Supplementary Methods

Study 1: Attentional task

Forty-six moderately difficult riddles that had clear and understandable solutions were obtained from a previous study (Sakaki & Niki, in press). They were randomly assigned to one of the four conditions. Because riddle questions and solutions were different in length, we did not fix presentation duration across all riddles. Instead, we calculated the duration participants would take to read each question and each solution, based on the average reading rates in Japanese (i.e., about 400 letters per minute).

On each trial (Figure 2A), participants were first shown a riddle. To allow participants to think about the riddle briefly, the riddle was presented for 3 sec plus the duration needed to read it. Following the riddle, participants indicated by pressing keys whether they had come up with a possible solution to the riddle or not.[1] Three hundred ms after the response, they viewed a biological, social, neutral picture, or three asterisks. The screen was divided into a three by three grid (without any visible lines) and the central cell was the location for the pictures or the asterisks. Participants were told that the pictures were irrelevant to the riddles and were asked to passively view the pictures. After 150 ms of the pictures or asterisks, a red dot appeared at one of

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[1] The proportion of trials where participants came up with a possible solution did not differ across stimulus type (*M* = 25 %; $p > .90$). Whether or not participants came up with a possible solution before they saw the correct solution did not modulate the effects of stimulus type (i.e., biological, social vs. neutral) both in the reaction time data and in the picture memory data (*ps* > .20).

the eight outer cells of the 3 X 3 grid of the screen while the picture still remained on the screen. Participants were told to press a left key with their right index finger to indicate a left side location, a middle key with their right middle finger to indicate a location either above or below the pictures, and a right key with their right ring finger to indicate a right side location (Figure 2B). Immediately after participants pressed the correct key, the picture disappeared and the dot was replaced by the solution to the riddle. The solutions were each presented for the duration needed to read them. The attention task consisted of 40 trials (10 biological, 10 social, 10 neutral and 10 control) in a randomized order. To reduce the primary/recency effects, additional three filler trials were added both at the beginning and at the end of the task. As in the control condition, participants saw asterisks instead of pictures in those filler trials.

Visual Complexity Analysis

In all studies involved in this paper, we used Matlab's Canny edge detector to compute an objective measure of visual complexity—the edge density of each image (Rosenholtz, Li, & Nakano, 2007). The Canny edge detector has three parameters: a low threshold, high threshold, and sigma. These thresholds were set to 0.11, 0.27, and 1 (Rosenholtz, et al., 2007).

Effects of Evolutionary Threats

In Studies 1 and 2, we performed post-hoc analyses to see the effects of evolutionary threats. Based on the evolutionary theories about emotion (Öhman, Flykt, & Esteves, 2001; Öhman, Lundqvist, & Esteves, 2001; Öhman & Mineka, 2001), biologically emotional pictures used in these studies were categorized into pictures depicting an evolutionary threat (e.g., snake, spider) and other pictures (e.g., gun). Socially emotional pictures were also categorized into those depicting an evolutionary threat (i.e., angry face) and others (e.g., KKK).

Supplementary Studies

Pilot rating studies

Picture Rating Studies. Thirteen Japanese participants who did not take part in any studies in the current paper rated the arousal (1: low- 9: high) and the valence (1: extremely negative- 9: extremely positive) of each IAPS picture. In addition, another 10 Japanese participants rated each picture on a) how strongly each picture is related to survival or reproduction (1: not at all - 9: extremely) and b) how strongly each picture is related to adaptation in social life (1: not at all - 9: extremely). Inter-rater reliabilities based on generalizability theory (Brennan, 2001; Cronbach, Linn, Brennan, & Haertel, 1997) were .92 for valence, .81 for arousal, .90 for biological relevance, and .83 for social relevance.

Word Rating Study. Another independent sample of Japanese participants (*N* = 17) rated 200 words in terms of valence (1: negative - 9: positive), arousal (1: not at all – 9: extremely), relation to survival or reproduction (1: not at all – 9: extremely), and relation to adaptation in social life (1: not at all – 9: extremely). Inter-rater reliabilities based on generalizability theory (Brennan, 2001; Cronbach, et al., 1997) were .99 for valence, .91 for arousal, .97 for biological relevance, and .97 for social relevance.

