Adaptive Memory: Investigating the Survival Processing of Faces

by

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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

It has been consistently found that words exhibit a mnemonic benefit when processed according to their relevance to a survival scenario (Nairne, Thompson, & Pandeirada, 2007). However, when Savine, Scullin, and Roediger (2011) tested this survival processing effect for faces, they were unable to obtain the effect. If memory evolved to aid survival, then memory for threatening individuals should be enhanced. This study examined whether the survival processing effect would be obtained for faces if they were processed according to a threat-focused scenario, modified from that of Savine et al. (2011), rather than a standard survival scenario. This hypothesis was tested in a between-subjects design, utilizing male and female faces, and two different threat scenarios along with a control scenario. A marginally significant survival processing effect for faces was obtained.

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Introduction

The adaptive memory paradigm, an extension of the functionalist perspective of William James, began as an endeavor to determine why memory works as it does (Nairne, Thompson, & Pandeirada, 2007). Taking an evolutionary perspective, they speculated that memory evolved as adaptive systems that functioned to retain information relevant to fitness and survival. The encoding of information in such a way into our memory systems has been termed *survival processing*, and Nairne et al. (2007) surmised that survival processing may result in better retention of information than other forms of processing.

In the paradigm, written words are typically presented to a participant in relation to one of several scenarios, and rated on the basis of relevance to that scenario. Normally these scenarios include a survival scenario – in which participants are normally asked to imagine being stranded in a foreign grassland and need to manage their survival – and a control scenario. The control scenario is typically a moving scenario, where the participant is instructed to imagine moving to a foreign land; it does not make reference to any life-critical situations. Afterwards, participants are asked to recall the presented words. Survival processing should result in better overall retention. Nairne et al. (2007) produced a number of experiments to determine whether the survival scenario produced greater subsequent recall, and found a robust survival processing effect across experiments. Survival processing at encoding produced greater subsequent retention than processing information according to other forms of deep processing, such as a moving scenario, or pleasantness ratings, and even self-referential processing. The effect was found for both between and within subjects manipulations of scenario, and also for recognition in addition to recall. The conclusion: memory systems are tuned to remember information relevant to survival.

The survival processing effect has been replicated in multiple laboratories (Bell, Röer, & Buchner, 2013; Kang, McDermott, & Cohen, 2008; Nairne, Pandeirada, & Thompson, 2008; Soderstrom & McCabe, 2011; and so on). Nairne et al. (2008) compared the effect of survival processing against other forms of deep processing, including generation and intentional learning, and found that survival processing produced superior retention. Survival processing was found to be effective in children as well (Aslan & Bäuml, 2012; Otgaar & Smeets, 2010), which would be expected of an evolutionary adaption.

It could be thought that, if survival processing is an adaptive mechanism, it should be especially effective when we encounter situations our ancestors faced. Weinstein, Bugg, and Roediger (2008) produced results supporting this view when they examined whether the effect is due to schematic processing, by pitting the typical grasslands scenario against a survival scenario in which participants had to imagine trying to survive in a modern city. They found superior recall for survival processing in the grasslands scenario. This superior effect of the ancestral scenario over the modern scenario was also found by others (Nairne, Pandeirada, Gregory, & Van Arsdall, 2009; Nairne & Pandeirada, 2010) suggesting that the conditions that our ancestors faced still exhibit some kind of ancestral priority in our processing, referred to by Klein (2013) as an "environment of evolutionary adaption" (p. 50), or EEA.

However, it should be noted that the "ancestral priorities" viewpoint is not without opposition; for example, Soderstrom and McCabe (2011) found no differences between grasslands and city survival scenarios – and instead found a superiority effect for any conditions which included zombie attackers. Olds, Lanska, and Westerman (2014) also compared grassland and city survival scenarios and found no difference, whereas Kostic, McFarlan, and Cleary (2012) compared the grassland survival scenario to various other non-grassland survival scenarios and found no evidence for ancestral priorities. Klein (2013) compared the grasslands survival scenario to an unspecified-environment survival scenario and found no difference between them; and Howe and Derbish (2014) found that survival processing resulted in greater susceptibility to the false memory illusion, which may not be expected of an adaption meant to aid survival by enhancing memory. There seems to be results that are inconsistent with the ancestral priorities account.

The survival processing effect was also found for pictures in addition to words, though it was found that the survival scenario in this case also produced the greatest number of distortions in addition to the highest recall (Otgaar, Smeets, & Van Bergen, 2010; see Howe & Derbish, 2014). Interestingly, pictures were found to result in greater recall than words in the adaptive memory paradigm. Perhaps this too can be considered support for the ancestral priorities account, as our ancestors were more likely familiar with concrete objects whereas written language is a relatively recent development, with the first writing system dating back to Mesopotamia, circa 3200 BC – although the Vinča signs from 5300-4300 BC and the Near Eastern tokens dating as far as 8000 BC suggest that written language had been under development for a little while before that (Daniels & Bright, 1996). Continuing from this line of thought, it should be feasible to apply the adaptive memory paradigm to other domains that are evolutionarily relevant and may exhibit an ancestral priority, such as the processing of faces. Savine, Scullin, and Roediger (2011) did just this, when they attempted to find a survival processing effect for faces. Over five experiments, they had participants consider a scenario – survival or other – and presented to participants a series of faces, and had them rate the faces according to their relevance to the scenario they read. This was followed by a distraction task of playing Tetris, which in turn was followed by a surprise recognition test.

In their first experiment, following Kang et al. (2008), Savine et al. (2011) pitted the survival scenario against a bank heist scenario. Participants were instructed to rate how helpful the faces appeared in aiding them in their task (helping them survive or rob a bank). No survival processing effect was found, though it should be noted that the authors used artificial computer generated male faces rather than pictures of real faces. For their second experiment, they used pictures of real faces, reduced the duration of the distraction task from ten minutes of Tetris to five minutes, and included a source memory test to see if the context a face was encountered in could be remembered. The scenarios were a survival hunting vs. a modern hunting competition (drawing on the idea of environmental ancestral priorities). Again no significant effect was found. Their third experiment compared survival and moving scenarios (see Nairne et al., 2007, for moving scenario as control). No effect was found. For their fourth experiment, they considered that rating faces on how helpful they may be to aid one's survival may not be the most efficient approach, and considered rating faces for how potentially threatening they were. Therefore, in their fourth experiment, they utilized two scenarios: in one, the survival-help scenario, participants were told to imagine being in the grasslands of a foreign land with other individuals. These individuals could be helpful in aiding their survival, and the participants had to rate how helpful they appeared to be. In the other scenario, the survival-threat scenario, participants had to consider that the other people with them in the grasslands could be potential threats to their survival, and they had to rate how potentially threatening the faces appeared. Even so, no effect was found. For their fifth experiment, they did another survival vs. moving manipulation, but this time with descriptive statements paired with each face, and memory for faces and statements was tested separately. Although a survival processing effect was found for statements, it was not found for faces. In all experiments, memory for faces did not approach ceiling, so the inability to find a survival processing effect cannot be due to ceiling effects. In the end, no survival processing effect was found for faces in any of their experiments.

