

Affiliative Stimuli as Primers to Prosocial Predispositions

Gabriela Guerra Leal Souza¹, Mirtes Garcia Pereira², Jaime Vila³,
Leticia Oliveira², and Eliane Volchan⁴

¹Universidade Federal de Ouro Preto (Brazil)

²Universidade Federal Fluminense (Brazil)

³Universidad de Granada (Spain)

⁴Universidade Federal do Rio de Janeiro (Brazil)

Affiliative stimuli are pleasant and highly biologically relevant. Affiliative cues are thought to elicit a prosocial predisposition. Here affiliative and neutral pictures were exposed prior to a reaction time task which consisted in responding to a visual target. Half the participants responded with finger-flexion, a movement frequently involved in prosocial activities. The other half responded with finger extension, a less prosocially compatible movement. Results showed that under the exposure to affiliative pictures, as compared to neutral ones, participants who used finger flexion were faster, while those using finger extension were slower. Performance benefits to the task, when flexing the finger, together with performance costs, when extending it, indicate the relevance of movement compatibility to the context. These findings put forward a possible link between affiliative primers and motor preparation to facilitate a repertoire of movements related to prosocial predispositions including finger flexion.

Keywords: affiliative, emotion, motor predisposition, prosocial, reaction time.

Los estímulos afiliativos son agradables y de gran relevancia biológica. Se cree que las señales afiliativas provocan una predisposición pro-social. En este estudio, fotos afiliativas y neutras fueron presentadas antes de una tarea de tiempo de reacción que consistía en responder a un objetivo/target visual. La mitad de los participantes respondieron utilizando dedo-flexión, un movimiento asociado con frecuencia a actividades pro-sociales. La otra mitad respondió con la extensión del dedo, un movimiento prosocialmente menos compatible. Los resultados mostraron que en la exposición a imágenes afiliativas, en comparación con las neutras, los participantes que usaron flexión del dedo eran más rápidos, mientras que aquellos que usaron extensión del dedo eran más lentos. El rendimiento superior en la tarea, en la flexión del dedo, junto con el perjuicio para el rendimiento en la extensión, son indicativos de la relevancia de la compatibilidad del movimiento con el contexto. Estos resultados presentan una posible relación entre primers afiliativos y la preparación motora que facilita un repertorio de movimientos relacionados con la predisposición prosocial, entre ellos, la flexión de los dedos.

Palabras clave: afiliativo, emoción, predisposición motora, prosocial, tiempo de reacción.

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Correspondence concerning this article should be addressed to Eliane Volchan. Instituto de Biofísica Carlos Chagas Filho, Universidade Federal do Rio de Janeiro. Av. Carlos Chagas Filho 373, Cidade Universitária, Rio de Janeiro, 21941-902 (Brazil). E-mail: evolchan@biof.ufrj.br

A number of studies have suggested that exposure to affective stimuli induce motivational predispositions (Bradley, Codispoti, Cuthbert, & Lang, 2001; Lang & Bradley, 2008). The study of the startle reflex modulation by picture viewing adds support to the notion that pictures act as primers to motivational predispositions. Startle is potentiated when participants view unpleasant stimuli and inhibited when viewing pictures judged as pleasant (Lang, Bradley, & Cuthbert, 1990). Researchers posited that positively and negatively evaluated stimuli produce somatic preparedness for respectively approaching and withdrawing (literally or figuratively) (Duckworth, Bargh, Garcia, & Chaiken, 2002; see Elliot, 2008 for a review).

