of the 'Familiar to me' button for the target identity was our primary measure of interest. No participants pressed this button for a filler identity.

The same 10 identities were presented in each block, but different images of each identity were shown. Thus, participants rated a unique facial photograph of each identity (i.e. the target plus nine fillers) in each of four blocks. The order in which identities were presented was randomized, with the exception that the target identity always appeared in the latter half of the trials (i.e. trials 6–10). The block in which each photograph was presented was randomized across participants.

On each trial, a face image on the standardized torso was displayed on a background, such that the face appeared in the centre of the screen. The Likert scale was placed at the bottom of the screen. A new trial began immediately following participants' response. The 'Familiar to me' option was presented in the top right-hand corner of the screen. If participants clicked the 'Familiar to me' option, they were asked to explain, in as much detail as possible, where they recognized the individual from. After doing so, participants clicked a 'Next' button to proceed. Individuals were only recorded as being familiar with the identity if they provided a response that accurately identified the target identity by name, the name of his character on *Friends* (Gunther), or any other description that clearly indicated they were familiar with the identity (e.g. the barista from *Friends*).

The background image on which the faces were presented became increasingly informative throughout the experiment: a plain grey background (Block 1, no context), a generic coffee shop (Block 2, low context), the empty *Central Perk* coffee shop set from *Friends* (Block 3, medium context), and the *Central Perk* coffee shop set with other cast members from *Friends* (Block 4, high context).

¹To ensure that participants understood the task, we asked participants to report what the instructions were for the task in a multiple-choice question immediately after the instructions. Participants were allowed two attempts. Three participants made an error on the first attempt; no participants were incorrect on the second attempt.

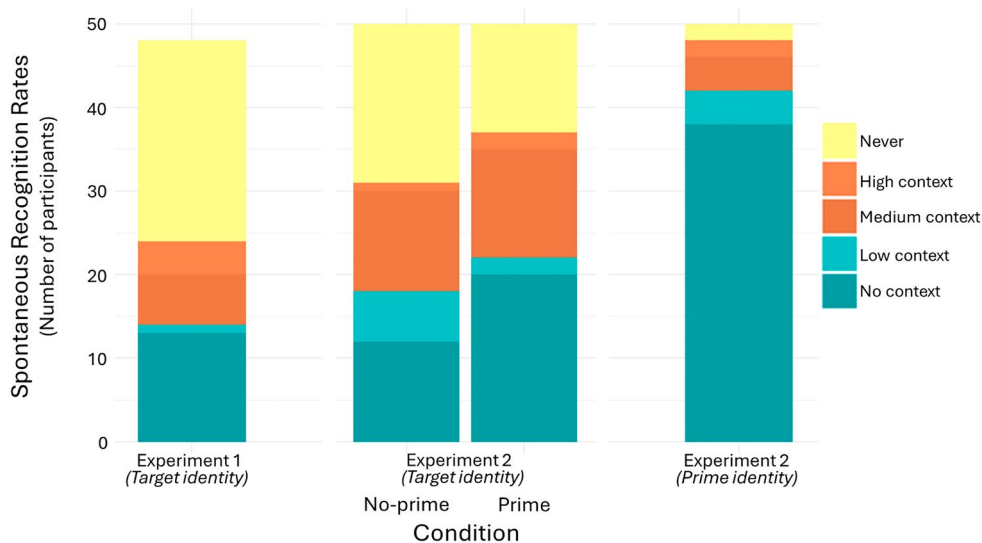


FIGURE 1 This depicts the proportion of participants who first spontaneously recognized the target identity in Experiment 1 (left-most bar) in uninformative (teal; light aqua) versus informative (rusty orange; light orange) contexts, or not at all (yellow). The corresponding data from Experiment 2 (middle bars) are also depicted for the no-prime and prime conditions. For completeness, we have also depicted the same values for the prime identity (right-most bar).

Familiarity Check

Next, participants completed the Familiarity Check, wherein they were directly asked if they recognized the target identity when shown in character. Participants were shown an array of five images of the target identity from scenes in which he was acting as Gunther on *Friends*. If participants responded that they were familiar with the identity, they were asked to provide the individual's name or any other highly identifiable information. The criteria used to evaluate familiarity in the Spontaneous Recognition task were applied here. Participants who did not pass the Familiarity Check were excluded.

Results and discussion

The data for Experiments 1 and 2 are available on OSF (osf.io/rdc5b). Of the 48 participants who passed the Familiarity Check, only 24 (50%) recognized the target identity at least once in the Spontaneous Recognition Task. To examine any influence of context, we collapsed across Blocks 1 and 2 (uninformative contexts) and Blocks 3 and 4 (informative contexts). Fourteen participants (29.17% of the 48 participants) spontaneously recognized the target identity in an uninformative context; 10 (29.41% of the remaining 34 participants) first did so within an informative context. A chi-square goodness-of-fit test revealed that the proportion of total participants who recognized the target identity in Blocks 1 and 2 vs. Blocks 3 and 4 did not differ from what would have been expected if the distributions were equal, $\chi^2(1) = 0.67, p = 0.41, BF_{01} = 2.92$. See Figure 1. Notably, 50% of participants never spontaneously recognized the target identity – despite seeing him four times, twice in the context with which he was associated in *Friends* (i.e. Blocks 3 and 4).