Assuming that memory is an adaptive mechanism, one that would aid in survival, it may be rather odd for there to be survival processing effects for written words (a relatively modern invention) but not for faces. Bell et al. (2013), while trying to investigate the proximate mechanisms in adaptive memory, found that the effect obtained for concrete words but not for abstract words. These results are understandable, as questions about the function and utility of objects have little relevance to abstract ideas like courage. Perhaps the reason Savine et al. (2011) found no survival processing effect for faces is because the scenarios were ill-designed to invoke the effect for faces. Just as asking how useful an abstract word is in a survival scenario doesn’t aid subsequent recall for that word, perhaps the way face processing and recognition has been utilized in the adaptive memory paradigm is also a design flaw? It may be that face recognition evolved to process the emotions of others, in order to aid survival and fitness. Memory for faces would thus have developed with a different function than memory for objects, and recognizing faces should serve a different purpose than recognizing objects. It may be that faces that are encoded and processed in more suitable ways than “helpfulness” would be remembered with greater accuracy. Viable candidates for more “suitable” processing may include memory for potential reproductive mates or memory for antagonistic and dangerous individuals. In their fourth experiment, Savine et al. (2011) found no difference between survival-help and survival-threat processing, however, that doesn’t necessarily mean threat has no function in face processing, within or without the adaptive memory paradigm. It should also be noted that the faces used in their experiment were static and intently lacking emotional expression, which could hamper the strength of the manipulation if emotion processing is a key factor in face processing.

Attention research shows that threatening faces are detected more quickly than neutral or happy faces in a visual search task (Hansen & Hansen, 1988; Öhman, Lundqvist, & Esteves, 2001; Fox et al., 2000; Tipples, Atkinson, & Young, 2002), which Hansen and Hansen (1988) and Öhman et al. (2001) interpreted as indicating parallel search for threatening faces but serial search for non-threatening faces. Similar results have been found with other threatening stimuli, like snakes and spiders (Öhman, Flykt, & Esteves, 2001). Threat advantage in face processing has also been found in the memory literature. When participants are primed into a self-protection state, their memory for racial out-group faces was enhanced (Becker et al., 2010). Furthermore, Mattarozzi, Todorov, and Codispoti (2014) found that faces perceived as trustworthy or untrustworthy were better remembered than emotionally neutral faces. Moreover, they found that untrustworthy faces were better remembered than trustworthy faces. They also found that the context – pleasant or unpleasant – the face appeared in (in their case, a newspaper headline paired with the face, describing some descriptive fact of the face owner) also had effects on memory. Kinzler and Shutts (2008) found that children, when presented with neutral faces of people claimed to have done something nice or something mean, exhibited superior memory for faces of people reported to have done mean things.

Within the adaptive memory literature, we see contradictory accounts of the function of threat in survival processing. Bell, Röer, and Buchner (2014) compared function-oriented and threat-oriented survival processing scenarios against each other to determine whether object function or threat is a more viable proximate mechanism for the survival processing effect. They found that processing items in terms of how well they facilitate avoidance of threat (object function) resulted in greater recall than processing them according to how well they hinder threat avoidance (threat processing). Furthermore, they found no differences between the threat-oriented scenario and a control scenario. Olds et al. (2014), in contrast, found that as threat level increased, so did the magnitude of the survival processing effect. Why might there be such divergence in their findings? First, in the threatening scenario, Bell et al. (2014) had participants either process items according to how much they hindered avoidance of negative risks or facilitated avoidance of those risks, but the threat level of the threat-oriented scenario could not have been different from that of the function-oriented scenario, as the scenarios were otherwise identical. For example, a participant might be asked to rate how well a basket or a giraffe would either hinder or facilitate the avoidance of starvation, dangerous animals, or physical injury (Bell et al., 2014). In a sense, it could be said that the items in the "threat" scenario were not being processed according to threat, but according to function – but rather than usefulness, uselessness. The items themselves were rated on a scale of how dangerous they were (on account of hindering the avoidance of harm), but I would argue that the real danger was not the items themselves but the threats they failed to prevent. Second, Bell et al. (2013) found evidence that negativity and mortality salience did not contribute to a survival processing effect. It may be possible that the scenarios in Bell et al. (2014) may unintentionally draw too heavily on mortality salience or negativity, as the risks in the scenarios included "starvation, homelessness, dangerous animals, disease, [and] physical injury" (p. 4); these scenarios already have far more negativity than the typical survival scenario. To be fair though, the function-oriented scenario also had these risks, so this explanation is perhaps less credible than the first.

Still a question of why the discrepancy exists in the literature is central. I have argued that the Bell et al. (2014) study had nearly equal levels of threat in its threat and function oriented scenarios, which would also explain why Olds et al. (2014) found a survival processing effect with increasing levels of threat. But why was no survival processing effect found in a face-threat scenario? The answer may lie in the presentation of the threat. As mentioned before, Becker et al. (2010) found that when participants were primed so that they were *already* in a mental state of self-protection from threat, faces of outgroup members were better remembered. Kinzler and Shutts (2008) found that when children were presented facial images of people said to have *already* committed a threatening action, memory for those faces was enhanced. Mattarozzi et al. (2014) also used faces that had *already* been reported to have performed some act, good or bad. In these studies, the owner of the face was either reported to have done some threatening action, or the participants were already primed into a state of self-protection. In other words, participants were in such a mindset that the faces represented not a *potential* threat, but an *actual* threat. It may be that memory for individuals considered to be actual threats is superior to memory for individuals considered to only be possible threats. This may also be why Olds et al. (2014) found that as threat level increases in a survival scenario, so too increases subsequent recall – it could be that increasing the level of threat may serve to make the threat less of a possibility and more of an actuality, and therefore more memorable. In Savine et al.'s (2011) fourth experiment, the faces in the survival-threat condition were only *potential* threats. The possibly antagonistic individuals whose faces were represented on screen were never reported to have done anything antagonistic.

Assuming that facial recognition processes are specialized to perform certain functions, and that memory for individuals known to be threats is one such function, then it may be that a survival scenario in which faces represent established rather than potential threats may yield superior memory in a subsequent recognition task. This study examines this possibility, by pitting survival-threat scenarios against a control scenario in which the faces presented in the threatening scenarios are established, rather than potential, threats. Due to the conflicting results of “ancestral priorities”, as measured by scenario environment, we also examined whether environment type (grassland or city) has any effects on the survival processing of faces.

Method

Participants

A total of 202 (147 female, 55 male) University of Waterloo undergraduate students participated for course credit. Participants had normal or corrected to normal vision. Each participant was tested individually in sessions lasting approximately 20 minutes.