Affiliative pictures (for example babies' faces) seem to be a prototypical example of a class of stimuli used in laboratory sets that are positive and highly biologically relevant. Among pleasant pictures, those depicting attachment scenes like happy family interactions and babies are rated as the most positive and elicit the highest activity of the zygomatic and orbicularis oculi muscles (Bradley et al., 2001). Using a measure of dynamic postural balance, Facchinetti, Imbiriba, Azevedo, Vargas, and Volchan (2006) revealed that the sight of affiliative pictures (babies and family interactions) produce significant motor modulation in the observer. Results suggested that affiliative stimuli evoke a prosocial predisposition through the activation of muscles that support an anterior-posterior displacement, favouring social bonding and reducing social distance. The postural modulation seemed specific to the category of affiliative stimuli since no modulation was observed when sports pictures were employed (Azevedo et al., 2005). Another study presented affiliative pictures prior to a reaction time task which consisted in simple visual detections of a circle (Pereira et al., 2006). Participants were instructed to detect the target in the inter-picture intervals of a sequence of presentations of either affiliative or neutral pictures, the latter being employed as baseline. Responses were conveyed by pressing a button with the index finger. Reaction times were faster after viewing affiliative pictures compared to the same procedure after viewing neutral ones. However, in this study, only one response movement was investigated (button press, involving finger flexion). Then the authors could not ascertain whether the movement of finger-flexion was specifically facilitated or the performance would be enhanced for any response movement. Besides, one would expect that the opposite movement, finger extension, would produce a slowdown in the performance. In this perspective, the viewing of affiliative picture could be more compatible with finger flexion and less compatible with finger extension. In fact, prosocial predispositions elicited by viewing affiliative stimuli (pictures of newborns) were proposed to involve protect, embrace, hold close and groom the baby (Brosch, Sander, & Scherer, 2007), actions most likely involving upper limb flexors including that of fingers.

To test the hypothesis that finger flexion is facilitated by viewing affiliative stimuli we devised an experiment in which participants (women) were exposed to affiliative pictures and performed a task with either finger flexion or finger extension. We expected that finger flexion, being a more compatible movement with prosocial predispositions, would be facilitated; while finger extension, a less compatible movement, would be hampered.

Methods

Participants

The initial sample consisted of sixty-four female undergraduate students from the Federal University of Rio de Janeiro (Brazil) with mean age of 19.7 (\pm 1.58) years old. Participants reported no neurological or psychiatric disorders, and were not taking medication. All of them were right-handed according to the Edinburgh Inventory (Oldfield, 1971) and had normal or corrected vision. The local ethics committee approved the experimental protocol, and each participant gave written consent prior to the study. Three participants were excluded from data analysis because their reaction time was more than 3 standard deviations above the mean.

Apparatus and stimuli

Participants were tested in a sound-attenuated room under dim ambient light. Stimulus timing and presentation, as well as response collection, were controlled by a computer. Stimulus presentation was programmed using MEL software (Psychology Software Tools Inc., Pittsburgh, PA, USA). The participant's head was positioned on a head-and-chin rest at 57 cm from the screen.

Fifty-eight pictures were selected from the International Affective Picture System (IAPS), a collection of standardized color photographic material (Lang, Bradley, & Cuthbert, 1999). Ten pictures of wide-ranging categories were selected for practice. Twenty-four affiliative (babies, children and families interactions) and twenty-four neutral (household and inanimate objects) pictures were used for testing.

Design and procedure

Pictures of the same category were presented on the computer screen for 2 s, each picture followed by an interval to perform a subsequent series of tasks. Similar to Pereira et al (2006), we were interested in the sustained component of the emotional modulation. Then, our objective was to determine how potential modulatory effects affected the series of target-detection trials that followed each picture's offset. The task consisted of

detecting a small circle (target) that appeared around the fixation spot presented at the center of the screen 500–700 ms prior to target onset. Both remained “on” until the participant’s response. Participants were required to respond as quickly as possible after target onset. The latency between target presentation and participant’s response (reaction time) was recorded.

Each trial was followed by a visual feedback, which appeared on the screen for 1000ms. The feedback consisted of the word “anticipated”, if the latency for finger movement was shorter than 100 ms; or the word “slow”, if no response was delivered until 1000ms. Otherwise, feedbacks presented the word “correct”. The fixation point reappeared 900ms after the offset of the feedback, indicating the beginning of a new trial. After twelve target-detection trials, a new picture of the same category appeared on the screen. Trials with latencies longer than 1000 ms or shorter than 100 ms were considered errors and were not included in the analysis (see details in figure 1A and B).