Supplemental-Study 1 (S-Study 1)

There are two potential concerns about Study 1. First, each person might have different evaluations about what is related to social adaptation and what is related to survival/reproduction, depending on his/her experiences. Second, Study 1 might not have enough statistical power to detect the effects of arousal and valence, because of the dichotomization approach we employed to examine the effects of arousal and valence (Irwin & McClelland, 2003). To address these concerns, in this supplemental study, we obtained each participant's evaluation about biological/social relevance, arousal, and valence for each stimulus. We then tested the effects of these four ratings while treating them as continuous variables to increase the statistical power. We also employed a different population (United States sample) and added different pictures to see whether our results would replicate with a different sample and stimuli.

Participants. Sixteen University of Southern California undergraduates participated (7 males; M_{age} = 21.25, SD = 2.14).

Materials. Four Americans, who did not participate in any of the studies in the current paper, were asked to solve 120 riddles obtained from Study 1, the Internet, and other resources. We used 55 riddles that none of these individuals could solve correctly but all could understand the provided solutions. In addition to the riddles, we used 39 pictures (about half of them were obtained from IAPS and the others from other sources). The picture set involved 3 images from each of the following categories: dead animals, weapons, negative faces, positive faces, neutral faces, sexual scenes, threatening animals, neutral objects, neutral scenes with people, positive scenes with people, negative scenes with people, non-threatening animals, and foods.

Procedure. The procedure was similar to Study 1 with one exception. Instead of the picture recognition memory task, we asked participants to rate each picture in terms of valence (1: negative – 9: positive), arousal (1: not at all – 9: extremely), how strongly the picture was related to survival/reproduction (1: not at all – 9: extremely), and how strongly the picture was related to social adaptation (1: not at all – 9: extremely) after they finished the attention task.

Results. Given the nested structure of our data in this study (i.e., response to each picture was nested in each participant), a hierarchical linear model approach (HLM: Raudenbush & Bryk,

2002) was employed to examine whether participants' own rating about each picture predicted a reaction time on a trial in which they saw the picture. The dependent variable was the reaction time for each individual trial from each participant. Independent variables were four rating scores (i.e., arousal, valence, relation to social adaptation, and relation to survival/reproduction) for each picture used in each individual trial from each participant. We also included the visual complexity for each picture (measured by Matlab's Canny edge detector) as an additional independent variable.

The rating for the relation to survival/reproduction emerged as the only significant predictor of the reaction time (S-Table 2). The higher the picture was rated in relation to survival/reproduction, the slower the reaction time was to detect the dot-probe (S-Figure 1). In contrast, there were no significant effects of arousal, valence, relevance to social life, and visual complexity. These results confirm findings from Study 1 and suggest that people have difficulty in drawing their attention away from biologically emotional pictures.

Supplementary Results

Study 1: Reaction time to detect dot-probe

We addressed the effects of other potential modulator factors, such as valence, subjective arousal, visual complexity, presence of people, and evolutionary threats. As in the main analysis reported in the paper, the response key was used as a covariate in these analyses.

Effects of valence and arousal. We examined the effects of valence by a 2 (stimulus type: biological, social) X 2 (valence: positive, negative) ANOVA on the reaction times. This ANOVA confirmed a significant effect of stimulus type, $F(1, 21) = 5.79$, $p < .01$, but no other significant effects ($ps > .50$). Next, we examined the effects of arousal. Biological and social pictures were categorized into high and low arousal stimuli by using the median of the pilot ratings in each category. A 2 (stimulus type) X 2 (arousal: high, low) ANOVA on the reaction times revealed a significant effect of stimulus type, $F(1, 21) = 6.05$, $p < .05$, with no other significant effects (*p*s > .20). Thus, participants were slower to detect the dot-probe following biological images than social images, regardless of subjective arousal level and valence (Figure 3B).

Effects of visual complexity. The mean edge density was .05 (SD = 0.02) for biological pictures, .04 (SD = 0.02) for social pictures, and .06 (SD = 0.04) for neutral pictures. To examine the effects of the visual complexity, biological, social and neutral pictures were categorized into complex and simple pictures by the median of the edge density values in each stimulus category. A 3 (stimulus type: biological, social, neutral) X 2 (complexity: complex, simple) ANOVA on the reaction times confirmed a significant effect of stimulus type, $F(2, 42) = 6.10$, $p < .001$, with no other significant effects (*p*s > .40).