Materials and design

Stimuli consisted of 64 faces (32 studied, 32 unstudied), with an equal number of male and female faces, taken from the AR Face Database (A.M. Martinez & R. Benavente, CVC Technical Report #24, June 1998). The faces that were used were selected on a pseudorandom basis of each having a neutral facial expression and lacking any distinguishing features, such as jewelry. All participants were presented with the same 32 faces in random order.

Procedure

The experiment consisted of three phases. In the first phase, the rating phase, participants were instructed to read a scenario that appeared on a computer monitor. They were then required to rate a series of faces that appeared on screen, using a scale of 1 to 5, reflecting how relevant they found each face to be to the scenario (1 meaning “not at all relevant”, to 5 meaning “very relevant), using the number keys. Thirty two faces were presented in the rating phase. Each face stayed on the screen until either the participant responded, or until five seconds had passed, at which point the next face appeared. Participants were not told that their memory was going to be tested. The scenarios were based on those by Savine, Scullin, and Roediger (2011); some modifications were made. The scenarios can be found in the appendix.

The second phase consisted of the participants playing Tetris on the computer for five minutes as a distraction. Participants were instructed to continue playing in the event of a "game over", until the five minutes had passed. Time elapsed was recorded by the experimenter.

In the third phase, the participants were informed that they would be presented another series of faces, some of which were faces from the first phase. They were instructed to indicate whether each face had been previously presented ("old") or whether the face had been presented for the first time ("new") via keystroke. The list consisted of 64 faces, 32 of which were the faces used in the first task, and 32 were unstudied lures. Each face appeared on screen until either a response was made or five seconds had passed.

Results

Of the original 236 participants, data from 1 participant were excluded from data analysis as the participant never finished the experiment; data from 8 participants were excluded for inadequate response in the encoding phase (failure to rate 10 or more of the 32 faces); data from 7 participants were excluded because they gave the same rating to all or nearly all faces; data from 8 participants were excluded for being RT outliers in either the encoding phase or the recognition phase (2.5 standard deviations away from the grand mean); and 10 were excluded for having a total accuracy rate of 0.2 or less in the recognition phase – as an accuracy score of 0.0 indicates equal hit and false alarm rates, and means the participant may have been guessing.

Accuracy was defined as hit rate minus false alarm rate, yielding a maximum possible score of 1 and a minimum possible score of -1. Participants were randomly assigned to either to the control scenario (n = 66), the threat scenario (n = 67), or the survival-threat scenario (n = 69).

Any facial stimuli that had a score more than 2.5 standard deviations away from the mean were removed from analysis. Data from 1 face were removed from analysis for yielding too high a hit rate among participants; data from 1 face were removed from analysis for yielding too many false alarms; and data from 1 face were removed from analysis as an outlier for encoding phase RT (participants spent too long studying the face).

Following Öhman and Dimberg (1978), who found that participants exhibited superior conditioning of angry male faces than angry female faces to aversive stimuli, we performed the analyses to investigate differences in processing for male and female faces. See Table 1 for rating, encoding phase response times, and subsequent accuracy means.

	Scenario Type					
	Ancestral Threat		Modern Threat		Moving	
	Male Faces	Female Faces	Male Faces	Female Faces	Male Faces	Female Faces
Hit Rate	.74	.78	.75	.76	.72	.72
	(.16)	(.11)	(.18)	(.14)	(.18)	(.16)
FA Rate	.20	.19	.20	.19	.21	.19
	(.14)	(.13)	(.15)	(.14)	(.14)	(.13)
Accuracy	.54	.59	.55	.57	.50	.53
	(.18)	(.18)	(.23)	(.19)	(.20)	(.18)
Mean Rating	3.11	2.17	3.06	2.09	2.87	2.9
	(.65)	(.56)	(.67)	(.54)	(.64)	(.70)
Mean RT	1801	1710	1825	1808	1669	1667
	(442)	(430)	(480)	(193)	(410)	(419)

Table 1 Accuracy by condition and gender of presented face. Also included are hit rates, false alarm (FA) rates, mean ratings, and response times (RT) of the rating phase.

Rating Phase

A 3×2 mixed design ANOVA – with scenario treated as a between-subjects variable and gender of face treated as a within-subjects variable – found a significant interaction of scenario types and face-gender on rating, $F(2, 199) = 37.44$, $MSE = 0.28$, $p < 0.001$, $\eta_p^2 = .27$, an effect of scenario, $F(2, 199) = 7.19$, $MSE = 0.50$, $p < 0.01$, $\eta_p^2 = .07$, and an effect of face-gender on rating, $F(1, 199) = 140.32$, $MSE = 0.28$, $p < 0.001$, $\eta_p^2 = .41$. Male faces were found to be consistently rated higher than female faces in both the ancestral threat ($M = -.94$, $SD = .73$), $t(68) = -10.73$, $p < .001$, $d = 1.55$, and modern threat conditions ($M = -.97$, $SD = .63$), $t(66) = -12.63$, $p < .001$, $d = 1.60$. Ratings between male and female faces did not differ in the control condition, p

= .83. A parallel 3×2 mixed design ANOVA also found a marginally significant face-gender effect in rating times, F(1, 199) = 4.66, MSE = 39,194, p = 0.065, η_p^2 = .02, with male faces taking longer to respond to. There was no effect of scenario (p = .13) and no interaction (p = .139).

Recognition Test

A 3×2 mixed design ANOVA found face-gender effects for accuracy, F(1, 199) = 4.48, MSE = 0.02, $p < 0.05$, η_p^2 = .02, with female faces remembered with greater accuracy, but no effect of scenario type was found. As performance on the modern and ancestral threat conditions did not differ from each other, the two threat conditions were collapsed. A linear contrast, weighing the total accuracy ratings of both threat scenarios together and comparing them to the control condition, found a marginally significant effect of scenario, t(199) = -1.88, p = 0.061, d = .28. The threat conditions tended to yield greater accuracy (M = .56, SD = .15) in recognition than the control condition (M = .52, SD = .16).

Regression: Encoding Phase RT and Recognition

A linear regression at the item level was performed to see if time spent studying a face predicted subsequent recognition for that face, but no effect was found, R^2 = 0.02, F(1, 29) = 0.55, $p > 0.5$. See Figure 1.