Participants were randomly assigned to one of two groups: “finger-flexion” or “finger-extension”. A photodiode circuit placed inside a small box detected finger movement and signaled the reaction time. Participants in the “finger-flexion” group ($N = 31$) were asked to lean the index finger inside the box and against its top and respond to the target by flexing the finger. Those in the “finger-extension” group ($N = 30$) were asked to lean the index finger against the bottom of the box and respond to the target by extending the finger (see details in figure 1C).

The set of 24 pictures of each category (affiliative and neutral) and all the target-detection trials performed in the interval between pictures comprised an experimental “block”. The order of the two experimental blocks was counterbalanced across participants. The length of each block ranged between 8.83 min to 14.11 min.

Participants were invited to return to the laboratory some days later to rate the pleasantness (valence) and intensity (arousal) of each picture seen, using the paper-and-pencil version of the Self-Assessment Manikin (Bradley & Lang, 1994). This evaluation was performed in another day to avoid tiredness effect on the pictures’ rating. Fifty participants completed this final phase.

Statistics

Data were analyzed by using Statistica 7.0 (StatSoft, Inc.). After the experiment, the blocks (affiliative and neutral) were divided into “early” (pictures 1–8), “intermediate” (pictures 9–16), and “late” (pictures 17–24) segments and the mean of reaction times (8 pictures \times 12 trials) were calculated. The division in segments followed the previous findings by Pereira et al. (2006) using a similar experimental paradigm. In that study, the authors showed that the modulatory effects due to viewing pleasant pictures occur rapidly and disappear as time goes

by. Then, it seems to be important to perform the analysis considering the time course; otherwise the emotional effect could be lost.

Mean reaction times were log-transformed to normalize the data, followed by a normality test using the Shapiro-Wilk W procedure. A mixed design ANOVA with Greenhouse–Geisser correction was performed on the mean log-transformed of reaction times with MOVEMENT (flexion, extension) as a between-subject factor and PRIMER (affiliative, neutral) and SEGMENT (early, intermediate, late) as within-subject factors. Fisher post hoc tests were employed in the flexion group for comparisons between affiliative and neutral primers during the early, intermediate and late segment. The same post hoc tests were employed in extension group.

The pleasantness and the arousal ratings were separately compared between the affiliative and neutral pictures by Student’s t-test for dependent samples.

In all analyses, we considered p values $\leq .05$ as statistically significant.

Results

The Shapiro-Wilk W test of the mean log-transformed of reaction times separately for primer and segment showed that the data are normally distributed. The analysis of reaction times did not reveal a main effect of MOVEMENT ($F_{(1, 60)} = 0.19, p = .7$), PRIMER ($F_{(1, 60)} = 0.61, p = .4$), or SEGMENT ($F_{(2, 120)} = 1.50, p = .2, \epsilon = .86$). Besides, there were no double interaction among MOVEMENT and PRIMER ($F_{(1, 60)} = 1.47, p = .2$), MOVEMENT and SEGMENT ($F_{(2, 120)} = 0.47, p = .6, \epsilon = .86$) or between PRIMER and SEGMENT ($F_{(2, 120)} = 0.59, p = .5, \epsilon = .95$). More important, the analysis of reaction times revealed a triple interaction among MOVEMENT \times PRIMER \times SEGMENT ($F_{(2, 120)} = 4.45, p = .02, \epsilon = .95$). Fisher post hoc analysis showed that for the finger-flexion group, reaction times to target-detection trials in the affiliative block were faster than those in the neutral block during the early (mean \pm standard error: 306 ± 11.2 ms and 317 ± 11.3 ms; $p = .014$, respectively) and intermediate segments (mean \pm standard error: 310 ± 10.7 ms and 327 ± 15.4 ms; $p = .005$, respectively). Previous results employing a similar paradigm (but only with finger-flexion responses) also found a segment-dependent acceleration of reaction time for affiliative pictures (Pereira et al, 2006). On the other hand, Fisher post hoc analysis revealed that for the finger-extension group, reaction times to target-detection trials in the affiliative block were slower than those in the neutral block during the intermediate segment (mean \pm standard error: 334 ± 13.8 ms and 325 ± 13.7 ms; $p < .05$). Table 1 illustrates the mean reaction time (in milliseconds) separately for segment, primer and