Effects of presence of people. Biological pictures involved pictures depicting people (e.g., a man who commits suicide) and other pictures (e.g., snake), while most of social pictures involved people. To address whether the presence of people is more important than the ratings of the biological/social relevance, we performed a similar analysis to the main analysis, but with excluding pictures that do not involve any people. This analysis confirmed a significant effect of stimulus type, $F(2, 42) = 7.36$, $p < .01$; participants showed slower reaction times after biological pictures than after social and neutral pictures, *t*s(42) = 2.42, 3.81, *p*s < .05, even when we excluded pictures not involving people (S-Figure 2A).

Effects of evolutionary threats. Based on a post-hoc categorization of stimuli (see Supplementary Methods for details), a 2 (stimulus type: biological, social) X 2 (evolutionary threats: evolutionary threats, other) ANOVA was carried out. The ANOVA confirmed a significant effect of stimulus type, $F(1, 18) = 5.67$, $p < .05$, with no other significant effects (*ps* > .50). Participants detected the dot-probe slower after biological pictures than after social pictures, regardless of whether they were evolutionary threats (M_{bio} = 470 ms vs. M_{social} = 418 ms) or not (M_{bio} = 455 ms vs. M_{social} = 425 ms), *Fs*(1, 18) = 5.56, 4.56, *ps* < .05. In fact, the reaction times were not different across angry faces (evolutionarily threatening but social stimuli; *M* = 418 ms), other social stimuli (*M* = 425 ms) and neutral stimuli (*M* = 419 ms).

Study 1: Memory of Emotional or Neutral Pictures.

Separate 2 (stimulus type) X 2 (valence) ANOVAs on the hit rates and on the accuracy measure of recognition (i.e., hit rate minus false alarm rate) did not reveal any significant effects (*p*s > .10). We also examined the effects of arousal based on the median split. Separate 2 (stimulus type) X 2 (arousal) ANOVAs were performed on the hit rates and on the corrected recognition measure, but once again we did not find any significant effects (*p*s > .14). Thus, participants remembered biologically emotional images as well as socially emotional images, regardless of subjective arousal level and valence. Similar results were also obtained even after excluding pictures not depicting people, $F(2, 42) = 12.84$, $p < .01$. Furthermore, the enhanced memory for biological and social pictures (compared to neutral pictures) remained regardless of the visual complexity, *Fs*(2, 42) = 3.12, 16.34, *p*s < .06, and the relevance to evolutionary threats, *Fs*(2, 42) = 9.00, 5.91, *ps* < .05.

Study 2: Memory of Emotional or Neutral Pictures

As in Study 1, additional data analyses were performed to address the effects of valence, subjective arousal, visual complexity, presence of people, and evolutionary threats.

Effects of valence and arousal. To examine the effects of valence, the hit rates and the remember rates were submitted to 2 (attention: full, divided) X 2 (stimulus type: biological, social) X 2 (valence: positive, negative) ANOVAs. These ANOVAs revealed a significant interaction between stimulus type and attention, $Fs(1, 44) = 7.73, 10.31$, $ps < .01$. Subsequent analyses revealed that the attention manipulation impaired memory for socially positive, $Fs(1, 44) = 12.07, 7.81$, $ps < .01$, and socially negative stimuli, $Fs(1, 44) = 9.89, 10.30$, $ps < .01$, but not for biologically positive and biologically negative stimuli ($ps > .15$; Figure 4B, 5B). The corrected hit rates and the corrected remember rates also revealed a significant interaction between stimulus type and attention for positive, $Fs(3, 44) = 3.65, 2.70$, $ps < .06$, and negative stimuli, $Fs(3, 44) = 7.13, 6.03$, $ps < .05$.

Next, we examined the effects of arousal by 2 (stimulus type) X 2 (attention) X 2 (arousal: high, low) ANOVAs on the hit rates and the remember rates. Once again, there was a significant interaction of stimulus type by attention, $Fs(1, 44) = 7.88, 10.74$, $ps < .01$. The attention manipulation impaired memory for social stimuli, regardless of whether the arousal was high, $Fs(1, 44) = 14.96, 11.90$, $ps < .01$, or low, $Fs(1, 44) = 7.71, 6.83$, $ps < .01$. In contrast, there were no significant effects of attention in biological stimuli, regardless of arousal level ($ps > .15$; Figure 4C, 5C). The corrected hit rates and the corrected remember rates also revealed a significant interaction between stimulus type and attention for both high, $Fs(3, 44) = 8.22, 4.69$, $ps < .01$, and low arousing stimuli, $Fs(3, 44) = 4.53, 8.84$, $ps < .01$.