Experiment 1 yielded two key findings. First, spontaneous recognition was surprisingly poor. Only half of the participants who passed the Familiarity Check (i.e. who recognized the target identity when shown an array of images taken from *Friends*) spontaneously recognized the target identity when shown images taken off set (i.e. when the target was not in character). Second, contextual cues did not lead to a marked improvement in spontaneous recognition. More than half of the participants who spontaneously

recognized the target identity first did so when he was shown in an uninformative context (i.e. on a grey background or in a generic coffee shop). Of the 34 participants who did not recognize the target identity spontaneously in these uninformative contexts, only 10 did so when the target was presented in an informative context, despite having seen the target identity in at least two previous blocks.

Experiment 1 raises important questions. First, we presented in-character images in our Familiarity Check, but out-of-character images in the Spontaneous Recognition Task. Although our findings suggest that spontaneous recognition is poor, an alternative explanation is that participants would not have recognized these out-of-character images even if directly asked to do so (i.e. that spontaneous recognition is limited by explicit recognition). Second, Tyler played a relatively minor character in *Friends*, though he appeared in 70% of the episodes. Whether spontaneous recognition improves with familiarity (e.g. for an actor playing a major character) remains unknown. Evidence that major characters are better recognized than minor characters in explicit recognition tasks (Devue et al., 2019) suggests that more familiar faces are more likely to be recognized spontaneously. Third, our findings suggest that spontaneous recognition is poor even when a face is primed by a context in which it might be expected. Whether spontaneous recognition improves when that same face is primed by images of another actor from the same show remains unknown. We addressed each of these questions in Experiment 2.

EXPERIMENT 2

The primary aim of Experiment 2 was to examine whether spontaneous recognition of a familiar minor character would be enhanced if primed with a major character from the same show. Participants completed the Spontaneous Recognition task from Experiment 1. Participants in the prime condition saw an image of Matt LeBlanc, the actor who played Joey – one of six main cast members who appeared in every episode of *Friends*, before seeing the target identity (Tyler) in each block. Participants in the no-prime control condition did not see LeBlanc. Although semantic priming (i.e. the effect wherein perceiving one identity influences the accuracy or speed with which a subsequent identity is recognized) is short-lived (Young & Bruce, 2024), we hypothesized that spontaneous recognition of the target identity would be higher in the prime than no-prime condition. The prime was intended to alert participants to the possibility of familiar faces, highlighting the TV show *Friends*. The benefit of this priming would be evident if more participants recognized the target identity in the prime condition and/or if they did so in a less informative context. We also hypothesized that spontaneous recognition of both identities would be higher in informative than uninformative contexts and examined whether the prime identity was spontaneously recognized more often than the target identity.

To enhance our conclusions, we added an Explicit Recognition Task and Manipulation Checks. After completing the Spontaneous Recognition Task, participants completed an Explicit Recognition Task. Here, we showed participants all 40 images from the Spontaneous Recognition Task and explicitly asked them whether each face was familiar. We measured the number of images (maximum=4) of the target and prime identities that each participant recognized. This allowed us to confirm that the prime was highly recognizable (i.e. suitable as a prime) and determine whether the prime was more recognizable than the target – a pattern that would shed light on any differences in spontaneous recognition. The Explicit Recognition Task also allowed us to examine two possible explanations for poor spontaneous recognition. If the number of images recognized during the Explicit Recognition Task exceeds the number of images recognized during the Spontaneous Recognition Task, we can conclude that spontaneous recognition per se is poor. If the number of images recognized during these two tasks is comparable, we can conclude that spontaneous recognition is poor because the target identity is not familiar.

After completing the Explicit Recognition Task, we conducted two Manipulation Checks. First, we showed participants an array of the target identity images from the Spontaneous Recognition Task to obtain a dichotomous measure of recognition comparable to the Familiarity Check. If participants passed

the Familiarity Check (i.e. recognized in-character images) but not the Manipulation Check (i.e. did not recognize out-of-character images), then failures of recognition during the Spontaneous Recognition Task would be attributable to an inability to generalize from in-character to out-of-character appearance (see Devue et al., 2019 for similar findings in a study examining explicit recognition of actors from *Game of Thrones*). We also showed participants an array of the prime identity images from the Spontaneous Recognition Task (prime condition only) and the two versions of the *Central Perk* background (with and without characters). We did this to verify that participants recognized the prime identity and the informative background scenes.

Finally, we created a questionnaire to measure participants' familiarity with *Friends* (e.g. watch occasionally vs. binge watch often). This allowed us to examine whether familiarity with *Friends* was associated with increased spontaneous recognition.