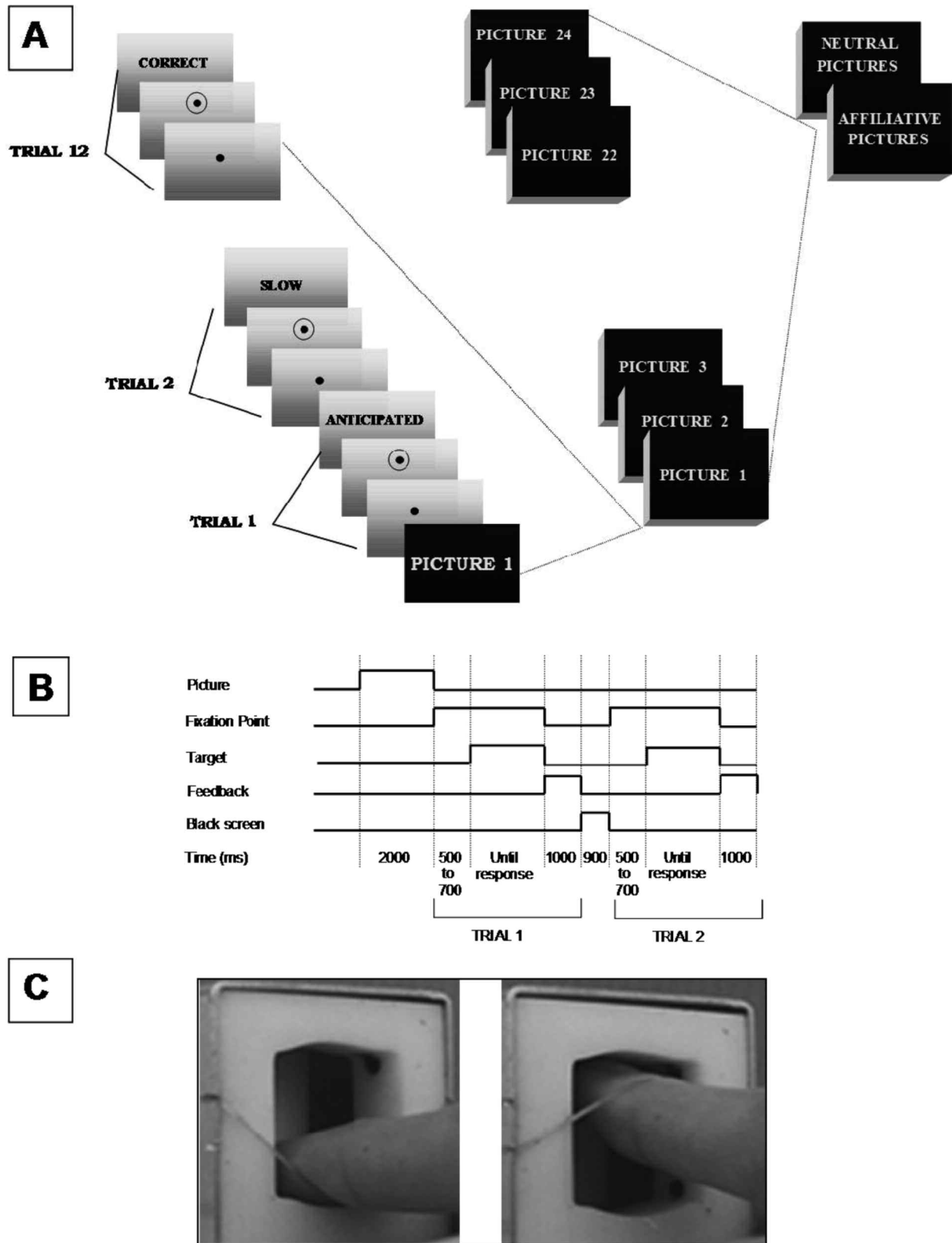


Figure 1. Design and procedure details. (A) Affiliative and neutral blocks contained 24 pictures of the same category. During the inter-picture intervals, participants performed twelve trials of a simple target-detection task. (B) Temporal structure associated with each picture presentation and subsequent target-detection trials. (C) Task execution using a finger-flexion movement (left) and finger-extension movement (right).

Table 1

Mean reaction time and standard error (in milliseconds) separately for segment, primer and movement

MOVEMENT	SEGMENT					
	EARLY		INTERMEDIATE		LATE	
	AFFILIATIVE Mean (SE)	NEUTRAL Mean (SE)	AFFILIATIVE Mean (SE)	NEUTRAL Mean (SE)	AFFILIATIVE Mean (SE)	NEUTRAL Mean (SE)
FLEXION	306 (11.2)*	317 (11.3)	310 (10.7) *	327 (15.4)	325 (12.5)	320 (12.8)
EXTENSION	323 (12.9)	324 (12.8)	334 (13.8) *	325 (13.7)	324 (12.6)	328 (11.7)

* $p < .05$

movement. Figure 2 illustrates the performances of both groups in the affiliative and neutral blocks, during the intermediate segment. Participants that were instructed to detect the target with finger flexion were significantly faster when they performed the task in the block which presented affiliative pictures than in the one that presented neutral pictures. For those instructed to execute the detection with finger extension, performance was significantly slower in the affiliative than in the neutral one.

