Cognitive Interference for Trauma Related Word Cues in Maltreated Children: Evidence from the "Emotional Stroop Task" in a Pakistani Cohirt

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Abstract

The study examined the sensitivity to emotional words through an 'Emotional Stroop' task in maltreated Pakistani children and identifying the cognitive interference for these words. A sample of 50 maltreated children with age range of 8-12 years and 50 controls was drawn from different schools and they were categorized by administering the Child Abuse Scale. The children had to identify the colors of neutral words, emotional words with non-violent associations and emotional words with violent associations. Maltreated group showed slower overall reaction times, more pronounced interference from emotional but non-violent words and extremely prolonged reaction time to emotional words with violent associations. These effects were even larger for maltreated male participants than for maltreated female participants. A similar pattern emerged on the error data. The data remained even when differences between the groups in terms of their behavioral problems, their socio-economic status and their family organization were taken into account as co-variates. Maltreated children showed a form of startle-response to emotionally violent words, blocking their response to the color. In addition to this, the maltreated children were also more affected by emotional words per se (with emotional nonviolent words compared with neutral words) than controls.

Key words: *Maltreated children, Emotional Stroop Task, cognitive interference, Pakistan*

Introduction

Child maltreatment is adult behavior that endangers or impairs a child's physical or emotional health and development or failure to act responsibly resulting in death, serious physical or emotional harm, sexual abuse or exploitation; or an act or failure to act which presents an imminent risk of serious harm (National Clearinghouse on Child Abuse and Neglect Information, 2006). The latest statistics from the USA suggests that more than 906, 000 children were maltreatment victims in 2005, 61 % experienced neglect, 19 % physical abuse, 10% sexually abuse, and 5 % emotional and psychological abuse. An estimated 1 out of 500 children died of maltreatment, 36 % neglect, 28% physical abuse, and 29% from multiple maltreatment types (Department of Health and Human Services, 2005). UNICEF estimate (2004) about Pakistan is 40% of the total child population of less than 5 years suffers malnutrition, 63% are anemic or underweight, and infant mortality rate is 81%. Poor conditions extend to the education sector too, 23 million children had never been to school, and net primary school enrolment/attendance was 56%. More than 120,000 Pakistani children work in factories or workplaces that do not meet minimum health standards (Asia Child Rights, 2005). A report indicated 1,549 cases of sexual abuse in 2003; representing a rate of three cases per day (SPARC, 2004). Thus, child maltreatment is a significant factor likely to influence the development of substantial numbers of children in Pakistan.

Impact of Child Abuse

The experience of maltreatment can have immense consequences for the children. Like other trauma victims, they experience significant distress and for being traumatized during the most critical period of their lives, the experience of abuse increases a child's risk of developing a number of health, developmental problems and even deficits in learning and intelligence (Elmer & Gregg, 1967); poor expressive language skills (Elmer, 1977), poor adjustment in school, an inability to cope with academic work, reduced responsiveness to teachers, a poor ability to exercise discipline and control, and impaired relationships with peers (Stott, 1974). Child abuse may even be associated with dysfunctional brain development resulting in impaired physical, mental, and emotional development (Perry, 2001).

Psychological abuse in particular may lead to problems of emotions, social competency, antisocial functioning (Crittenden, Claussen, & Sugarman., 1994) and linked clinical consequences include anxiety, depression, low self esteem, negative life views, and suicidal ideation (Briere & Runtz, 1991; Crittenden et al., 1994). Beers and Bellis (2002) evaluated cognition in maltreated children using neuropsychological instruments measuring language, attention, abstract reasoning/executive functioning, learning and memory, visual-spatial processing, and psychomotor function. They found that maltreated children performed more poorly on measures of attention and abstract reasoning/executive functioning. There is an emerging consensus that early experiences can be a cause of developmental delay. Perry (2001) found that abused infants and toddlers often experience developmental delays across a broad spectrum of measures, including cognitive, language, motor, and socialization skills. Recently Parasad, Kramer, and Ewing-Cobb (2005) investigated cognitive, motor, and language skills in physically abused toddlers and preschoolers. Physically abused children scored significantly lower than controls on measures of cognitive functioning, motor skills, and language skills.

Another crucial consequence of child abuse is the behavioural problems in children. Kinard (1995) found that both abused boys and girls had greater behavioural problems than their counter parts, with abused boys having more problems than abused girls. Behavioral problems were also associated with the child's disclosure of abuse (Dubowitz, Black, Harrington, & Verscoore, 1993; Gushurst, 2003). Whether behavioural problems are causal in leading to some of the other associated difficulties in maltreated children need to be evaluated in research. In the present research we had investigated the differential responses to emotional and non-emotional words in maltreated and non-maltreated (control) Pakistani children. Measures of their behavioural problems were also taken so that inter-individual variations in such problems would not be a confounding factor.

Emotional STROOP Task

The 'Emotional Stroop' task requires the identification responses to the colors of words where the words vary in their emotional connotations. Typically words with negative emotional associations (including words that are related to personal trauma) interfere more with colour identification than do neutral words, with no emotional connotations. For example, using a computerized procedure, McNally, Kaspi, & Reiman (1990) found that patients with combat-related PTSD exhibited more interference from trauma-related words than for equally "negative" words that were unrelated to the trauma. McNally, English and Lipke (1993) showed that Vietnam combat veterans with PTSD exhibited increased Stroop interference for trauma-related words. McNally, Clancy, Schacter, and Pitman (2000) further found that psychologically traumatized people exhibit delayed color naming of trauma words in the emotional Stroop task. This result is interesting as it suggests some degree of specificity in the responses to trauma-related words, and not just generally increased sensitivity to words with emotional- associations.

