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The Effect of Anxiety on Verbal and Visual Priming Tasks an Adolescent Victims of Bullying

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Abstract

Bullying is a stressing event that can generate long-term repercussions in victims including anxiety and low academic achievement. Many studies have demonstrated that anxiety can modulate the way in which information is encoded and recovered, especially if it has emotional content. Studies using priming tasks have reported that patients with anxiety disorder tend to remember threatening events better than pleasant or neutral ones. The objective of this study, therefore, was to determine whether the presence of anxiety has an effect on the performance of priming tasks with negative stimuli in victims of bullying. For this purpose, three groups of adolescents: bullying victims with anxiety (BVWA); bullying victims without anxiety (BV); and non-victims (NV), performed verbal and facial priming tasks with emotional (positive and negative valence) and neutral content. The BVWA group showed better performance on verbal priming tasks with negative valence stimuli than on those with positive and neutral valence, but this effect was not observed on the facial priming task, on which BV and NV had better performance with happy faces. Our data show that verbal and facial stimuli with negative valence could have differential effects on adolescent victims of bullying with anxiety. The frightening verbal stimuli generate facilitation in implicit memory likely because, thanks to social networks, words have become a very common way to intimidate others.

Keywords

Adolescents; Anxiety; Bullying; Priming

Introduction

Adolescence is the transition period between childhood and adulthood characterized by hormonal, structural and functional changes, as well as transformations of social behavior that include increasing interest in, and time spent with, other adolescents, such as beginning romantic relationships. For this reason, experiences at school with peers are an important factor for the subsequent development of the adolescent's personality and self-image [1]. For this sector of the population, forming part of a social group is very important, as it helps them form their identity and fosters their sense of belonging and self-esteem [2]. Therefore, the bullying or violence that adolescents may suffer at school at the hands of their peers could have negative consequences for their emotional, social and cognitive development [1].

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Olweus [3] defined bullying as the presence of intimidating behaviors that are performed repeatedly and maintained over time with the intention of humiliating and subduing a victim by a student, or group of students, through physical, verbal and/or social aggressions motivated by an urge to cause the target harm. Bullying is very frequent, for global statistics report that 20%-66% of children and adolescents experience such aggression [4-6]. Several studies have reported that this dynamic also tends to generate other types of violence that impact victims in the short, medium and long term, and that victims may show a tendency to develop numerous symptoms, some of them physical (abdominal pain, headache), some psychopathological (anxiety, post-traumatic stress disorder, depression, suicide attempts, suicide, etc.), and others cognitive (low academic performance) [7-12].

Given the foregoing, bullying may be considered a kind of early, chronic stressor that generates deregulation in the secretion of cortisol and is associated with neurophysiological and cognitive impairments. Research on bullying shows that adolescent victims reported more stress and exhibited altered cortisol levels on the Trier Social Stress Test, compared to non-victims [11]. Those authors found higher cortisol levels immediately after the stressor was felt with lower cortisol levels 30 min later. They also reported a relationship between bullying and poor physical health. Although there are no studies that have evaluated baseline cortisol levels of bullying victims, it has been found that children who suffer stress due to other types of violence, such as child abuse, show elevated levels of this hormone [13,14].

This deregulation of cortisol secretion could have effects on brain structures that possess a high density of glucocorticoid receptors, such as the amygdala [15], hippocampus [16], and prefrontal cortex [17]; structures that also play an important role in memory and emotional processing.

Cortisol deregulation can generate adverse changes in the brain, such as accelerated loss of neurons, delays in the process of axonal myelination, abnormalities in the appropriate development of neural pruning, inhibition of neurogenesis, and glycogenesis [18-21]. All these alterations can affect the adolescent brain because it is undergoing both progressive and regressive changes that are regionally specific and serve to refine the organ's functional connectivity [22,23]. During typical adolescence, cortical development is characterized by the progressive thinning of the gray matter that begins well before adolescence in cortical regions involved in basic sensory and motor functions and continues in the prefrontal cortex (PFC) throughout adolescence. The amygdala, in turn, shows age-related changes in functional connections with other cortical regions, specifically the medial prefrontal cortex, insula, superior temporal sulcus, parahippocampal gyrus and posterior cingulate [24].