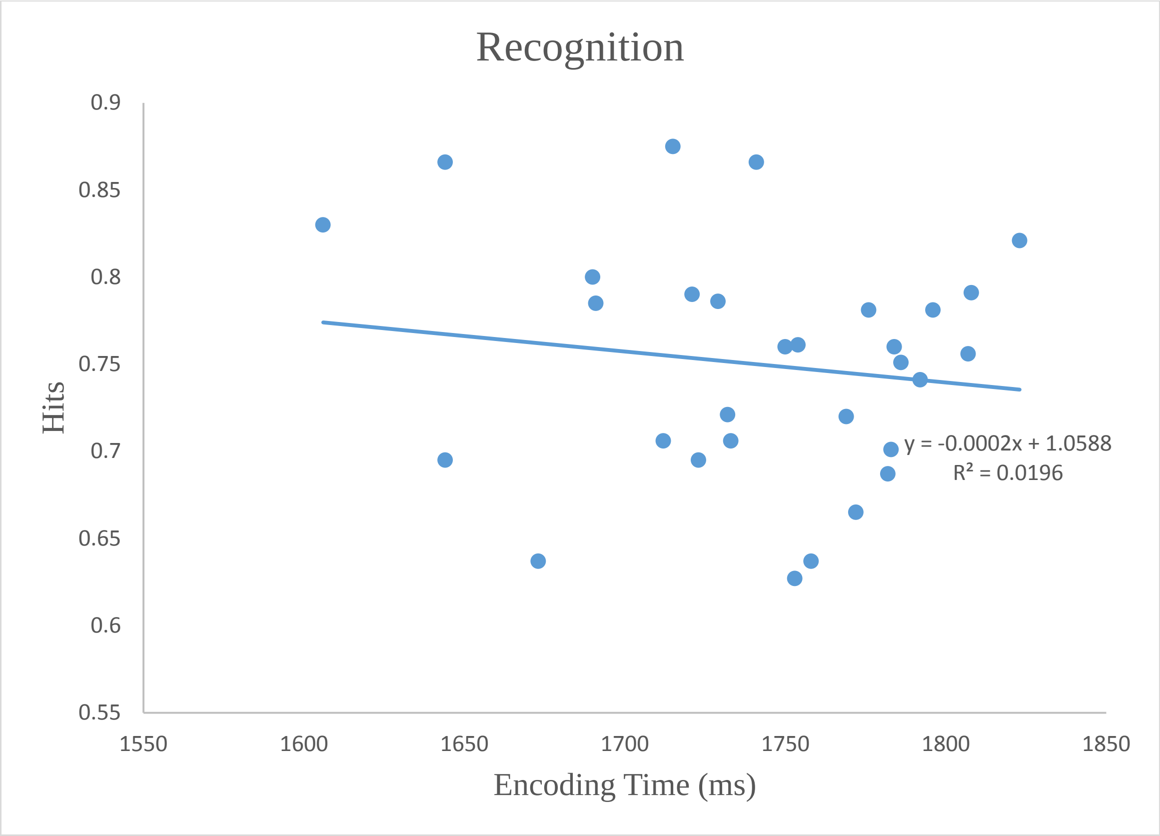

Figure 1 Scatterplot showing the mean hit rate as a function of time spent studying each face

Regression: Scenario type and Encoding Phase RT on Accuracy

A multiple linear regression at the subject level was performed to determine the effects of both scenario type and encoding phase RT on subsequent accuracy. A significant effect was found, $R^2 = .10$, $F(2, 199) = 10.77$, $p <.001$. Time spent studying the faces was a significant predictor of face recognition accuracy, $\beta = .30$, $t(199) = 4.392$, $p < .001$, whereas scenario type was not found to be a significant predictor, $p = .39$.

Discussion

The present study investigated the effect of survival processing on face recognition. Previous studies have found that the survival processing effect is robust and applies to written words (Nairne et al., 2007) and even pictures (Otgaar et al., 2010). However, even though one might expect the survival processing effect to extend to memory for faces as an adaptive mechanism, previous research failed to support this claim (Savine et al., 2011). In this study, under the hypothesis that memory for established threats may be greater than memory for potential threats, we were unable to find evidence to support the claim that survival processing has beneficial effects for facial recognition memory within a context of threat, although marginally significant effects were found.

The effect sizes found, particularly that of scenario type on accuracy, were admittedly small. The subject level regression showed that time spent studying a face is a more reliable predictor of subsequent accuracy than the scenario type. On the other hand, it could be that threat processing recruits encoding resources, and as a result encoding phase time differences could reflect scenario type differences. The effect sizes by Nairne et al. (2007) in the survival processing of words were larger; their between-subjects experiment 1 obtained a significant effect of condition on recall, η_p^2 = .09, and their within-subjects experiment 2 also obtained a significant effect, η_p^2 = .31. A within-subjects design might be better suited to test survival processing of faces.

Response times in the encoding phase tended to be longer for the survival-threat conditions than for the control condition. This is consistent with the hypothesis that when participants suspected an individual to be a threat, they attended more to that individual's face than when the individual was supposedly a help. It has been shown already that faces considered to be threats are associated with an attentional advantage in detection time (e.g., Öhman et al., 2001), therefore that faces would be attended to longer should not be surprising. Even so, one might expect that if the faces in the survival-threat conditions were studied longer, there should be an accompanying benefit to recognition. Why this was not the case could be due to various factors. It could be that threat processing is too similar to mortality salience – which was shown to not be effective – in which case we might expect recognition not to be enhanced (Bell et. al., 2013).

We constructed two types of threat scenario – ancestral and modern threat – in order to investigate if the notion that the grassland scenario exhibits an "ancestral priority" applies to the survival processing of faces. Recognition accuracy did not differ between threat scenario environments; both threat scenarios displayed approximately equal levels of recognition accuracy. However, it may be too early to say that the ancestral priorities account doesn't apply to memory for faces, as no overall effect was found. If another experiment were conducted which implemented changes into the design (such as those briefly outline below), then it would be possible to determine the feasibility of the "ancestral priorities" account.

Response times to male faces in the threat conditions were not mediated by scenario type (ancestral or modern) and male faces generally took longer to respond to than female faces, perhaps indicating that male faces are considered threatening regardless of context. This could indicate deeper levels of processing, but if that were the case the recognition phase should have yielded greater accuracy for male faces, which was not the case. The speculation that male faces are seen as more threatening regardless of context is supported by the finding that male faces are consistently rated as more threatening than female faces (Table 2). If males are generally seen as more dangerous or threatening, response time to male faces would not be mediated by scenario type. This could be one reason why no support for the "ancestral priorities" account was found.

It could be that the lack of significant effect of scenario type on memory may be due to the materials of the experiment. All the faces in this experiment (and in the one by Savine et al.,

2011) were faces with neutral expressions. There is evidence to support the hypothesis that certain basic emotions, such as anger, are universally recognized by specific facial configurations (Ekman et al., 1987). If face perception evolved to detect specific kinds of information from facial features – for example, threat cues – one might expect that these features should be present in order to be detected. Assuming that the perception of anger or other facial cues was part of the development of the detection of threat from human faces, the use of only faces with neutral expressions would not be expected to elicit as large an effect, or any effect. It may certainly be that a survival processing study of faces would only show an effect when the faces exhibited relevant emotional facial configurations; alternatively, if evolution has developed our perception of facial expressions to such a high degree, it may be redundant to try to find an interaction of the effects of facial expression and scenario type. Another experiment, utilizing facial expressions as a factor, might be able to determine if such an interaction can be found.