Methods

Participants

Our final sample comprised 100 participants ($N_{\text{Male}} = 36$; $N_{\text{Female}} = 62$; $N_{\text{Other}} = 2$; $M_{\text{Age}} = 32.40$ $SD_{\text{Age}} = 4.27$; White: 50%, South East Asian: 14%, Black: 7%, Hispanic: 7%, South Asian: 5%, Indigenous: 3%, Middle Eastern: 4%, Mixed Race: 2%, Undisclosed: 8%) recruited from Prolific. The sample size was determined using a Bayesian sequential design as suggested by Schönbrodt and Wagenmakers (2018). In line with previous approaches for sequential testing (e.g. Ben-Yakov et al., 2022; Davis et al., 2024), we first tested a total of 25 participants in each condition (prime vs. no prime) who passed the Familiarity Check. We then tested participants in groups of 5 per condition until either the appropriate amount of evidence for our analysis of interest (an influence of the prime on spontaneous recognition) was met (i.e. BF_{01} or $BF_{10} \geq 6$ for the null or alternative hypothesis) or until our predefined maximum number of participants had been tested (i.e. $N = 50$ per condition). An additional 180 participants were excluded because they did not pass a Familiarity Check (see below). Participants were compensated with £2.25 for their time. All participants provided informed consent.

Stimuli and measures

In addition to the stimuli that were used in Experiment 1, we gathered nine images of the prime identity (Matt LeBlanc) under the same restrictions as in Experiment 1. LeBlanc played Joey in *Friends* – a character who appeared in 234 (100%) of *Friends* episodes as indicated on IMDb (https://www.imdb.com/title/tt0108778/?ref_=nm_knf_c_1; retrieved on December 2025). The four images used in the Spontaneous Recognition Task were natural photographs (taken between 2003 and 2004) that were captured when LeBlanc was not on the set of *Friends*. The five images used in the Familiarity Check were gathered from scenes where LeBlanc was acting as Joey on the set of *Friends*.

Friends TV Show Familiarity Questionnaire

We developed a *Friends* TV Show Familiarity Questionnaire to examine whether participants' reported level of familiarity with the TV show was related to their spontaneous recognition of the target. Items included: 'Have you ever seen the TV show *Friends*?', 'When did you last watch *Friends*?', 'How often do you watch *Friends*, currently?', 'How often did you watch *Friends* when originally playing on cable TV?'. Participants received an Experience Score that could range from 0 (never having seen *Friends*) to 14 (e.g. having watched *Friends* within the last two days, often multiple times a week, binge watching *Friends* multiple times and having watched it when it originally aired). One participant opted out of completing this questionnaire.

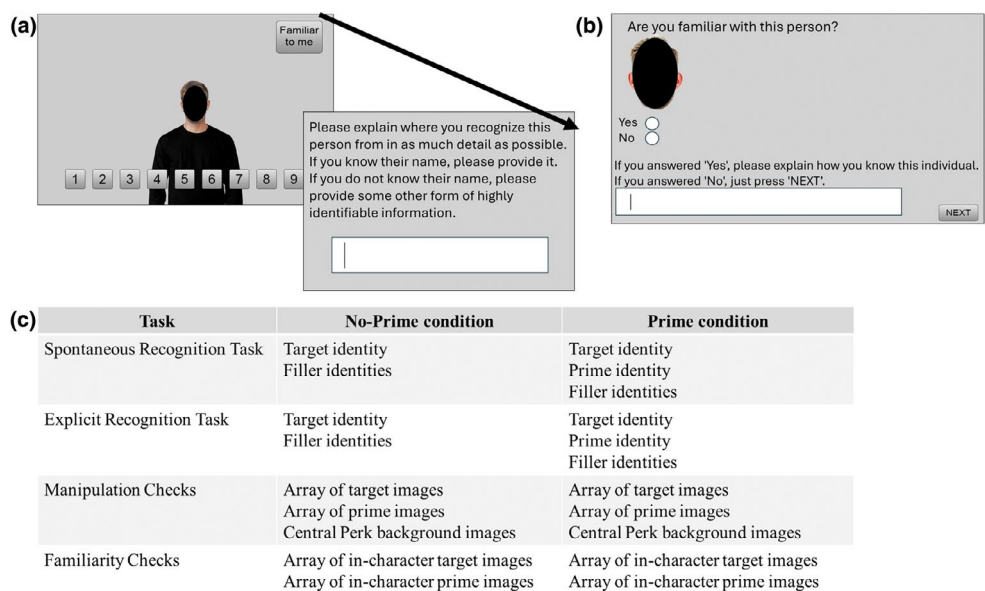


FIGURE 2 (a) Represents a trial from Block 1 of the Spontaneous Recognition Task, including the prompt that would follow if participants selected the ‘Familiar to me’ response. (b) Represents a trial from the Explicit Recognition Task, followed by the prompt that would follow if participants selected Yes. Note that for copyright reasons, we cannot display the models’ faces or the background images used. (c) Outlines the procedure in the two conditions.

Procedure

Spontaneous Recognition Task

Participants completed the same Spontaneous Recognition Task as in Experiment 1. Participants were randomly assigned to one of two conditions: no-prime or prime. The no-prime condition was the same as Experiment 1. In the prime condition, one of the filler identities was replaced by the prime identity. The prime identity was always randomly presented on Trials 2 to 4; the target identity was always randomly presented on Trials 6 to 10. This ensured that the prime would never be seen on the first trial of a block or immediately preceding the target identity. The ‘Familiar to me’ response button was moved to cover the face of Joey (Matt LeBlanc) in the background of Block 4. This placement was consistent across blocks.² See Figure 2.

We recorded whether each participant spontaneously recognized the target and (in the prime condition) prime identities at least once. Participants who did so were given a Context Score out of four based on the context in which they first spontaneously recognized the identity. A Context Score of 4 signified that a participant first recognized the target when presented on the no-context (grey) background (i.e. when the target identity was wholly unexpected). A Context Score of 1 signified that a participant first recognized the target when presented on the high-context background (i.e. *Central Perk* coffee shop with the main characters).