In addition to these extensive connections, the amygdala contains a significant number of sexual hormone receptors, so it could be involved in the changes in social and emotional processing exhibited by adolescents [25]. Finally, it suffers volume variations and hyper-reactivity to emotional stimuli during adolescence [26,27].

The amygdala's hyper-reactivity to emotional stimuli, together with the immaturity of the prefrontal cortex, might make adolescents more vulnerable to developing psychopathological disorders in

response to stressing events such as bullying. Anxiety is one of the most frequent disorders related to bullying, and may manifest itself in the short, medium or long term. This disorder can occur during the school stage, appearing immediately and remaining after six months [28] in students who are victims, compared to adolescents who are bullies and those who do not participate in bullying [29].

But anxiety may also appear in later stages of development, such as early adulthood [30]. Anxiety can modulate the way in which emotional information is encoded and recovered, even though the victim makes no deliberate attempt to recall the incidents that caused it. In this context, the influence of emotional stimuli on the memory of adolescent victims with anxiety secondary to bullying plays an important role, especially on the unintentional memory type, because intrusive memories are a common symptom of several anxiety disorders. Thus, it is important to study the relationship between anxiety and the formation of implicit memories, such as priming. This kind of memory has been defined as the unintentional retrieval of previously-acquired information that does not require conscious or explicit recollection of specific previous experiences, but is able to improve recognition of such information when it is presented later [31].

Anxiety is also characterized by increased sensitivity to threatening stimuli [32], repetitive negative thoughts, and dissociation in such cognitive processes as attention and memory [33]. Studies of anxiety's relationship to, and influence on, the emotional valence of priming have not yet reached a clear consensus in the scientific literature due to the mixed results reported. Coles and Heimberg's meta-analysis [34], for example, found that of five studies which evaluated implicit memory in people with anxiety (panic attacks), two reported a bias for threatening information, but the other three did not. In relation to research that has reported an effect, Coitre et al. [35] reported that patients with anxiety (panic attacks) managed to complete more words with threatening content than clinical controls and controls without pathology. Those authors propose that the memory of patients with panic disorder is skewed towards catastrophic associations and that such associations can occur in the presence or absence of consciousness. Li et al. [36] reported similar results after evaluating 40 students (average age, 16 years) from two groups: high and low anxiety. They found that the scores of the high-anxiety subjects on priming tasks were strongly-affected by subliminal threat stimuli.

The presence of anxiety symptoms as a product of high alertness can influence how bullying victims encode, store and retrieve memories, in proportion to their severity. In this regard, some studies have reported that patients with post-traumatic stress disorder (PTSD) have an intentional –though disorganized or incomplete– reminder of the traumatic event, and that involuntary memory fragments are easily-activated by perceptual signals [37]. Specifically, implicit memory could be related to the effect of previous experiences on subsequent behavior, despite the absence of any intention to remember, or even conscious knowledge. Therefore, observing bias on certain implicit tasks suggests that the effects of memory do not depend solely on intentional retrieval [33].

In view of the fact that a high percentage of bullying victims develop anxiety, and that these subjects show cognitive bias towards the threatening emotions that affects implicit memory, we designed the present study with the goal of determining whether the presence of anxiety has an effect on the performance of verbal and visual priming tasks with emotional stimulus in victims of bullying. We also sought to identify the relationship between anxiety and performance on priming tasks with different emotional stimuli.

Materials and Methods

Participants

To obtain the sample for this study, we applied "the questionnaire on intimidation and maltreatment among peers in high school" [38] which is validated in Mexico and particularly in the state of Jalisco where the present study was carried out. This questionnaire allows classifying adolescents into three groups: bullying victims, observers and bullies. The questionnaire was applied to 1618 students from three different public high schools in the state of Jalisco, Mexico. This method allowed us to identify 87 male victims of bullying and 574 male non-victims (observers) which did not exert bullying. The adolescent victims were those who obtained the highest scores on the questions that evaluated the characteristics related to being a victim of bullying, but the lowest scores on the questions that evaluated the characteristics of being an observer and bully. In addition, we selected as non-victims of bullying the adolescents who obtained the highest scores on the questions that evaluated the characteristics related to being an observer and the lowest responses on the questions that evaluated the characteristics of being a victim and aggressor. Later, the Spence Children's Anxiety Scale (SCAS) [39] was applied to all subjects so identified the anxiety symptoms.