Effects of visual complexity. The mean visual complexity (reflected by the edge density measure) was 0.03 (SD = 0.02) for biological pictures, 0.02 (SD = 0.02) for social pictures, and 0.05 (SD = 0.06) for neutral pictures. A 3 (stimulus type: biological, social, neutral) X 2 (attention) X 2 (complexity: complex, simple) ANOVAs were carried out on the hit rates and the remember rates. These analyses revealed a significant interaction between stimulus type and attention, $Fs(2, 88) = 3.31, 4.80$, $ps < .05$, with no significant effects involving complexity (ps > .05). The attention manipulation influenced memory for socially emotional pictures both in the complex, $F(1, 88) = 10.42, 10.13$, ps < .01, and simple picture sets, $F(1, 88) = 13.24, 9.08$, ps < .01. In contrast, memory for biologically emotional pictures was not affected by the attention manipulation, irrespective of complexity (ps > .10). The corrected hit rates and the corrected remember rates also showed a significant interaction of stimulus type by attention both in the complex, $Fs(5, 88) = 2.91, 3.97$, $ps < .05$, and simple picture sets, $Fs(5, 88) =4.04, 2.77$, $ps < .05$.

Effects of presence of people. As in Study 1, we examined the effects of stimulus type and attention after discarding pictures not involving people. The analyses supported the results from the main analyses (S-Figure 2B-2C). That is, both the hit rates and the remember rates indicated that the attention manipulation had significant effects on memory for socially emotional pictures involving people, $Fs(1, 88) = 12.32, 20.61$, $ps < .01$, but not for biologically emotional pictures involving people ($ps > .30$).

Effects of evolutionary threats. Based on a post-hoc categorization of stimuli (see Supplementary Methods), a 2 (stimulus type) X 2 (evolutionary threat) X 2 (attention) ANOVA was performed on the hit rates. There was a significant interaction between stimulus type and attention, $F(1, 44) = 4.13$, $p < .05$, but no significant effects of evolutionary threat. Participants' memory of angry faces (i.e., evolutionary threatening but social stimuli) was worse in the divided attention condition ($M = .74$) than in the full attention condition ($M = .95$), $F(1, 44) = 9.20$, $p < .01$, consistent with our findings for other socially emotional stimuli. In fact, angry faces were remembered better than neutral pictures in the full-attention condition (M_{angry} = .95 vs. $M_{neutral}$ = .87), but the enhancement disappeared in the divided attention condition (M_{angry} = .74 vs. $M_{neutral}$ = .79). In contrast, the attention manipulation did not have significant effects on memory for biologically emotional stimuli even after we excluded pictures depicting an evolutionary threat ($p > .30$). A similar ANOVA on the remember rates also confirmed a significant interaction between stimulus type and attention, $F(1, 44) = 7.39$, $p < .01$, with no significant interactions involving evolutionary threats.

Study 4: Behavioral Results

During the like/dislike judgments, participants showed faster reaction time to words than pictures (M_{word} = 2679 ms; M_{pict} = 2820 ms), $F(1, 14) = 6.51$, $p < .05$. In general, pictures involve more visual features and more visual elements than words, which might result in longer reaction times to pictures. In addition, we found an interaction between stimulus type and material, $F(3, 42) = 4.86$, $p < .05$. Regarding words, there were no significant effects of stimulus type ($p > .80$). In contrast, for pictures, participants produced faster reaction times to nonsense pictures (*M* = 2680 ms) than biological (*M* = 2822 ms), social (*M* = 2868 ms) and neutral pictures (*M* = 2911 ms), *t*s(42) = 2.78, 3.66, 4.51, *p*s < .05. Since pictures involve many visual elements or visual features, it seems likely that participants had to consider each of them to understand the meaning of pictures, while they did not have to interpret each visual element when pictures are nonsense. This might result in faster reaction time to nonsense pictures than other pictures.

We also analyzed the proportion of pictures that participants' judgments were consistent with the predefined valence category (i.e., liked positive pictures; disliked negative pictures). As in the reaction times, participants made more accurate judgments about words (*M* = .91) than pictures (*M* = .70), *F*(1, 14) = 41.26, *p* < .01. This result again suggests that pictures have more information than words, which resulted in less accurate judgments about pictures than words. There were no other significant effects (*p*s > .35).