Explicit Recognition Task

Next, participants completed an Explicit Recognition Task wherein they were shown the 40 face images from the Spontaneous Recognition Task again, without the presence of the backgrounds or torso. Participants were asked to indicate whether each face was familiar or unfamiliar. We did this to

²Just as in Experiment 1, participants in Experiment 2 completed a multiple-choice question where they reported the task instructions prior to the Spontaneous Recognition Task. Participants responded to the same question a second time, after the Spontaneous Recognition Task.

determine participants' ability to recognize the prime and target images when explicitly asked. The target identity was presented on the seventh trial in each block. In the prime condition, the prime identity was presented on the fourth trial of each block. Participants who indicated they were familiar with a face were asked to explain in as much detail as possible from where they recognized the individual. We calculated an Explicit Recognition Score for both the target and prime identity based on the number of images (max = 4) of each identity recognized.

Manipulation Checks

Next, participants in both conditions completed the same Manipulation Checks. These were designed to confirm that the informative background scenes and prime identity were familiar using a dichotomous measure. For completeness, we also showed the target identity. All images in the Manipulation Checks were taken from the Spontaneous Recognition task and shown in the following order: an array of the four images of the target identity; an array of the four images of the prime identity; the *Central Perk* image devoid of characters (as in Block 3 of the Spontaneous Recognition Task); the *Central Perk* image with the main cast of *Friends* (as in Block 4). On each trial, participants were asked to indicate whether they were familiar with the identity or background in the photographs. Participants who indicated they were familiar with a person or scene were asked to explain the source of recognition in as much detail as possible.

Familiarity Checks

Participants then completed the Familiarity Check for both the target and prime identities. As in Experiment 1, these in-character images were taken from *Friends*. All participants included in our final analyses passed the Familiarity Check for the target identity (see above). All but one participant (no-prime condition) passed the Familiarity Check for the prime identity. This person recognized the prime identity but did not meet our strict criterion of explicitly stating that they recognized him from *Friends*. Participants completed the *Friends* TV Show Familiarity Questionnaire.

Results

Unless otherwise noted, all analyses were pre-registered on AsPredicted (<https://aspredicted.org/5ka6zm.pdf>).

Manipulation checks

The informative context images were highly recognizable. Only seven participants failed to recognize the *Central Perk* image on one ($n=4$) or two ($n=3$) trials. Likewise, 98 participants recognized the prime identity. Thus, both the informative background scenes and the prime identity were highly recognizable. The results described below do not change when participants who were inaccurate on these Manipulation Checks were excluded.

Across both conditions, 78³ of the 100 participants explicitly recognized the target identity in the Manipulation Check (i.e. when presented with the array of out-of-character images from the spontaneous recognition test); 22 ($n_{\text{prime}}=8$; $n_{\text{no-prime}}=14$) failed to do so despite passing the Familiarity Check (i.e. despite recognizing images of the target when taken from the set of *Friends*). This suggests that some participants may fail to recognize the target identity spontaneously because they do not recognize him in out-of-character images even when explicitly asked.

³One of these participants indicated having seen the target earlier in the task as opposed to identifying the target as Gunther from *Friends*. We credited this participant with passing the manipulation check based on having met our strict criterion of spontaneous recognition.

Spontaneous recognition

No participant spontaneously recognized a filler identity. Spontaneous recognition rates for the prime identity were high. All but two participants (96%) in the prime condition recognized the prime identity in at least one block of the Spontaneous Recognition Task (Block 1: 76%, Block 2: 84%, Block 3: 90%; Block 4: 96%) – confirming that LeBlanc should have functioned well as our prime. In contrast, across both conditions 68 of the 100 participants recognized the target identity at least once. Ten participants did not spontaneously recognize the target identity despite passing the Manipulation Check; 22 participants failed to recognize the target both spontaneously and in the Manipulation Check. We note that the spontaneous recognition rates for the target identity are higher here than in Experiment 1 – an effect that is likely driven by the timing of Tyler's death, and the resulting media coverage when we began testing for Experiment 2. Thus, 68 of the 78 (87.18%) participants who might be expected to recognize the target identity spontaneously did so.

Effects of priming

We first investigated whether the probability of spontaneous recognition varied across prime conditions. A chi-square test showed that the proportion of participants who spontaneously recognized the target identity at least once across the four blocks did not differ across prime conditions, $\chi^2(1) = 1.65$, $p = 0.20$, odds ratio = 1.74, $BF_{01} = 9.80$. The proportion of participants who spontaneously recognized the target in the prime condition ($n = 37$; 74%) and no-prime condition ($n = 31$; 62%) was similar.

We next examined whether participants in the prime condition first recognized the target identity in a less informative context than participants in the no-prime condition. We did so using context scores, wherein the highest score (i.e. 4) meant that a participant first recognized the target on a grey background, and the lowest score (i.e. 1) meant that a participant first recognized the target on the most informative context. As such, we only included participants who recognized the target in the Spontaneous Recognition Task. An independent samples t -test revealed that context scores for participants in the prime condition ($M = 3.08$, $SD = 1.06$) did not differ from those in the no-prime condition ($M = 2.94$, $SD = 0.96$), $t(66) = 0.59$, $p = 0.56$, $d = 0.14$, $BF_{01} = 3.46$. Thus, despite being recognizable, the prime identity did not increase the number of participants who spontaneously recognized the target identity or facilitate recognition in less informative contexts.