In the present experiment threat was used as the primary factor for survival processing of faces. It could very well be that threat by itself is not a significant factor in survival processing. Some of the previous studies would support this; Bell et al. (2013) found that mortality salience and negativity was not a factor, and Bell et al. (2014) did not consider threat-orientation to be an effective factor in survival processing. It may be that there are other mechanisms that would be more suited to obtaining a survival processing effect for faces – reproduction perhaps being an adequate candidate. An adaptive memory study utilizing reproduction as a proximate mechanism could potentially manifest an effect for faces.

The possibility that memory for faces is too well developed already, so that any beneficial effect that survival processing might have would not contribute to the already complex memory systems we have for recognizing human faces, was considered. However, as most participants did not reach ceiling in the recognition test, this is not likely the case. Another speculation may be that from an evolutionary standpoint, memory for groups – rather than particular faces – would benefit from the survival processing effect. If this is the case, group membership might be a more viable route to investigate than faces. One possible way to test this might be to present participants with two sets of faces in a survival scenario, where one set would be labeled as members of the participant's own group and the other set labeled as members of another group or tribe. Afterwards, a random member of either the participant's group or the outsider group is said to have either helped the participant or harmed the participant. The participant would then be presented with all faces from both sets and asked to label them according to which group they were claimed to be in. If matching of faces to the outsider group is more accurate than matching faces to the participant's own group when a particular member of that group has been claimed to have harmed you, this could be seen as evidence supporting the survival processing effect for faces within the context of group membership.

One substantial change with this study is that it introduced a new dimension to the design. Savine et al. (2011) only used male faces, whereas this study used equal numbers of male and female faces. It is possible that the introduction of female faces could have changed the experiment design too substantially. It is possible that, if male faces are seen as more threatening than female faces as the results indicate, the survival processing effect may have been diluted. For future experiments it may be prudent to include only male facial stimuli.

Further improvements to the study design may include using only faces with emotional expressions, particularly anger, and seeing if this would increase the magnitude of the survival processing effect. Another avenue for research may be to test the adaptive memory paradigm for faces in regards to other likely proximate mechanisms, for instance reproductive success rather than threat.

Conclusion

Within reason, we suggested that when faces of individuals were claimed to represent established, actual threats, the survival processing effect would be found. However, the results of this experiment do not support that hypothesis. It is possible that the neutrality of the facial expressions are counterproductive to the function of facial processing of emotions, in which case emotive faces would fare better. It is also possible that memory for group membership would benefit from survival processing, and facial processing would be only a component of memory for groups. As no recognition effect was found, the "ancestral priorities" mechanism as a factor of survival processing could not be supported or denied. Even though the intended result was not found, this study provides direction for future research in the area of survival processing of faces.

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Appendix A

Scenario Types

Control In this task we would like you to imagine that you are planning to move to a new home in a foreign land. Over the next few months, you'll need to locate and purchase a new home and transport your belongings. We would like for you to imagine that there is another individual moving with you. We are going to show you a set of faces of whom the person may be. We would like you to rate how helpful this person would be in aiding you in your move. Some of the people may be helpful and others may not - it's up to you to decide.

Threat In this task we would like you to imagine that you are stranded in a city of a foreign land. The city is poverty stricken and its inhabitants are desperate. You've found temporary lodging, but over the next few months you'll need to find steady financial resources. We would like for you to imagine that there other people close by in the city. Individuals in this city are known to be hostile, and a person has already tried to attack you. You will need to determine how much of a threat this person is to your survival. We are going to show you a set of faces of whom the person may be. We would like you to rate how threatening each person might be in this situation. Some of the people may be threats to your survival and others may not - it's up to you to decide.

Survival-threat In this task we would like you to imagine that you are stranded in the grasslands of a foreign land, without any basic survival materials. Over the next few months, you'll need to find steady supplies of food and water and protect yourself from predators. We would like for you to imagine that there other people in the grasslands with you. Individuals in this land are known to be hostile, and a person has already tried to attack you. You will need to determine how much of a threat this person is to your survival. We are going to show you a set of faces of whom the person may be. We would like you to rate how threatening each person might be in this situation. Some of the people may be threats to your survival and others may not - it's up to you to decide.

Appendix B

Participant Data

Encoding Phase

		Rating		RT	
Scenario	Participant	Female Face	Male Face	Female Face	Male Face
Moving	3	4	2	1419	1639
	6	3	3	2266	2362
	9	2	4	2037	1870
	14	3	3	1946	1664
	15	3	3	2035	1898
	18	3	3	1252	1567
	21	3	3	2239	2262
	24*	5	5	722	826
	27	3	2	1302	1216
	33	4	2	1677	1569
	36	3	3	1984	1830
	39	2	2	2056	1840
	42*	5	5	1724	944
	45*	5	5	1053	1011
	48*	3	4	1646	2340
	51*	3	3	2848	2538
	54*	3	2	2839	3072
	57*	1	1	987	1045
	60	3	3	2377	2033
	63	2	4	1671	1505
	66	2	2	1950	2124
	69	3	3	2091	2022
	72*	2	1	1805	1517
	75	3	2	1502	2286
	79	3	4	1866	1853
	82	2	3	1672	1606
	85	2	3	1867	1621
	88	1	2	1006	1426
	91	3	3	1223	1250
	94	4	3	1582	1767
	97	3	2	1189	1173

100	4	3	1312	1214
103*	4	3	1358	1412
106	2	3	1474	1920
109	3	4	1316	1444
112	2	2	1244	1416
115	2	3	1320	1529
118	1	4	914	1226
121	3	3	1429	1343
124	2	3	1866	1969
127*	3	3	1929	1139
130	2	4	1969	2143
133	3	2	1619	2047
136	3	3	2815	2472
139	2	2	852	1078
142	3	3	1217	1278
145	3	3	1298	1402
148	3	3	1407	1628
152	3	1	1931	1292
154	2	4	1614	1800
157	4	3	1318	1185
160	3	3	1480	1423
163	3	3	1737	1865
166	2	1	1096	900
169	4	3	1719	1815
172*	3	2	570	438
175	4	4	1543	1313
178	4	3	1154	1396
181	3	3	1101	951
185	3	3	949	806
188	3	3	1578	1256
191	4	3	2335	2208
194	4	4	1441	1933
197	3	3	1780	2516
200	4	4	1997	1862
203	2	5	1609	1192
206	3	3	1597	1731
207	4	3	2432	2463
210	3	3	2055	1758
213	4	3	1291	1495
216	4	3	1551	1498
219*	2	2	1616	1349