Although participants were faster and more accurate to make like/dislike judgments about biological pictures than social pictures in Study 2, the difference between these two conditions was not significant in the current experiment (*ps* > .30). In this experiment, we asked participants to press keys after the stimuli disappeared to reduce confounding effects of motor reactions on brain activity. Thus, unlike in Study 2, participants did not have to make like/dislike judgments as quickly as possible. The difference in valence judgment accuracy and speed between biological and social stimuli might be detected only when participants had limited time to make like/dislike judgments.

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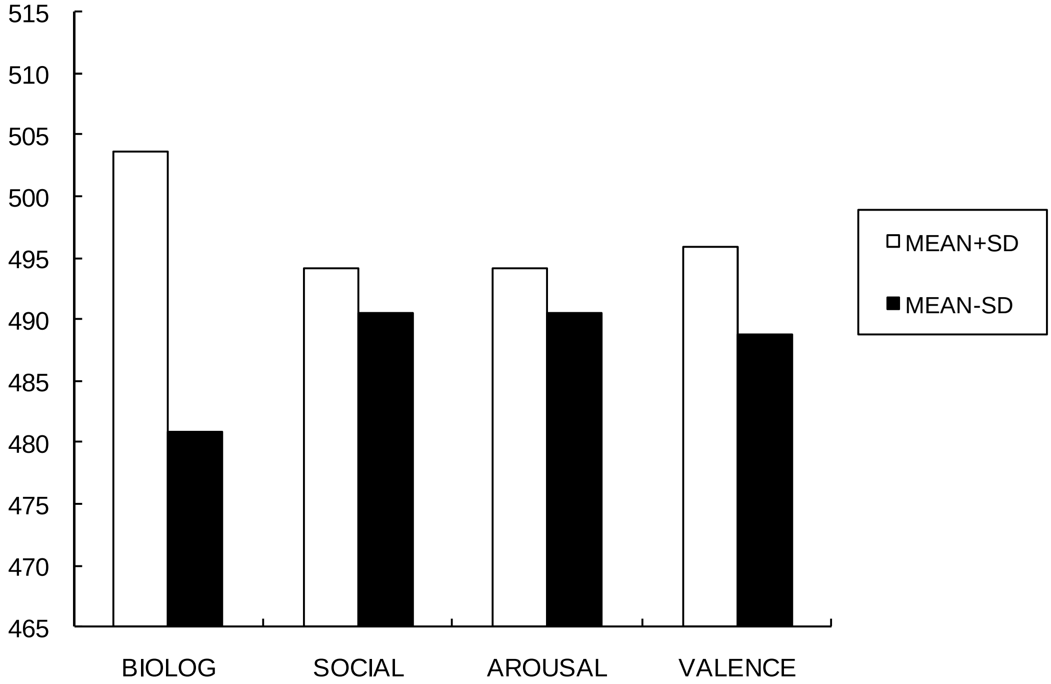
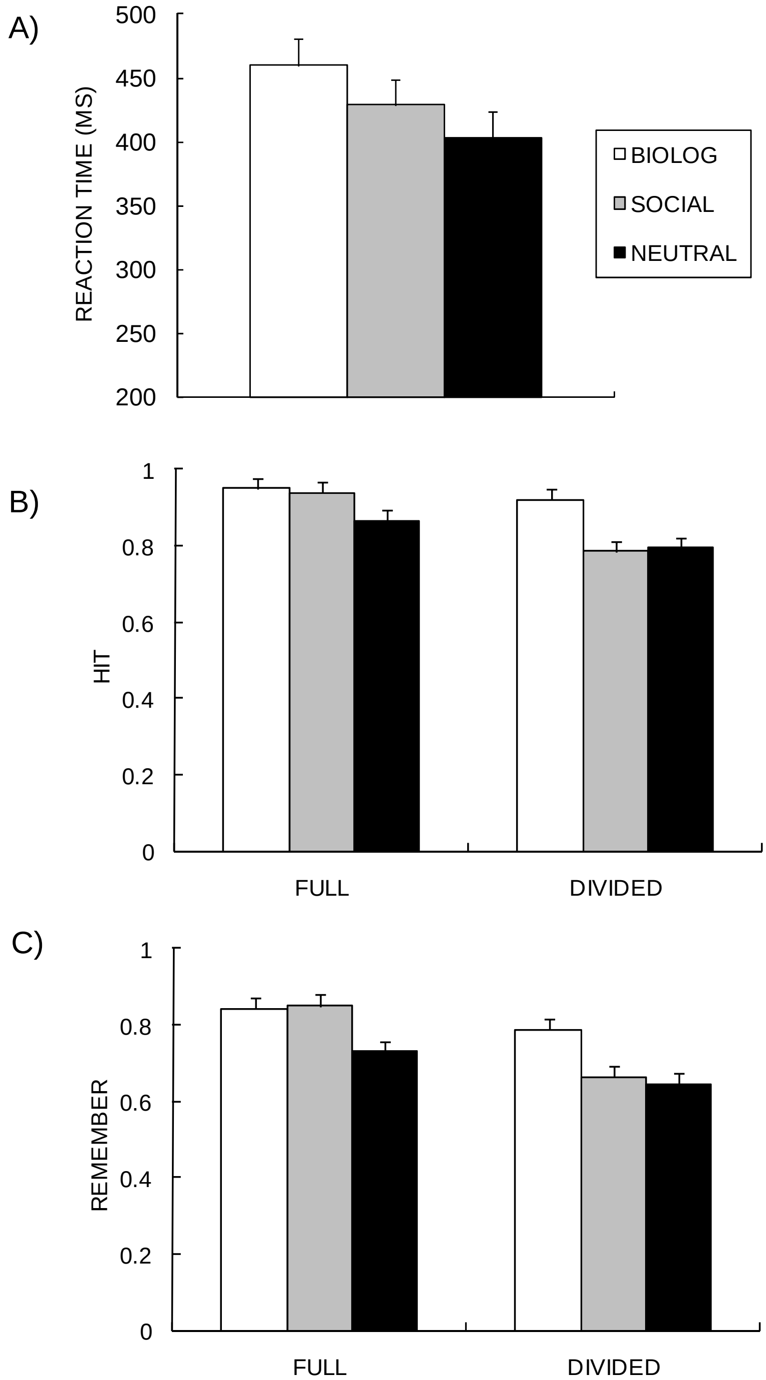