Effects of context

We next investigated whether the proportion of participants who recognized the target in the prime and no-prime conditions varied across uninformative (i.e. grey or generic coffee shop) vs. informative contexts (i.e. *Central Perk*, *Friends* cast). Forty of 100 participants (40%) spontaneously recognized the target identity in an uninformative context; 28 (46.66% of the remaining 60 participants) first did so within an informative context. A chi-squared analysis confirmed that the proportion of participants who recognized the target in uninformative vs. informative contexts was similar in both the prime and no-prime conditions, $\chi^2(1) = 0.02$, $p = 0.88$, odds ratio = 1.02, $BF_{01} = 3.42$. An exploratory goodness-of-fit chi-square analysis collapsed across conditions found no difference between our observed frequencies for participants who first recognized the target in the informative (60.30%) and uninformative (39.70%) contexts, compared to those that would be expected if the distributions were equal, $\chi^2(1) = 2.88$, $p = 0.09$, $BF_{01} = 1.59$.⁴

⁴This null effect is even more prominent when prime groups are analysed separately $ps > 0.21$, $BF_{01}s > 2.10$.

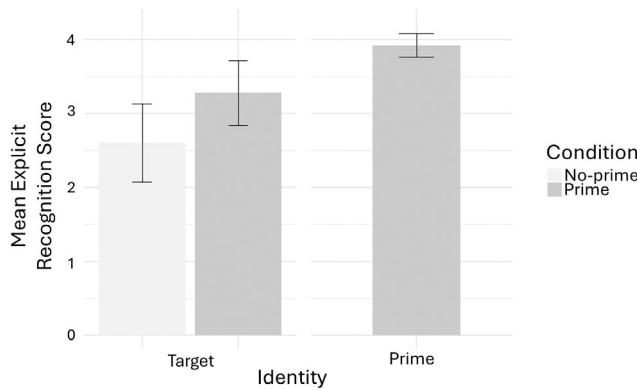


FIGURE 3 Depicts the mean Explicit Recognition Scores across the no-prime (light grey) and prime (dark grey) conditions for the target identity (left-most bars) and for the prime identity (right-most bar). Error bars represent 95% CI.

Effects of familiarity

To investigate whether participants' familiarity with the TV show *Friends* predicted the context in which the target was spontaneously recognized, we correlated Context Scores with Experience Scores from the questionnaire. Context Scores were not related to participants' experience with the TV show *Friends*, $r(67)=0.07$, $p=0.55$, $BF_{01}=3.83$.⁵

We also conducted exploratory analyses to examine whether spontaneous recognition in the prime condition varied across the prime (highly familiar) vs. target (less familiar) identities. An exploratory McNemar test confirmed that the proportion of participants in the prime condition who spontaneously recognized the prime vs. target differed significantly ($p<0.001$). Participants were more likely to recognize the prime ($n=48$) than the target identity ($n=37$) at least once in the Spontaneous Recognition Task. These effects were supported by a paired samples t -test investigating Context Scores. Context Scores were greater for the prime ($M=3.65$, $SD=0.82$) than the target identity ($M=3.08$, $SD=1.06$), $t(36)=3.40$, $p=0.002$, $d=0.56$, $BF_{10}=20.01$, suggesting that the prime identity was recognized in less informative contexts.

Explicit recognition: exploratory analyses

In the Manipulation Checks, 98 of 100 participants recognized the prime identity and 78 recognized the target identity. To further examine explicit recognition, we conducted three exploratory analyses.

Effects of familiarity

We first examined whether participants in the prime condition were more likely to recognize the prime identity (a main character) than the target identity (a minor character) in the Explicit Recognition Task. To do so, we analysed participants' Explicit Recognition Scores. A paired samples t -test revealed that participants were better able to recognize the prime identity ($M=3.92$, $SD=0.57$) than the target identity ($M=3.28$, $SD=1.55$); $t(49)=3.06$, $p=0.004$, $d=0.43$, $BF_{10}=9.06$ (see Figure 3). A McNemar test confirmed that the proportion of participants who had explicitly recognized the prime vs. target identity at least once differed significantly, $p=0.008$. Participants were more likely to recognize the prime ($n=49$) than the target identity ($n=41$) at least once in the Explicit Recognition Task.

⁵As reflected by an exploratory independent t -test, participants in the prime condition were no more familiar with *Friends* than those in the no-prime condition, $t(97)=-0.07$, $p=0.95$, $d=-0.001$.

Effects of prime

We next examined whether explicit recognition of the target identity was better in the prime vs. no-prime condition. An exploratory independent samples *t*-test revealed that explicit recognition of the target identity did not differ across the prime ($M=3.28$, $SD=1.55$) and no-prime conditions ($M=2.66$, $SD=1.86$); $p=0.07$, $d=0.56$, $BF_{01}=1.12$. A chi-square test confirmed that the number of participants who recognized the target identity at least once in the Explicit Recognition Task did not differ across the prime ($n=41$) and no-prime ($n=34$) conditions, $\chi^2(1)=2.61$, $p=0.11$, odds ratio = 2.12, $BF_{01}=1.32$.