After that process, 42 male adolescents (mean age=13.6, SD =0.861 years) agreed to participate in the study. They were classified in three groups: a) 14 adolescent victims of bullying with high symptoms of anxiety (BVWA); b) 14 adolescent victims of bullying without anxiety (BV); and c) 14 student non-victims without anxiety (NV). Participants in the three groups were matched by age, socioeconomic status, IQ scores and school grade as shown in Table 1. Intelligence quotients (IQ) were estimated using the abbreviated version of the WISC-IV, which consists of two subtests: vocabulary and block design. All subjects were regular students with no history of behavioral problems, child abuse, neurological disorders, learning disabilities, drug abuse (personal or by the mother), chronic illness, or attention deficit disorder, according to the DSM-5 criteria.

All procedures involved in this research were approved by the Ethics Committee of the Institute of Neuroscience in accordance with the ethical standards laid down in the 1964 Helsinki Declaration.

Table 1: Characteristics of the groups: bullying victims with anxiety (BVWA), bullying victim's without anxiety (BV), and non-victims (NV).

Measure	Group							
	BVWA		BV		NV			
	Mean	S.E	Mean	S.E	Mean	S.E	F (2,42)	*p*
*SCAS	63.86	0.628	50.71	1.04	48.71	1.59	50.379	<0.001
IQ WISC-IV	97.29	2.69	97.14	2.67	96.93	2.63	0.005	0.995
Age	13.65	0.225	13.63	0.230	13.52	.228	0.091	0.913

*Clinically-significant scores: anxiety (SCAS) scores greater than or equal to 60.

All participants and their parents were informed about the research procedure and signed an informed consent form.

Priming tasks

Participants had to resolve two implicit memory tasks: on the first one, verbal priming, they were asked to read a series of 24 full-words –8 with positive emotional valence (e.g. to dance, to sleep), 8 with negative emotional valence (e.g. fracture, to fight), and 8 neutral (e.g. key, elbow) – presented one-by-one on cards for 10 s. Then they were instructed to rate each word on a 1-5 scale according to their familiarity with it (1=least familiar, 5=most familiar). After 10 min, 60 cards were presented with incomplete words (24 of which were the same words as above, while 36 were new). Each card was shown for 5 s and the participant had to say which word might be represented. We counted the total number of words that were completed correctly, as well as the total number of correct words with each type of emotional content (positive, negative, neutral). The priming effect was calculated by subtracting the percentage of the new words completed correctly from the percentage of words previously seen and completed correctly.

To select the words for the verbal priming tasks, we asked eighty-four children and adolescents aged 10-17 about what things made them feel "good" (pleasure) or "bad" (displeasure) and we obtained 208 words. Subsequently, the 74 most frequent words (43 unpleasant and 31 pleasant) were selected and additionally, 24 words associated with child abuse and bullying (for example, loneliness, beating, slapping, etc.) from the ICAST questionnaire [40] were taken. Subsequently, both the words obtained in the inquest and those extracted from ICAST were written on white cards, which were shown to 10-17 year old children and adolescents (11 boys and 10 girls). They had to separate the words that made them feel good from those that made them feel bad. Then, they had to order each set of words in descending order, beginning with the one that caused them a more intense emotion, to which they generated less emotion; this order allowed assigning a number to each word. Finally, we calculated the median of each word and selected the 20 most pleasant and the 20 most unpleasant. Additionally, we included another 20 words with neutral emotional content that were extracted from a battery to evaluate the attention and memory; this battery is standardized in the Mexican population [41].

On the second task, facial priming, a set of 30 photographs with facial expressions (10 angry, 10 happy, 10 neutral) were presented randomly on a computer screen for 1000 ms with an inter-stimulus interval of 750 ms. Subjects had to indicate with keyboard key '1' if it was the face of a man, or keyboard key '7' if it was a woman. Ten minutes later, the same images were presented randomly (one-by-one) but mixed with another 30 photos. Participants had to indicate, by pressing key '1', if the image had been presented previously (old image), or key '7' if they thought the image was shown for the first time (new image). We counted the total correct answers with each type of emotional content (happiness, anger and neutral).