S-Figure 1. Participants' own evaluation about biological relevance also significantly predicted the reaction times in the attention task, after controlling the effects of social relevance, arousal, valence and visual complexity (S-Study 1). The figure represents the mean reaction time at one standard deviation above and below the mean of each of the four rating scores (biological relevance; social relevance; arousal and valence), after controlling for the other rating dimensions and visual complexity. BIOLOG = rating of how strongly each picture is related to survival or reproduction; SOCIAL = rating of how strongly each picture is related to social life; AROUSAL = arousal rating; VALENCE = valence rating.



S-Figure 2. Effects of presence of people in pictures. Similar results were obtained even after excluding pictures that do not depict people in the attention task in Study 1 (A), in the hit rates in Study 2 (B), and in the remember rates in Study 2 (C).

S-Table 1. Mean ratings from the pilot rating studies for emotional or neutral pictures used in Studies 1, 2 and 3.

Type		Valence	Arousal	Biolog	Social
Study 1					
Positive	Bio	5.9	4.9	6.4	5.6
	Soc	5.8	5.0	4.1	6.5
Negative	Bio	3.6	5.9	7.0	4.2
	Soc	3.9	5.9	4.4	6.2
Neutral		4.8	4.3	2.7	5.0
Study 2					
Positive	Bio	5.9	4.7	6.0	4.9
	Soc	5.8	4.9	4.3	6.9
Negative	Bio	3.8	5.5	6.6	3.8
	Soc	4.2	5.5	4.1	6.5
Neutral		5.0	4.2	2.9	5.2
Study 3					
Positive	Bio	5.8	4.8	6.2	5.0
	Soc	5.8	4.9	4.3	6.8
Negative	Bio	3.9	5.5	6.8	4.2
	Soc	4.1	5.6	4.2	6.3
Neutral		5.1	4.2	2.9	5.2

Note: Bio = biologically emotional stimuli; Soc = socially emotional stimuli; Valence = mean rating scores of valence (1: extremely negative- 9: extremely positive); Arousal = mean rating scores of arousal (1: not at all-9: extremely); Biolog = mean rating scores of how strongly the picture is related to survival/reproduction (1: not at all-9: extremely); Social = mean rating scores of how strongly the picture is related to social life (1: not at all-9: extremely).

S-Table 2. Fixed effects of each rating score on the reaction times in the dot-probe task (S-Study 1).