Differences in explicit and spontaneous recognition

An exploratory McNemar test confirmed that the proportion of participants who recognized the target identity at least once differed across the Explicit and Spontaneous Recognition Tasks, $p=0.04$. Participants were more likely to recognize the target identity in the Explicit Recognition Task ($n=75$) than the Spontaneous Recognition Task ($n=68$).

Discussion

Experiment 2 replicates the key findings of Experiment 1. Spontaneous recognition of the target identity was less robust than explicit recognition. Further, priming the target identity with an informative background image did not facilitate spontaneous recognition. Experiment 2 extends these findings to show that spontaneous recognition is less robust than explicit recognition even when the target is primed by images of another actor from the same show.

Our inclusion of an Explicit Recognition Task and Manipulation Checks that used the same out-of-character images as the Spontaneous Recognition Task allows for a more nuanced interpretation of our findings. One can consider explicit recognition of these images as the upper limit for spontaneous recognition. From that perspective, nearly 90% of participants who might be expected to recognize the target spontaneously did so. This is comparable to what we observed for the prime identity; 98% of participants who might be expected to recognize him spontaneously did so. Our findings suggest that spontaneous recognition is less reliable, at least in part, because out-of-character images are hard to recognize, even when directly asked to do so – even among participants who recognize in-character images (see Devue et al., 2019 for a similar finding).

Our inclusion of the prime identity allowed us to examine whether spontaneous and explicit recognition improves with familiarity. Explicit recognition was better for the prime (main character) than target (supporting character) identity. Spontaneous recognition was also better for the prime identity but, as noted above, this effect is likely partially attributable to differences in explicit recognition. Evidence that major characters are better recognized than minor characters in explicit recognition tasks is also consistent with Devue et al. (2019). We discuss the implications of these findings in the General Discussion.

GENERAL DISCUSSION

Contemporary estimates of the robustness of familiar face recognition are based on tasks in which participants are explicitly asked to identify whether a face is familiar, to provide the corresponding name or to determine whether a newly learned face was previously seen in the experiment (e.g. see Bruce et al., 2001; Devue et al., 2019; Laurence & Mondloch, 2016; Mishra et al., 2019; Russell et al., 2009). Very few studies have examined spontaneous recognition of familiar faces, despite the importance of spontaneous recognition in social and applied (e.g. in law enforcement) settings. To our knowledge, only two studies have investigated spontaneous recognition; both showed that it can be error prone (Laurence et al., 2021; Young et al., 1985). The current study examined spontaneous recognition of

minor and major characters from the TV show *Friends*, and the extent to which spontaneous recognition is facilitated by contextual cues.

Spontaneous recognition: Adequate, but fallible

In Experiment 1, 50% of participants spontaneously recognized the target identity, a minor character who appeared in all seasons of *Friends*; 68% of participants did so in Experiment 2. Despite these recognition rates being poor relative to those observed for familiar faces in explicit tasks (e.g. Hole et al., 2002; Jenkins et al., 2011; Noyes & Jenkins, 2019; Zhou & Mondloch, 2016), they are surprisingly good relative to Laurence et al. (2021) who reported that no participants spontaneously recognized the familiar face when first asked. We suggest two possible explanations. First, the higher rate of spontaneous recognition in the current study might be attributable to how faces were presented. Whereas Laurence et al. presented the familiar face surreptitiously in the background, we presented the familiar face in the centre of the screen and required participants to rate its trustworthiness – thus ensuring that attention would be allocated to the face. This suggests that familiar faces may not capture attention when they are peripheral to an ongoing task and wholly unexpected. Second, it is possible that the ‘Familiar to me’ button caused participants to consider familiarity, despite our instructions that all faces were expected to be unfamiliar—an aspect of our design that was essential to measure spontaneous recognition.

Nonetheless, many participants in the current study failed to recognize the target identity spontaneously. Their failure to do so is partially attributable to the nature of the stimuli presented during the spontaneous recognition task, all of which were out-of-character images. All participants included in our analyses were familiar with the target identity as he appeared on *Friends*, as confirmed in our Familiarity Check (i.e. an array of four in-character images). Out-of-character images might be harder to recognize than in-character images because they fall outside of the participants’ experience (see Devue, 2019 for evidence that similarity to in-character appearance influences explicit recognition). Experiment 2 afforded us an opportunity to determine the extent to which spontaneous recognition was limited by the ability to recognize out-of-character images vs. spontaneous recognition per se. (We did not collect this information in Experiment 1.) Explicit recognition of out-of-character images was imperfect; 75 of 100 participants recognized the target identity at least once in the Explicit Recognition Task and 78 did so in the Manipulation Check (when shown an array of out-of-character images). Thus, approximately 90% of participants who were able to recognize out-of-character images did so spontaneously, suggesting that spontaneous recognition is largely constrained by explicit recognition, at least when a face is attended to and the image is potentially recognizable.