	222	3	2	1759	1722
	223	3	3	1755	1791
	226*	3	1	1126	912
	229	3	3	2045	1694
	232	2	3	1919	1888
	235	4	3	1633	1823
	238	4	3	1091	1477
	25247*	0	0	0	0
Ancestral Threat	2	3	4	1847	1446
	5	2	3	2214	2439
	8	3	3	1050	1592
	11	3	4	2522	2480
	13	2	2	1677	1705
	17	3	3	1623	1659
	20	2	4	2994	2786
	23	2	3	1342	1781
	26	2	3	1799	1587
	31	2	3	1801	1956
	35	2	2	1677	2191
	38	2	3	2837	2198
	41	2	2	1467	1453
	44*	2	3	1001	958
	47	2	4	2042	2297
	50	2	3	1609	1629
	53	1	3	1563	1614
	56	3	3	1493	1652
	59	2	3	1988	2390
	62	1	4	1254	1374
	65	2	2	2243	2933
	68*	3	3	2314	2860
	71*	2	3	1083	1351
	74	1	2	1223	1923
	78	2	2	1589	1911
	81	3	4	2106	2158
	84	2	2	1892	2335
	87	2	4	1726	1548
	90*	2	3	1337	1497
	93*	4	3	1808	1240
	96	2	3	2098	2077
	99	3	3	1748	1690
	102	3	3	1748	1758

105	2	3	1264	1001
108	2	2	2263	2652
111	2	2	1898	1838
114	1	2	716	820
117	2	3	1518	1688
120	3	3	1252	1391
123	2	3	1613	2066
126	2	4	1861	1696
129	2	2	1148	1447
132	2	3	1450	1400
135	3	3	2303	2469
138	2	4	1460	1460
144	2	3	1415	1422
147	2	3	1755	1590
150	2	3	1690	1949
153	2	4	1970	1678
156	2	3	1518	1637
159	2	4	1796	1588
162	3	4	1553	1386
165	2	4	958	843
168	4	2	1659	1728
171	2	4	1700	1840
174	3	3	1923	1761
177	2	4	1352	1752
180	2	3	1209	1200
183	2	2	1429	1549
184	2	3	1278	1888
187	3	3	1817	2052
190*	2	3	2773	3295
193	3	3	1855	2117
196	2	3	2174	1765
199*	2	3	3025	3222
202	3	3	1398	1395
205*	2	4	3072	3219
209	2	4	1484	1429
211	1	2	1132	1412
215	2	1	1489	1315
218	3	4	2253	2088
221	2	2	1123	1330
225	2	4	2143	2092
228	3	3	1693	1709

	231	2	3	1634	1852
	234*	2	3	981	1256
	237	3	3	1717	1711
	240	3	4	1873	1826
Modern Threat	1*	0	0	0	0
	4*	1	1	932	1062
	7	3	3	2295	2441
	10	2	3	2167	2378
	12*	3	3	890	810
	16	3	4	2157	2393
	19	2	3	2128	1859
	22	3	4	2529	1933
	25	2	3	2241	2384
	28	2	2	1589	1514
	34	2	3	2171	2257
	37	2	3	687	812
	40	2	3	943	1229
	43	3	3	1782	1708
	46*	1	2	1140	1221
	49	1	3	1465	1926
	52	3	3	1371	1335
	55	3	4	1698	1546
	58	2	3	2325	1997
	61	2	3	2139	2008
	64	3	3	2671	2459
	67	1	3	1288	1380
	70*	0	0	0	0
	73	1	2	1615	2456
	77	2	2	1414	1541
	80	2	2	1515	1648
	83	2	4	1814	1568
	86	2	3	1887	2497
	89	2	2	1485	1661
	92	3	4	1728	1615
	95	1	3	2517	2659
	98	1	2	1164	1113
	101	2	3	3244	2388
	104	3	3	1595	1060
	107	3	4	1658	1308
	110	3	4	2621	1599
	113	2	2	1623	1640

116*	1	2	979	1313
119*	1	1	324	304
122	1	2	1176	1871
125	2	3	2531	2413
128	2	3	2386	2529
131	2	3	1805	2070
134	2	3	1193	1481
137	2	3	1660	2212
140*	2	2	3808	3394
143*	2	2	2113	2164
146	2	3	1721	1836
149	2	4	1495	1208
151	2	2	2084	2169
155*	3	3	2823	2500
158	3	4	2158	1619
161	2	3	1639	1714
164	2	2	1639	1376
167	1	4	991	1279
170	2	4	1568	1669
173	2	4	1830	1677
176	2	2	1790	1776
179	3	3	1609	1676
182	2	4	1740	2128
186	1	2	1489	1715
189	3	3	2126	2856
192	2	4	1657	1621
195	3	4	2736	2477
198	2	4	1512	1411
201	1	2	1235	1345
204	3	3	1763	1358
208	2	2	1666	1705
211	2	3	1542	1622
214	2	3	1620	1691
217	3	4	1458	1574
220*	1	1	1140	1339
224	2	4	2292	2342
227	2	3	2035	1922
230	2	3	1345	1196
233	2	3	1618	1490
236	1	2	1336	1480

239	3	4	1030	939

Recognition Phase

Scenario	Participant	Hit Rate Female Faces	Hit Rate Male Faces	FA Rate Female Faces	FA Rate Male Faces	RT Female Faces	RT Male Faces
Moving	3	15	14	2	2	1319	1293
	6	13	11	4	7	1496	1518
	9	13	11	5	6	1642	1568
	14	12	11	3	3	1023	982
	15	10	9	3	2	1229	1206
	18	15	15	6	8	953	972
	21	6	10	0	3	1075	1331
	24*	13	7	0	4	1468	1152
	27	11	14	5	12	596	567
	33	14	12	0	4	1305	1642
	36	14	13	2	4	878	867
	39	10	9	0	1	1062	1166
	42*	5	9	14	12	1506	1186
	45*	13	9	5	4	1199	1290
	48*	7	5	8	9	898	1018
	51*	15	16	2	4	1769	2049
	54*	5	9	14	12	1353	1475
	57*	14	14	0	4	964	973
	60	8	8	2	3	1577	1318
	63	10	15	6	2	1561	1458
	66	14	10	4	4	844	921
	69	12	10	3	2	1037	1066
	72*	7	2	12	11	1088	1437
	75	11	9	4	3	1768	1568
	79	13	16	3	4	949	935
	82	7	9	0	2	1238	1246
	85	14	14	1	3	1177	972
	88	11	14	0	1	962	904
	91	8	14	5	5	858	884