The images with facial expressions (anger, happiness, neutral) used on the task had already been piloted and used in a previous study [42].

Procedure

Participants were assessed in the morning during the months of March 2015 to November 2016 in one session of 20 min each. All evaluations were carried out in a room free of noise and stimuli distracters, specially-conditioned for this purpose.

Data analysis

To determine if there were significant demographic and psychopathological symptoms among the three study groups, one-factor ANOVAs were carried out, while split-plot ANOVAs (3 groups × 3 emotional valences) were applied to compare task scores. Post-hoc Bonferroni tests were used to determine the direction of the differences. Also, Pearson's correlations between the anxiety scores and the results of the verbal and facial priming memory tasks were performed. Statistical significance was considered with an alpha <0.05.

Results

Characteristics of participants

There were no significant differences in age or estimated IQ among subjects, so the only significant difference was in anxiety levels, where BVWA had significantly higher scores than the other two groups (Table 1).

Verbal priming

The analysis of the correct responses did not show an effect of group ($F(2,39)=0$ .077, $p=.926$, $\eta^2=0.077$), but there was an effect of word valence ($F(2,39)=9.472$, $p=.001$, $\eta^2=0.195$) and an interaction between the factors group and emotion ($F(2,39)=7.76$, p =0.001, $\eta^2=0.228$). *Post hoc* analyses showed that BVWA had a higher number of correct responses for words with negative emotional content than for words with positive and neutral emotional content. Similarly, BVWA achieved a higher number of correct words with negative content than the other two groups.

In the priming effect, there were effects of group ($F(2,39)=15.459$, $p=.001$, $\eta^2=0.284$) and word valence ($F(2,39)=28.325$, $p=0.001$, $\eta^2=0.592$), as well as a tendency to interaction between the factors group and emotion ($F(2,39)=2.272$, $p=.069$, $\eta^2=0.104$). As Figure 1 shows, BVWA had a priming effect with the negative stimuli.

Visual priming

The analysis of the correct responses did not show an effect of group (F (2, 39)=0 .996, $p=.379$, $\eta^2=0.049$), but there was an effect of facial expressions ($F(2,39)=15.822$, $p=0.001$, $\eta^2=.289$) and an interaction ($F(2,39)= 4.45$, $p=0.003$, $\eta^2=0.186$). Intragroup post hoc analyses showed that BV had a higher number of correct responses for facial expressions with positive emotional content, compared to the negative expressions. Also, NV achieved a higher number of correct answers for the images with positive content than for the other two kinds of emotional content. The intergroup analysis showed that NV had more correct answers than BVWA (Figure 2).

Finally, Pearson's correlation analysis showed a positive correlation ($r=0.399$, p =0.009) between anxiety and the verbal priming effect scores with negative stimuli (Figure 3).

Discussion and Conclusion

The purpose of this study was to determine whether the presence of anxiety has an effect on the performance of verbal and visual priming tasks with emotional stimulus in victims of bullying. As we expected, the bullying victims with anxiety showed better performance than the groups without anxiety for the negative stimuli on the verbal priming task, and this performance correlated positively with anxiety symptoms. Conversely, the victims with anxiety had lower performance than the other two groups with the happy faces