Despite being good, several findings suggest that spontaneous recognition is fallible. First, 10% of participants who recognized the target at least once in the Explicit Recognition Task, did not do so spontaneously. Second, whereas approximately three of four images were recognized in the Explicit Recognition Task ($M=2.97$, $SD=1.73$, collapsed across the prime and no-prime conditions), only two of four images were recognized spontaneously ($M=1.99$, $SD=1.62$). Thus, approximately one of every three recognizable images were not recognized spontaneously. In short, spontaneous recognition is not limited entirely by explicit recognition. While both explicit and spontaneous recognition likely operate on shared mechanisms, spontaneous recognition might be less optimized. Below we discuss the influence of familiarity and context on spontaneous recognition.

The influence of familiarity

In Experiment 1, we elected to examine spontaneous recognition of a minor character to avoid ceiling effects. In Experiment 2, we included images of a main character. Images of the main character served as a prime and allowed us to examine whether spontaneous recognition is more likely for a highly familiar face. The results of Experiment 2 provide compelling evidence that familiarity influences both explicit and spontaneous face recognition. All but one participant in the prime condition recognized

the prime identity in the Explicit Recognition task and all but two participants did so spontaneously. Indeed, 84% of participants spontaneously recognized the prime identity in an uninformative context (Blocks 1 and 2). Thus, despite being wholly unexpected in Blocks 1 and 2, most (but not all) participants spontaneously recognized a highly familiar face. These findings are entirely consistent with Devue et al. (2019) who reported better (and more confident) recognition of actors who played main characters vs. supporting roles.

The influence of context

Our second aim was to examine the extent to which spontaneous recognition is facilitated by contextual cues. This question was inspired by previous proposals suggesting that spontaneous recognition of familiar faces might fail when faces are seen out of context (e.g. Laurence et al., 2021; Young et al., 1985). In the current study, participants were as likely to first recognize the target identity in an uninformative context (Blocks 1 and 2) as in a highly informative context (Blocks 3 and 4), despite the informative context being the primary setting in which the target identity was encountered on *Friends*. Furthermore, priming the target face with a highly familiar face from the same TV show (alerting participants to the possibility of familiar faces being presented and priming the cast of *Friends*) did not increase spontaneous recognition of the target identity. Participants in the prime condition of Experiment 2 were not more likely to recognize the target identity than those in the no-prime condition nor were they more likely to do so in a less informative context. Our findings suggest that when a familiar face is wholly unexpected, contextual cues may not improve spontaneous recognition.

We do not know whether contextual cues would have increased explicit recognition of our target identity because we presented faces on plain grey backgrounds during the Explicit Recognition Task. Previous evidence that context plays a key role in the explicit recognition of familiar and recently learned faces predicts that it might have done so here (e.g. Akan & Benjamin, 2023; Bar et al., 2008; Brennen & Bruce, 1991; Davies & Milne, 1982; di Oleggio et al., 2021; Watkins et al., 1976).

Theoretical implications and future directions

Our findings, along with those of Young et al. (1985) and Laurence et al. (2021) call for more work examining spontaneous face recognition. Doing so is challenging. Participants need to be recruited who are familiar with the to-be-recognized identity without alerting them (i.e. without screening for familiarity). In the current study, we had to reject between one half and two thirds of participants because they failed the Familiarity Check which is both costly and time consuming. Nonetheless, spontaneous recognition captures the task faced in daily life and is worthy of investigation.

Second, our findings add to a growing call for incorporating familiarity into models of face recognition (see Burton, 2013; Young & Burton, 2018) and highlight the need for a more nuanced approach. Most studies have treated familiarity as a dichotomous variable (e.g. Jenkins et al., 2011; Noyes & Jenkins, 2019; Zhou & Mondloch, 2016). While there have been hints of these gradations in the face learning literature (e.g. Baker & Mondloch, 2023), these gradations in familiarity have been largely ignored (see Wiese et al., 2024 for a discussion). A notable exception is Devue et al. (2019) who provided compelling evidence that degree of familiarity matters. Participants' confident recognition (vs. a mere feeling of knowing) of actors from *Game of Thrones* was limited to the most prominent actors. Likewise, participants in the current study were more likely to recognize the prime identity (a main actor) than the target identity (a supporting actor) in both the Spontaneous and Explicit Recognition Tasks. More research is needed to examine whether personally significant people (e.g. family members, best friends) are spontaneously recognized more reliably than actors and lecturers. This is entirely plausible given the rich perceptual and semantic representations of highly familiar people. Such studies could provide further insight about the extent to which spontaneous recognition is constrained by explicit recognition.

A new theory proposed by Devue and de Sena (2023) suggests a way forward. Devue and de Sena argue that initial representations of a newly encountered face include only coarse features (e.g. head silhouette, hairstyle, pattern of inner features), a cost-effective mechanism for face learning. Representations incorporate fine features (e.g. details of the eyes or mouth) over time, and only for faces that vary in appearance (i.e. faces for which such detailed representations are necessary for recognition). Their theory suggests that the fallibility of spontaneous recognition of the target identity reported here might be attributable to participants having a coarse representation. Tyler was not a widely known actor outside of *Friends* and, on *Friends*, he did not frequently change his appearance and was almost always encountered in the same location. Future research should examine the extent to which spontaneous recognition varies with the density and duration of experience with an identity and the type of representation possessed.