Variable	Coefficient	T	p-value
Biolog	3.54	2.14	.049
Social	1.00	0.41	.689
Arousal	0.73	0.39	.696
Valence	0.79	0.36	.723
Complexity	-3444.16	-1.78	.094

Note: Biolog = rating of how strongly each picture is related to survival or reproduction; Social = rating of how strongly each picture is related to adaptation in social life; Arousal = rating of how arousing each picture is; Valence = rating of how much each picture is positive or negative; Complexity = picture’s objective complexity measure (edge density).

S-Table 3. Examples and mean pilot rating scores for emotional/neutral words used in Study 3.

		Valence	Arousal	Biolog	Social	Example
Positive	Bio	7.1	5.1	6.4	4.9	Pregnancy; Health; Ecstasy; Grilled meat; Sushi; Life saving
	Soc	7.1	5.2	4.4	6.7	Trust; Achievement; Gift; Salary; Career success; Bride; Friendship
Negative	Bio	2.7	5.3	6.9	4.1	Starving; Illness; Poison; Cancer of stomach; Paralysis; Corpse; Funeral
	Soc	2.6	5.4	4.4	6.4	Loneliness; Divorce; Fraud; Rebuke; Romantic breakup; Terrible defeat
Neutral		5.1	3.0	2.2	2.7	Basement; Dish; Gravity; Raindrop; Copy; Window frame

Note: Bio = biologically emotional stimuli; Soc = socially emotional stimuli; Valence = mean rating scores of valence (1: extremely negative- 9: extremely positive); Arousal = mean rating scores of arousal (1: not at all-9: extremely); Biolog = mean rating scores of how strongly the word is related to survival/reproduction (1: not at all-9: extremely); Social = mean rating scores of how strongly the word is related to social life (1: not at all-9: extremely).

S-Table 4. Brain areas showing greater activity to biological than social pictures for each valence category.

	Area	H	BA	x	y	z	T
Biological picture > Social picture							
Positive	Inferior Occipital Gyrus	L	18	-32	-94	-8	6.20
		R	18	34	-90	-14	4.81
	Middle Occipital Gyrus	L	18	-32	-94	4	4.11
		R	18	38	-88	4	6.40
	Cerebellum	L		-40	-48	-28	5.12
		L		-32	-56	-28	7.30
		L		-28	-80	-22	4.14
		L		-48	-50	-24	5.13
		R		32	-50	-30	6.82
		R		28	-66	-28	4.44
		R		32	-62	-20	4.26
	Fusiform Gyrus	L	37	-46	-62	-18	4.84
	Superior Temporal Gyrus	L	22	-66	-38	16	5.07
	Insula	L	13	-40	-8	0	4.37
Negative	Middle Occipital Gyrus	L	19	-30	-92	-14	4.27

Note: The table shows MNI coordinates. For positive stimuli, we employed $p < .001$-uncorrected. Clusters of activations that involved less than ten contiguous voxels were discarded. The same threshold did not produce any significant effects of negative stimuli. Therefore, we used $p < .005$-uncorrected with 20 continuous voxels for negative stimuli.

S-Table 5. Brain areas showing greater activity to social than biological pictures for each valence category.

	Area	H	BA	x	y	z	T
Social picture > Biological picture							
Positive	MPFC	L	8	-12	54	42	7.49
		L	10	-10	64	20	6.13
		R	9	0	52	22	4.27
		R	9	10	66	22	4.25
	Posterior Cingulate/Precuneus	L	23	-2	-64	20	5.54
		R	31	0	-60	28	5.21
		R	30	6	-64	12	4.96
	Temporo-Parietal Junction	L	22	-58	-62	10	6.37
		R	22	56	-48	8	5.96
		R	22	60	-40	8	5.60
		R	22	56	-72	12	5.07
		R	37	54	-58	6	4.31
	Anterior Temporal Gyrus	L	38	-48	0	-50	5.46
		L	20	50	0	-34	4.27
		R	20	56	-4	-28	4.45
	Parahippocampal Gyrus	R	38	22	-14	-26	5.75
	Superior Frontal Gyrus	L	6	-10	34	60	5.38
	Superior Temporal Gyrus	R	38	36	12	-30	5.24
	Precentral Gyrus	L	4	-14	-14	64	6.70
Negative	MPFC	L	9	-12	66	24	4.93
		R	9	-8	54	42	5.99
		R	9	4	52	40	5.42
	Posterior Cingulate/Precuneus	R	30	8	-64	18	6.50
		R	31	0	-64	28	6.41
		R	31	22	-74	16	5.39
		R	29	10	-46	10	4.31
		R	31	-16	-82	18	4.30
	Temporo-Parietal Junction	L	39	-58	-70	16	4.86
		L	39	-52	-54	10	4.28
		R	39	52	-62	10	6.30
	Anterior Temporal Gyrus	L	20	-56	-8	-26	8.00
		R	21	54	-2	-26	4.88
	Parahippocampal Gyrus	L	36	-44	-34	-8	4.72
	Middle Frontal Gyrus	L	6	-48	18	46	5.47
		L	6	-38	8	46	4.70
	Inferior Frontal Gyrus	R	47	42	30	-16	5.02
	Precentral Gyrus	R	6	48	24	14	5.30
		R	9	48	24	38	5.23