94	14	13	2	3	1447	1320
97	13	12	1	5	783	734
100	11	11	6	3	1225	1279
103*	13	8	3	3	1296	1504
106	10	14	4	7	1649	1357
109	8	10	2	2	822	859
112	12	12	9	5	1539	1487
115	8	10	2	4	1018	1170
118	14	10	2	2	696	705
121	11	11	3	8	1439	1427
124	7	8	1	4	1121	1036
127*	13	13	1	2	1049	967
130	13	11	3	4	1051	1184
133	14	13	4	5	798	729
136	13	14	2	3	1379	1308
139	12	4	4	5	691	701
142	13	10	5	5	906	1011
145	13	14	7	10	1100	1045
148	13	12	1	2	1140	1317
152	12	8	4	3	1010	1146
154	9	7	2	3	1042	1107
157	11	12	4	1	1140	1046
160	11	14	2	4	1146	1168
163	11	13	6	6	1052	901
166	13	9	0	4	1267	1274
169	10	14	2	4	1315	1017
172*	10	11	2	3	1060	1142
175	9	10	4	2	820	771
178	14	15	3	4	874	870
181	8	7	4	4	825	860
185	9	5	2	1	816	829
188	9	10	4	8	887	997
191	15	13	1	4	1080	1205
194	12	14	1	5	1345	1246
197	13	13	3	4	1424	1565
200	10	13	3	0	877	935
203	15	15	4	3	1227	1277

	206	10	7	6	2	1226	1237
	207	14	16	3	3	1351	1234
	210	15	14	5	5	931	828
	213	13	14	4	4	1130	1017
	216	14	12	7	4	954	980
	219*	8	8	7	8	864	965
	222	7	9	0	1	1461	1474
	223	13	9	6	2	1118	1282
	226*	8	5	5	9	769	852
	229	13	11	0	4	1253	1370
	232	5	6	1	3	899	987
	235	13	14	2	4	1289	1214
	238	16	12	2	2	995	1251
	25247*	10	9	9	6	356	483
Ancestral Threat	2	15	15	4	9	1172	1125
	5	12	12	4	5	1386	1249
	8	11	13	2	2	1038	920
	11	13	10	1	1	1106	1172
	13	9	12	1	0	764	885
	17	14	12	4	2	927	966
	20	14	13	2	8	1763	1387
	23	11	14	3	5	1094	1230
	26	12	7	4	3	952	954
	31	13	8	4	3	1335	1124
	35	14	11	8	4	1427	1401
	38	11	13	0	3	1150	1023
	41	16	16	0	3	790	787
	44*	10	15	11	10	648	650
	47	15	12	1	0	1040	1089
	50	9	12	3	2	1213	1320
	53	12	15	3	3	1374	1397
	56	10	8	2	7	1076	1094
	59	14	9	1	0	1172	1297
	62	11	13	6	8	1160	1009
	65	13	15	2	3	1162	1308
	68*	13	14	6	9	2251	1906
	71*	8	7	0	0	710	882
	74	13	11	0	3	832	969
	78	16	15	5	2	992	1191

81	14	14	4	5	1411	1205
84	13	13	4	0	1639	1788
87	11	11	1	6	867	834
90*	11	11	2	0	1476	1327
93*	7	6	8	5	1502	1644
96	14	14	0	3	1340	1356
99	12	11	0	4	1627	1427
102	16	13	7	3	1083	1299
105	13	15	7	7	945	994
108	14	13	2	3	1378	1706
111	12	11	1	3	849	891
114	11	13	6	10	749	816
117	10	11	3	6	1260	1348
120	13	15	2	2	743	756
123	12	15	5	4	1467	1437
126	12	8	2	4	1021	1044
129	12	11	0	2	1135	1056
132	10	12	8	6	708	884
135	13	14	3	4	1547	1763
138	11	13	5	7	1399	1310
144	16	9	1	2	997	1029
147	13	14	5	2	1332	1270
150	12	11	4	2	824	850
153	8	12	2	3	1328	1622
156	12	12	1	0	946	1010
159	14	11	3	7	1095	1162
162	10	12	4	4	1135	1099
165	12	12	6	6	885	915
168	9	14	2	2	1274	1033
171	13	10	3	1	1263	1318
174	13	14	1	4	833	872
177	11	5	3	2	1091	952
180	13	13	8	5	930	1018
183	13	9	5	1	844	916
184	12	11	3	4	1071	1195
187	11	11	6	4	1146	1107
190*	10	15	3	7	1502	1474
193	13	10	1	3	1334	1851
196	12	11	1	1	1434	1232
199*	7	11	0	1	1450	1664
202	11	7	2	3	898	843

	205*	13	11	0	1	1914	1799
	209	16	9	2	3	912	882
	211	14	13	5	6	1260	1149
	215	10	12	3	4	1061	1115
	218	13	10	3	3	846	949
	221	14	5	7	2	1073	1087
	225	14	15	1	6	1188	1035
	228	12	10	3	3	1022	1092
	231	13	14	1	3	1100	1065
	234*	5	7	14	10	947	937
	237	15	11	1	2	1250	1137
	240	14	10	2	4	1134	1155
Modern Threat	1*	13	13	4	3	1477	1513
	4*	6	13	1	6	1143	1257
	7	14	14	4	6	1267	1169
	10	15	15	7	8	1408	1660
	12*	2	4	3	4	911	691
	16	15	15	3	5	996	1040
	19	12	10	4	4	1270	1230
	22	14	12	3	0	1126	1068
	25	12	14	2	0	1596	1690
	28	15	13	1	4	805	882
	34	14	13	6	6	1059	1237
	37	11	10	5	3	1143	1182
	40	12	9	4	2	819	811
	43	12	13	1	7	1521	1594
	46*	10	11	9	7	839	901
	49	16	16	5	5	1147	1438
	52	13	12	2	4	945	949
	55	11	15	1	3	853	897
	58	13	12	3	3	1309	1508
	61	14	13	2	3	1115	1061
	64	12	12	2	8	1748	1429
	67	13	14	1	2	791	848
	70*	10	6	1	5	902	1044
	73	10	12	1	0	1157	1409
	77	12	8	4	5	718	783
	80	15	15	6	7	1124	1115
	83	14	16	9	7	902	936
	86	12	10	0	0	1181	1126
	89	13	15	2	3	1294	1301

92	13	13	6	9	1019	1011
95	10	10	3	4	1540	1503
98	9	7	1	2	1275	1604
101	16	13	3	3	994	969
104	10	8	3	5	981	855
107	13	15	3	5	1136	1037
110	12	15	2	3	1110	1025
113	12	7	4	8	1061	1022
116*	11	15	1	4	924	982
122	13	13	8	2	1058	1108
125	13	5	2	6	1560	1778
128	15	10	0	0	1207	1314
131	11	14	0	5	1012	1007
134	14	12	7	9	771	795
137	11	11	2	1	1193	1051
140*	12	10	1	6	1505	1646
143*	12	10	6	3	2037	1971
146	11	8	6	4	1214	1340
149	10	4	1	3	873	921
151	7	12	4	3	1758	1672
155*	12	9	2	3	2217	2357
158	14	10	8	6	1187	1292
161	10	8	3	2	1119	1109
164	5	6	1	2	995	917
167	9	10	1	5	1011	894
170	15	16	0	6	974	829
173	12	14	4	0	1323	1267
176	7	7	2	6	1331	1503
179	12	13	3	6	976	939
182	11	16	3	5	1215	983
186	12	13	4	3	1478	1645
189	13	14	1	1	1233	1305
192	10	10	3	1	922	994
195	14	14	1	0	1629	1277
198	12	13	1	3	930	1024
201	15	10	0	2	1286	1211
204	12	11	2	6	963	888
208	13	16	1	2	1374	1571
211	11	12	8	1	929	769
214	11	10	5	2	1301	1284
217	10	13	0	1	907	1134