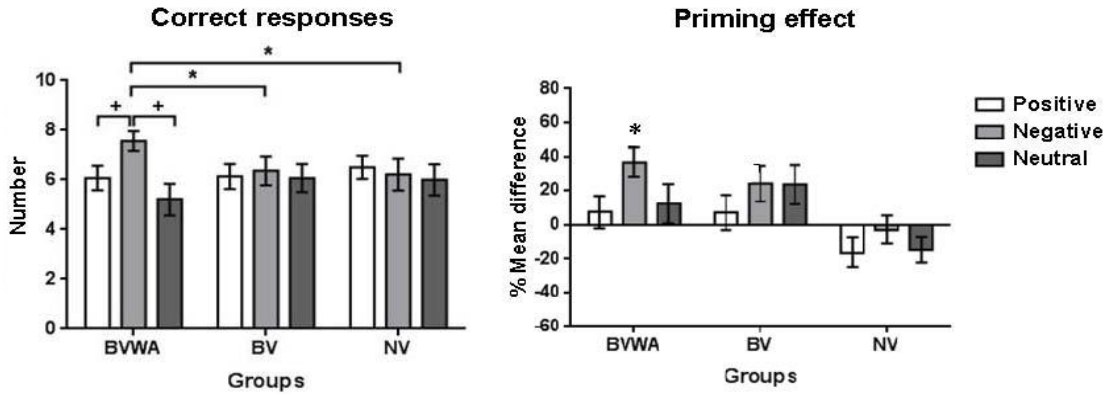

Figure 1: A) number of correct answers on the verbal priming task (Mean ± S.E.) for each type of stimulus by adolescent victims of bullying with anxiety (BVWA), bullying victims without anxiety (BV), and non-victims (NV). * Indicates a significant difference ($p<0.05$) between groups, while + indicates a significant difference ($p<0.05$) between emotions. B) Mean difference (± S.E.) of the percentage of the previously-seen and new words that were completed correctly for each type of stimulus in BVWA, BV and NV. * A priming effect was present when the difference in the number of correct responses to the words seen previously and the new ones was positive and significantly different from zero.

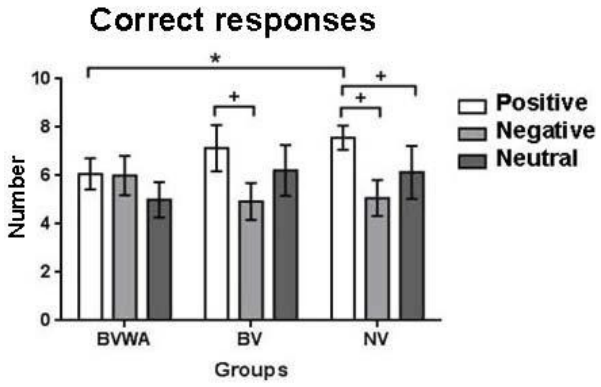

Figure 2: Number of correct responses on the facial priming task (Mean ± S.E.) for each type of stimulus in adolescent victims of bullying with anxiety (BVWA), bullying victims without anxiety (BV), and non-victims (NV). * Indicates a significant difference ($p<0.05$) between groups, while + indicates a significant difference ($p<0.05$) between emotions.

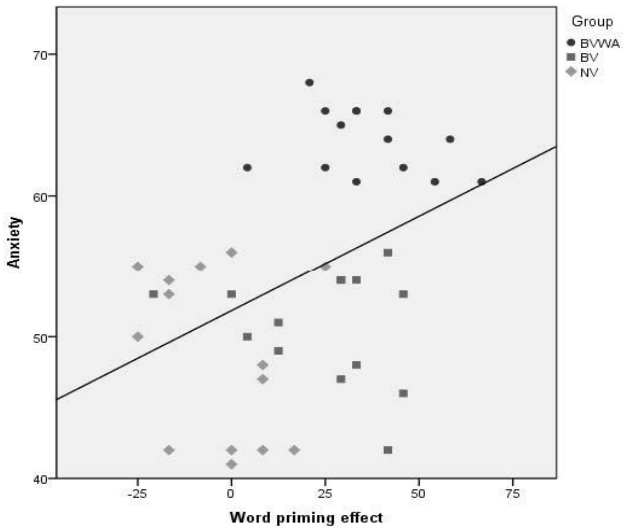

Figure 3: Scatter plot showing the correlation between anxiety scores and the verbal priming effect with negative valence in the BVWA, BV and NV groups.

on the visual priming task. As mentioned above, the BVWA group obtained more correct answers on the verbal priming task for words with negative valence than with the other two kinds of stimuli and the other groups. In addition, performance with threatening words shows a positive correlation with anxiety symptoms. These results are similar to those from a study by Li et al. [36] who evaluated 40 students divided into two groups: high and low anxiety. They used a subliminal priming paradigm in which subjects viewed masked, briefly-presented words, and then took an exclusion-completion test that involved completing three letter stems without using recently-perceived words. They found that completion rates were higher for words viewed subliminally compared to a baseline estimate. Also, unconscious priming was greater for threatening words than for neutral words in the high-anxiety group, and for neutral *vs.* threatening words in the low-anxiety group. The authors argued that enhanced unconscious priming of threat completions among anxious individuals may model intrusions in anxiety, when unconscious processing breaks into consciousness in the form of threat-related intrusive thoughts.