Note: The table shows MNI coordinates. $p < .001$-uncorrected with 10 continuous voxels.

S-Table 6. Results from conjunction alayses between emotional words and pictures for each valence category.

		Area	H	BA	x	y	z	T
Biological Words and Biological Pictures								
	Positive	Postcentral Gyrus	R	40	46	-38	24	6.64
			R	40	60	-30	18	3.34
	Negative	No significant results						
Social Words and Social Pictures								
	Positive	MPFC	L	9	-8	60	16	6.60
			L	9	-6	62	26	5.86
			L	10	-14	64	10	4.95
			L	9	-14	42	44	3.59
			L	9	-22	44	46	3.01
		Posterior Cingulate/Precuneus	L	31	-2	-68	22	7.08
			R	31	0	-62	30	6.21
		Temporo-Parietal Junction	L	19	-50	-64	12	4.80
		Anterior Temporal lobe	L	20	-50	-4	-34	5.38
		Parahippocampal Gyrus	R	36	28	-20	-28	4.94
	Negative	MPFC	L	9	-8	56	32	6.62
			L	9	-10	62	24	5.73
			R	10	8	60	34	4.59
		Posterior Cingulate/Precuneus	L	31	-2	-66	22	4.68
		Temporo-Parietal Junction	L	39	-58	-70	18	5.57
			L	39	-50	-70	8	5.25
			L	39	-50	-62	16	5.05
		Anterior Temporal Gyrus	L	38	-36	16	-32	8.56
			L	38	-44	14	-38	6.92
			L	38	-44	16	-30	6.83
			L	20	-52	-2	-32	5.13
			R	21	54	2	-38	4.13
			R	21	48	8	-40	3.83
Biological Words and Social Words								
	Positive	Anterior Temporal Gyrus	L	21	-62	-60	10	3.81
			L	21	-50	0	-34	3.80
		Posterior Cingulate/Precuneus	L	29	-2	-58	16	3.80
			L	31	-4	-64	22	3.30
			L	31	-12	-66	28	3.19
			L	31	-4	-50	36	3.29
			L	31	-4	-56	30	3.13
	Negative	MPFC	L	10	-16	44	30	4.18
			L	10	-12	56	26	3.16

Note: The table shows MNI coordinates. $p < .005$-uncorrected for each contrast entered into a conjunction analysis. Clusters of activations that involved less than 20 contiguous voxels were discarded.

S-Table 7. Correlations among the four ratings in the pilot rating studies and in S-Study 1.

			Biolog	Social	Arousal
Correlation matrix	Picture Rating	Social	.11		
		Arousal	.70**	.14	
		Valence	-.09	.19+	-.21*
	Word Rating	Social	.39**		
		Arousal	.58**	.45**	
		Valence	-.11	.04	-.33**
	S-Study 1	Social	.58**		
		Arousal	.66**	.44**	
		Valence	-.25	.15	-.28

		Partial Correlation with Arousal (controlling the other scale)	
		Biolog_Social	Social_Biolog
Partial Correlation	Picture Rating	.69**	.08
	Word Rating	.44**	.24**
	S-Study 1	.49**	.07

Note: Biolog = biological relevance rating; Social = social relevance rating; Arousal = arousal rating; Valence = valence rating. Biolog_Social = biological relevance after controlling the effects of social relevance; Social_Biolog = social relevance after controlling the effects of biological relevance. +: *p* < .05; *: *p* < .01, **: *p* < .001.