Mean errors rates during affiliative and neutral blocks were 2.9% and 3.2% respectively and there was no significant difference between them (Student's t -test, $t = -1.08$, $p = .28$).

As expected, pleasantness ratings for affiliative pictures were significantly higher than pleasantness ratings for neutral pictures (Student's t -test, $t = 19.55$, $p < .001$). Arousal ratings were also higher for affiliative than for neutral pictures (Student's t -test, $t = 6.24$, $p < .001$).

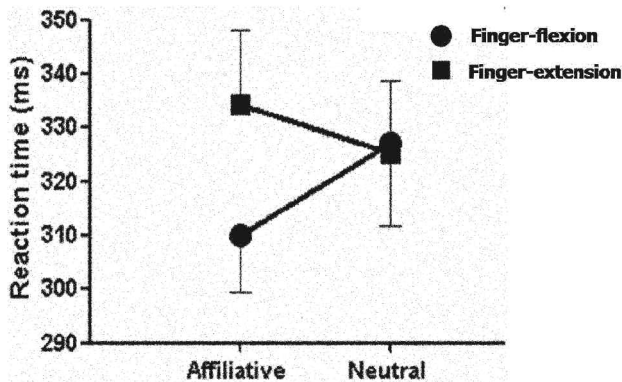


Figure 2. Mean reaction times for target-detection during the intermediate segments of the affiliative and neutral blocks. Task execution with finger-flexion movement (circles) was faster in the affiliative block than in the neutral one. For the finger-extension movement (quadrates), the performance was reversed. For ease of interpretation, all means (plus standard errors) are given in the original millisecond reaction latencies.

Discussion

Participants were exposed to affiliative and neutral pictures and performed a detection task with either finger flexion or finger extension. The flexion group was faster and the extension group was slower to detect the targets when primed with affiliative compared to neutral pictures. The hypotheses for the underlying mechanisms of these results should account for both findings.