The subliminal processing of threatening stimuli could activate sub-cortical brain regions independently of consciousness-generating, top-down cortical modulation loops and, in that way, improve the memory of that type of stimulus. In this regard, Brooks et al. [43] conducted a meta-analysis of Functional Magnetic Resonance Imaging (fMRI) studies which found that the subliminal presentation of threatening stimuli contributes to activating the amygdala, bilateral anterior cingulate, bilateral insular cortex, hippocampus, and primary visual cortex. They posited that this core neuronal arousal in the brain, which may at first be independent of conscious processing, potentially involves a network that incorporates primary visual, somatosensory, implicit memory, and conflict-monitoring regions. These networks could contribute to anxiety disorder, which is associated with aberrant automatic emotional processing. In the specific case of words, Naccache et al. [44] reported that the emotional content (threatening *vs.* neutral) of subliminal words modulates the activity of the amygdala, and that this can occur with long latency (>800 ms). They suggest that such latency could reflect a top-down influence that amplifies the unconscious activation of the amygdala. Naccache et al. [45] explain that when subjects focus their attention on the predicted time of appearance of the target, as in our study, they open a temporal window of attention for a few hundred milliseconds.

This temporal attention benefits the priming that is presented temporally close to the target.

Regarding the relationship between priming and attention, authors like Kiefer et al. [46] argue that automatic, unconscious processing depends on the attentional amplification of processing paths that are congruent with the task, and propose an attentional sensitization model of unconscious visual processing. According to this model, unconscious visual processing is automatic in the sense that it begins without deliberate intent, but is susceptible to top-down attentional control. They also mention that subliminal priming depends on (a) attentional resources, (b) susceptibility to stimulus expectations, (c) the influence of action intentions, and (d) is modulated by the characteristics of the task. These results suggest that attention can either enhance or attenuate unconscious visual processes congruently with representations of attentional tasks, similar to conscious perception. Considering these arguments, we believe threatening words can be attended and then memorized in a privileged way in adolescent victims of bullying, because words are one of the most common means of intimidating people through various media, including notes, messages, emails, text messages and social networks.

Another explanation could lie in the activation of the amygdala, since it has been reported that in clinically-anxious populations the amygdala shows hyperactivity in response to stimuli with negative values [47]. Studies with rodents and non-human primates have shown that the functional connectivity among the basolateral complex (BLA), medial amygdala (MeA) and central nucleus of the amygdala (CeA) ensures that sensory and contextual information associated with emotional situations –such as fearful or anxiogenic circumstances– is channeled to effector regions where it produces appropriate responses necessary for survival [48]. Research in humans also suggests that the amygdala plays an important role in anxiety, suggesting that both enlarged (adults) and reduced (young adults) amygdala volumes have been associated with human anxiety disorders [47,49,50].

There are also reports that the prefrontal cortex (PFC) and rostral anterior cingulate cortex play important roles in regulating anxiety; specifically, cognitive control of anxiety states from threat-related distractors and the reappraisal of threatening stimuli were associated with lateral PFC (IFG) and medial PFC (vmPFC, OFC) activation and, simultaneously, decreased amygdala activation [51,52]. However, modulation of amygdala activation by the PFC is not as effective in adolescents as in adults, for it has not yet fully matured in younger people. In this regard, there are reports that the frontal cortex of adolescents has less white matter (myelin) than in adults. Also, the amygdala presents hyper-reactivity to emotional stimuli [26,27]. Hence, the immaturity of the PFC and hyper-activation of the amygdala may leave adolescents more vulnerable to developing anxiety disorders in response to social stressful events, such as bullying.