220*	11	12	2	5	1149	1174
224	16	15	2	2	1243	1284
227	11	15	3	4	1306	1299
230	9	8	5	4	998	1021
233	12	11	3	4	910	956
236	13	10	1	1	1164	1168
239	10	11	7	4	1077	1049

Appendix C

ANOVA Tables

Encoding Phase Ratings
3 (Scenario: Moving, Ancestral Threat, Modern Threat) × 2 (Face Gender: Female, Male)
Mixed ANOVA

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
sex	Sphericity Assumed	39.868	1	39.868	140.321	0.000
	Greenhouse-Geisser	39.868	1.000	39.868	140.321	0.000
	Huynh-Feldt	39.868	1.000	39.868	140.321	0.000
	Lower-bound	39.868	1.000	39.868	140.321	0.000
sex * Condition	Sphericity Assumed	21.276	2	10.638	37.442	0.000
	Greenhouse-Geisser	21.276	2.000	10.638	37.442	0.000
	Huynh-Feldt	21.276	2.000	10.638	37.442	0.000
	Lower-bound	21.276	2.000	10.638	37.442	0.000
Error(sex)	Sphericity Assumed	56.539	199	0.284		
	Greenhouse-Geisser	56.539	199.000	0.284		
	Huynh-Feldt	56.539	199.000	0.284		
	Lower-bound	56.539	199.000	0.284		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	2940.201	1	2940.201	5845.309	0.000
Condition	7.233	2	3.617	7.190	0.001
Error	100.097	199	0.503		

Paired Samples Test

	95% Confidence Interval of the Difference

Condition			Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
C	Pair 1	F_RESP - M_RESP	0.024	0.887	0.109	-0.194	0.242	0.219	65	0.828
ST	Pair 1	F_RESP - M_RESP	-0.938	0.726	0.087	-1.112	-0.763	-10.731	68	0.000
T	Pair 1	F_RESP - M_RESP	-0.971	0.629	0.077	-1.125	-0.818	-12.632	66	0.000

Encoding Phase RT
3 (Scenario: Moving, Ancestral Threat, Modern Threat) × 2 (Face Gender: Female, Male)
Mixed ANOVA

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
sex	Sphericity Assumed	134797.331	1	134797.331	3.439	0.065
	Greenhouse-Geisser	134797.331	1.000	134797.331	3.439	0.065
	Huynh-Feldt	134797.331	1.000	134797.331	3.439	0.065
	Lower-bound	134797.331	1.000	134797.331	3.439	0.065
sex * Condition	Sphericity Assumed	156311.678	2	78155.839	1.994	0.139
	Greenhouse-Geisser	156311.678	2.000	78155.839	1.994	0.139
	Huynh-Feldt	156311.678	2.000	78155.839	1.994	0.139
	Lower-bound	156311.678	2.000	78155.839	1.994	0.139
Error(sex)	Sphericity Assumed	7799715.714	199	39194.551		
	Greenhouse-Geisser	7799715.714	199.000	39194.551		
	Huynh-Feldt	7799715.714	199.000	39194.551		
	Lower-bound	7799715.714	199.000	39194.551		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	1232793606.070	1	1232793606.070	3414.738	0.000
Condition	1485632.129	2	742816.064	2.058	0.130
Error	71843258.517	199	361021.400		

Recognition Phase RT
3 (Scenario: Moving, Ancestral Threat, Modern Threat) × 2 (Face Gender: Female, Male)
Mixed ANOVA

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
sex	Sphericity Assumed	15140.705	1	15140.705	1.668	0.198
	Greenhouse-Geisser	15140.705	1.000	15140.705	1.668	0.198
	Huynh-Feldt	15140.705	1.000	15140.705	1.668	0.198
	Lower-bound	15140.705	1.000	15140.705	1.668	0.198
sex * Condition	Sphericity Assumed	3992.027	2	1996.013	0.220	0.803
	Greenhouse-Geisser	3992.027	2.000	1996.013	0.220	0.803
	Huynh-Feldt	3992.027	2.000	1996.013	0.220	0.803
	Lower-bound	3992.027	2.000	1996.013	0.220	0.803
Error(sex)	Sphericity Assumed	1805827.091	199	9074.508		
	Greenhouse-Geisser	1805827.091	199.000	9074.508		
	Huynh-Feldt	1805827.091	199.000	9074.508		
	Lower-bound	1805827.091	199.000	9074.508		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	525322744.809	1	525322744.809	4473.302	0.000
Condition	72677.145	2	36338.573	0.309	0.734
Error	23369587.077	199	117435.111		

Recognition Phase Accuracy
3 (Scenario: Moving, Ancestral Threat, Modern Threat) × 2 (Face Gender: Female, Male)
Mixed ANOVA

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
sex	Sphericity Assumed	0.108	1	0.108	4.483	0.035

	Greenhouse-Geisser	0.108	1.000	0.108	4.483	0.035
	Huynh-Feldt	0.108	1.000	0.108	4.483	0.035
	Lower-bound	0.108	1.000	0.108	4.483	0.035
sex * Condition	Sphericity Assumed	0.021	2	0.010	0.430	0.651
	Greenhouse-Geisser	0.021	2.000	0.010	0.430	0.651
	Huynh-Feldt	0.021	2.000	0.010	0.430	0.651
	Lower-bound	0.021	2.000	0.010	0.430	0.651
Error(sex)	Sphericity Assumed	4.807	199	0.024		
	Greenhouse-Geisser	4.807	199.000	0.024		
	Huynh-Feldt	4.807	199.000	0.024		
	Lower-bound	4.807	199.000	0.024		

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	121.352	1	121.352	2432.136	0.000
Condition	0.178	2	0.089	1.787	0.170
Error	9.929	199	0.050		

Recognition Phase Accuracy
Linear Contrast

Contrast Tests

		Contrast	Value of Contrast	Std. Error	t	df	Sig. (2-tailed)
ACC	Assume equal variances	1	-0.088893308	0.047175066	-1.884	199	0.061
	Does not assume equal variances	1	-0.088893308	0.047886300	-1.856	123.928	0.066