A growing body of research has addressed the influence of positive affect as compared to negative and neutral affect on cognitive processes (see Ashby, Isen, & Turken, 1999 for a review). Positive affect enhances cognitive flexibility (Dreisbach, 2006) and helps to overcome functional fixedness and improves problem solving (Isen, Daubman, & Nowicki, 1987). Better performance associated with positive mood induction could underlie the findings here for the "flexion group", but it is not coherent with the worst performance of the "extension group".

Some studies employing reaction time paradigms to investigate the modulation of motor behaviors evoked by affective stimuli had proposed that flexor arm movements ("approach") are facilitated by pleasant stimuli, and extensor arm movements ("avoidance") are facilitated by unpleasant stimuli (Chen & Bargh, 1999; Duckworth et al., 2002). However, subsequent investigations had proposed that the movement compatibility effect depends on people's representation of their selves in space rather than intrinsic properties of the muscles (Markman & Brendl, 2005; Eder & Rothermund, 2008). There are reasons to suppose that viewing affiliative pictures evoke prosocial predispositions. As mentioned earlier, viewing pictures of newborns is expected to elicit in adults a phylogenetically based readiness for bonding behavior (Brosch et al., 2007). It has been proposed that even imagining ourselves in a particular social interaction can be sufficient to engage those cognitive and motor mechanisms necessary for the actual encounter (Lloyd, 2009). Further, after having been exposed to affiliation primes depicted in pictures, 18-month-old infants help an adult more often and more spontaneously, revealing that, even in infancy, a mere hint of affiliation is sufficient to increase prosocial predispositions (Over & Carpenter,

2009). A large amount of studies in primates (including humans) showed that scenes displaying actions activate motor circuits, particularly the mirror motor system (Rizzolatti & Sinigaglia, 2008) and mirror areas may be preferentially activated by 'social' actions, i.e. actions directed towards other humans (Blakemore, Bristow, Bird, Frith, & Ward, 2005). We hypothesize that affiliative primers activate a neural network (including mirror systems) which triggers a general prosocial orientation.

Studies of social bonding in primates support the involvement of flexion movements of the fingers in prosocial behavior. Allo-grooming (the grooming of others), which is considered a special kind of prosocial action, assumes in primates (including humans) a particularly important and prominent role in social bonding (Dunbar, 2010; Nelson & Geher, 2007). Finger flexion is a hallmark movement during grooming, being especially dependent on a "finger-and-thumb" precision grip that is unique to the primates (Dunbar, 2010).

In the finger-flexion group, sustained increase in speed on the reaction time was observed to detect the targets when primed with affiliative compared to neutral pictures, during the early and intermediate segments. This result suggests that sustained modulatory effects due to viewing pleasant pictures can occur relatively rapidly, when the motor response is compatible. Pereira et al. (2006), using a similar paradigm, also found a segment-dependent acceleration of reaction time for affiliative pictures in the early segment, when the task was performed by flexing the finger. These findings are in agreement with other studies which showed a fast influence of positive stimuli. For instance, Schacht and Sommer (2009) using event-related brain potentials showed that positive verbs were processed more quickly than neutral ones in a task of lexical decision. In this same vein, Smith, Bradley, and Lang (2005) showed that zygomatic muscle activity was elevated early during blocked picture presentations when viewing pleasant compared to unpleasant pictures. On the other hand, in the finger-extension group, the affiliative pictures produced the slowing down of reaction times only in the intermediate segment. One possibility is that this interference occurred later because we induced a positive emotional state by the presentation of affiliative pictures in a context where the participants were asked to perform an incompatible motor task (e.g. extend the finger). In this case, the incompatibility between the emotional and the motor system probably produced a delayed slowdown in the reaction times.

In summary, in our experimental paradigm, exposure to affiliative pictures, may have acted as a prime for the repertoire of prosocial movements including predispositions to grooming. We pose that finger flexion is a relevant movement in this context and this is indicated by the performance benefits to the task when flexing the finger together with performance costs when extending it. Taken together, these results offer evidence that viewing affiliative primers may implicitly and automatically impact on prosocial behavior.

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