The high performance on the verbal priming task by adolescents with anxiety may be related to some of the symptoms that characterize this disorder. Halligan et al. [37] suggest that development of PTSD (an anxiety disorder) is mediated by the presence of memory alterations because, while the intentional recall of the stressful event is often disorganized or incomplete, involuntary memory fragments are easily and unwittingly activated by perceptual signals. In relation to the results of our visual priming task, BVWA showed no differences in relation to the emotional content of the faces. In contrast, both BV and NV had more correct responses with positive than negative stimuli. Also, NV had more correct responses with positive stimuli than BVWA. We believe that there are several possible explanations for these results. First, contrary to the case of verbal stimuli, high levels of anxiety could damage the priming of facial stimuli. On this topic, Haas et al. [53] analyzed the effects of emotional priming on a facial search task in participants with different levels of social anxiety (low and high). They found that the priming of faces with expressions of anger, surprise or fear facilitated the visual search in people with low anxiety, but that these same emotions impaired the visual search of participants with high levels of anxiety. The authors argue that while in subjects with severe anxiety negative facial emotion could improve the initial capture or withdrawal of attention to or from the stimulus, later it can impair identification of the stimulus. The way in which emotion affects priming for emotional faces in adolescents with anxiety could be mediated by adrenal stress hormones, which would impact memory consolidation *via* interactions with arousal-induced activation of noradrenergic mechanisms in the amygdala [54]. These effects would be mediated selectively by the basolateral complex of the amygdala (BLA), a complex that modulates the memory consolidation of many different types of information by sending eferences to other brain regions, including the caudate nucleus, nucleus accumbens and cortex [55]. However, in contrast to the enhancing effects on consolidation, high circulating levels of stress hormones impair memory retrieval and working memory. These effects also require noradrenergic activation of the amygdala and interactions with other brain regions [54].

The second explanation has to do with the better performance on happy faces by the groups without anxiety (BV, NV), which contrasted with observations of BVWA. Several studies have found that healthy participants show better recognition of happy faces [56], even when they are presented extra-foveally [57]. Additionally, performance on a working memory task with emotional stimuli improves when happy faces are shown [42,58]. The better performance with happy expressions on priming tasks may occur because it is easier to recognize them than negative emotions [59]. Hence, the brain resources required for processing are fewer than those needed to maintain and manipulate information in working memory, leaving subjects with more resources to decide whether or not they had seen that person's face before. In contrast, faces with negative valence receive priority processing [60], leaving fewer neural resources available for other cognitive processes. In contrast to groups without anxiety, for our BVWA participants the happy face did not improve performance, probably because for them recognizing happy and negative faces entails a similar degree of difficulty. For BVWA, the expressions of happiness did not represent pleasant, easy-to-recognize stimuli, since on many occasions these expressions emitted by their schoolmates may represent mockery and precede an aggression.

The third explanation for the absence of differences among the types of expressions in the BVWA group could be related to the fact that the faces used in our visual priming task were of adults. There is evidence that the age of the faces shown can influence the way in which they are perceived and processed. On this issue, Bouragui et al. [61] examined whether anxious children (aged 6-9) exhibit comparable responses to emotional facial expressions in adults and children, compared to children without anxiety. They used a forced-choice paradigm in which subjects had to judge the age (adult/child), gender (male/female) and emotion (anger/happiness) of faces presented one-by-one on a screen. Though all participants identified anger more efficiently than happiness, the non-anxious children responded

more quickly to angry adult faces in all conditions, while the anxious subjects did not show this effect, but did process anger on children's faces more accurately than on adult ones. The authors concluded that these results suggest that anxious children paid more attention to their peers' disapproval, while non-anxious children focused more on adults' disapprobation. We consider that this phenomenon could also be present in our BVWA group, suggesting that approval by peers is more important for adolescents than children. Considering this possibility, future studies with adolescent victims of bullying need to compare the priming effect in relation to faces of teenagers and adults. Finally, we recognize that our study has some limitations, especially the small sample size and the differences between the verbal and facial priming paradigms employed, since the first task was presented on paper and the second by computer. Also, we consider that it would be very useful to measure response times on both tasks. In terms of future research, we believe that it would be interesting to compare the effects of verbal and facial stimuli with negative valence on bullied adolescents who suffer different forms of intimidation.

In conclusion, this study shows that verbal and facial stimuli with negative valence can have differential effects on adolescent victims of bullying who suffer anxiety. While the threatening verbal stimuli generated facilitation in implicit memory, the angry faces did not, likely because, thanks to social networks, words have become a very common form of intimidation.

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Conflicts of Interest

The authors report that they have no conflicts of interest.

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