Third, our findings raise questions about the role of context in face learning and recognition. As noted above, encountering a face (almost) exclusively in a single context may lead to a coarse representation because the context might serve as a cue to identity, mitigating the need for a finer representation. Several studies suggest that conceptual information facilitates face learning by activating the social brain network (Schwartz & Yovel, 2016, 2019; Shoham et al., 2022). A role for conceptual information is consistent with Bruce and Young's (1986) model in which there is a bi-directional relationship between the Face Recognition Unit and the Person Identity Node. For this reason, we expected spontaneous recognition to increase significantly when the target identity was presented in the context of *Central Perk* – the coffee shop in which he was almost always encountered, and when presented after the Prime identity – a major actor from the same show. We anticipated that these contexts would activate the Person Identity Node for Tyler, lowering the threshold for spontaneous recognition. Nonetheless, our finding aligns with an anecdote described by O'Reilly (2023). On 5 July 1982, Elton John was the headline act at an outdoor event in St. Louis (USA). Faced with the task of getting Elton John to the backstage area in the non-stadium venue, security banked on the fallibility of spontaneous recognition; they hid Elton John in plain sight. He walked through the hotel lobby unrecognized and then through the concert crowd dressed as a police officer among fellow officers. Not one person recognized him. This failure of spontaneous recognition is attributable to Elton John's appearance differing from his flamboyant stage appearance and to a limousine surrounded by security serving as a decoy. In short, like the lecturer in Laurence et al.'s study, Elton John was not expected and was probably not attended to.

One limitation of our study is that we only have a behavioural measure of spontaneous recognition and participants were instructed that all faces were expected to be unfamiliar. It is possible that some participants recognized the target identity but were uncertain given our task instructions and so failed to report doing so. Many sources of external information (e.g. cost of a recognition error, target frequency, conceptual information; Baker & Bindemann, 2026; Stabile et al., 2024; Mueller et al., 2024; Ünäl et al., 2025) are weighted when making identity decisions. Context might influence the amount of evidence that one requires to make a recognition response (Stanislaw & Todorov, 1999; Summerfield & Egner, 2014).

Event-related potentials provide a fruitful avenue to explore these questions. Two event-related potentials, the N250 and the Sustained Familiarity Effect (SFE), are larger for personally familiar than unfamiliar faces, even when identification is incidental (Wiese, Anderson, et al., 2022; Wiese, Ingram, et al., 2019; Wiese, Tüttenberg, et al., 2019). These components are also observed for familiar members of other visual categories (Wiese et al., 2023). Both components are influenced by level of familiarity (Wiese, Tüttenberg, et al., 2019; Wiese, Hobden, et al., 2022; Wiese et al., 2024). Whereas the N250 and SFE were absent for images of British royals (Wiese, Tüttenberg, et al., 2019), both components were robust for images of favourite, but not disliked, celebrities (Wiese, Hobden, et al., 2022). Indeed, the N250, but not the SFE, was indistinguishable for images of highly personally familiar people and favourite celebrities. Wiese and colleagues suggest that the N250 is associated with the activation of a perceptual representation, while the SFE is associated with the retrieval of identity-specific knowledge. These results provide important insights about our findings. Our target identity was a minor character in *Friends* and unlikely to achieve the status of favourite celebrity. Participants might have had a less robust perceptual representation of his face and/or lacked a rich semantic representation. In contrast,

for many *Friends* fans, Matt LeBlanc might be characterized as a favourite celebrity, leading to automatic activation of both a perceptual representation and identity-specific knowledge. To identify the extent to which spontaneous recognition is limited by the activation of a perceptual representation vs. activation of semantic knowledge, future research could compare the N250 and SFE in participants who did vs. did not spontaneously recognize a specific facial identity. Doing so would also further clarify the extent to which the fallibility of spontaneous recognition is linked to explicit recognition. Robust N250 and SFE components for highly personally familiar faces also predict that such faces would be spontaneously recognized in our task, even in the absence of contextual cues. Nonetheless, Young et al.'s diary study suggests that in daily life people can fail to spontaneously recognize even highly personally familiar faces, suggesting some independence.

SUMMARY

Across two experiments we report that both spontaneous and explicit familiar face recognition vary with degree of familiarity. Participants were less likely to recognize out-of-character images of the less vs. highly familiar celebrity, an effect that might reflect a less robust perceptual representation and/or less semantic knowledge. Spontaneous recognition was less reliable than explicit recognition and was not facilitated by the presentation of a highly familiar and semantically related face (i.e. a cast member from the same show) or by contextual cues. Future research should examine spontaneous recognition of highly personally familiar faces to better capture real-world face recognition.

AUTHOR CONTRIBUTIONS

Kristen A. Baker: Conceptualization; investigation; writing – original draft; methodology; writing – review and editing; formal analysis; supervision; data curation; validation; visualization. **Vincent J. Stabile:** Conceptualization; investigation; methodology; writing – review and editing; formal analysis; data curation; software. **Catherine J. Mondloch:** Conceptualization; investigation; funding acquisition; writing – original draft; writing – review and editing; methodology; project administration; supervision; resources.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in OSF at https://osf.io/rdc5b/overview?view_only=1d889f9c37fe403f8aa16cb2077e99ef.

ETHICS STATEMENT

Brock University, Canada. (21-020). This is the link to the project which contains the data from both experiments: osf.io/rdc5b.

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