One possible causal factor contributing to these increased interference effects under Stroop conditions is that trauma victims may show greater attentional sensitivity of words associated with trauma e.g., Lange, Nelson, & Collins (1990) found panic disorder and panic attacks to be associated with increased attention to threatening information in individuals on the measures of anxiety symptoms and panic along with the emotional Stroop task. The panic history and anxiety symptoms were associated with attentional bias for information related to physical and social threat. To date, most studies into the Emotional Stroop effect have used adult participants, but there are also reports of its successful application to children and adolescents e.g., children diagnosed with spider phobias (Kindt & Brosschot, 1997), anxiety disorder (Neshat-Doost, Yule, & Dagleish, 1999), conduct disorder (Baurer & Hesselbrock, 1999), and PTSD (Moradi et al., 1999) have all been reported to show diagnosis-specific interference. Taghavi (1996) conducted a study with threat, depression-related, positive and neutral words with child and adolescent patients with GAD.

Relative to non-anxious control participants, the anxious participants showed a selective increase in Stroop interference effect for negative emotional information. Perez- Edgar and Fox (2003) found that children who were slowed in responding to Stroop words with both positive and negative connotations also exhibited greater signs of emotional and social, but not cognitive, maladjustment across time. The emotional Stroop has also been used with children in order to detect differences in emotional responsitivity between socially rejected and socially accepted children (Martin & Cole, 2000; Martin et al., 2003) and as a measure of construct avoidance in cognitively inhibited children (Morren, Kindt, Van den Hout, & Van Kasteren, 2003). Rosen, Milich, and Harris (2007) represented the first evidence of a relation between distinct implicit processing patterns and chronic peer victimization among children while using an Emotional Stroop task.
The relative simplicity of the Emotional Stroop task makes it well suited for use in developmental studies and also as a possible behavioural marker of emotional disturbance in children, perhaps linked to prior maltreatment.

As a precursor to this, this study aimed at examining whether children with a history of maltreatment show an increased emotional Stroop effect, particularly for emotional words with a violent connotation. We designed Emotional Stroop task for maltreated children which included colored words; emotionally neutral, emotional but unrelated to violent acts and both emotional and associated with violence. The task was to identify the colour of the word on each trial (a 4-choice response) and we measured when the emotional words tended to interfere more with colored word's identification in the maltreated children than with the control participants. In addition, given that the maltreated children differed from the control group in terms of their behavioural problems and socio-economic status, effects due to these factors were extracted as co-variates, to test if there were effects related to maltreatment over and above this.

Method

Participants

The sample of voluntary participants, 50 with a history of maltreatment and 50 control children (no prior history of maltreatment). Within each group there were 50% girls and 50% boys, with an age range of 8 and 12 years (M = 10.38, SD = 1.25).The children were drawn from a range of social classes and they were categorized by administering the Child Abuse Scale (Malik & Shah, 2007). The data were collected from 5 public and 5 private schools from five major cities in the Punjab including Multan, Lahore, Bahawalpur, Dera Ghazi Khan and Rawalpindi-Islamabad after taking informed consent from the parents.

Personality Measures

Child Abuse Scale

This is an indigenously developed self report measure for children of 8-12 years (Malik & Shah, 2007) in Urdu, comprising of 34 items pertaining to four empirically determined subscales through factor analysis, namely physical abuse, emotional abuse, physical neglect, emotional neglect. The responses were recorded on a 4-point rating scale i.e., "Never", "Sometimes", "Frequently" and "Always" (score 1 to 4). Subjects' score on CAS was a sum of scores on each item and total score ranged from 34 to 136. The score range of 66-136 had been considered as indicator of severe child abuse while the least score of 34-40 on CAS considered as an indicator of non-abuse. The authors have reported highly significant validity and reliability for CAS (α = .92) and its subscales ranging from .63 to .90, $p < .0001$ (Malik & Shah, 2007) suggesting it a reliable measure of the intensity and degree of abuse and neglect.

Comprehensive Behaviour Rating Scale for Children

Seventy items from teacher rating scale of CBRSC (Neeper, Lahey, & Frick, 1990), were translated into Urdu while employing a standardized back translation procedure to assess behavioural problems in children. Each item describes a particular behaviour or cognitive attribute of the child. The scale includes 9 subscales including Inattention-Disorganization, Reading problems, Cognitive Deficits, Oppositional- Conduct Disorders, Motor Hyperactivity, Anxiety, Sluggish Tempo, Daydreaming, and Social Competence. The authors reported high estimates of test-retest reliability for CBRSC ranging from .84 to .94. The intercorrelation of CBRSC with Revised Behaviour Problem Checklist (Quay & Peterson, 1987) and Conner's Teacher Rating Scales (Conners, 1997) were found high (r =.81) indicating strong construct validity.

In the first step of translation, 10 bilingual experts with at least an M. Phil in Psychology (5 men & 5 women) translated the items while keeping in view the grammatical and connotative meanings which were then scrutinized by the researchers to select the suitable translations with the highest frequency. The retained items were then back translated into English by 10 bilingual teachers (5 men & 5 women) with educational qualifications at least Masters in English from GC U and Islamia University, Bahawalpur. After comparing the Urdu translation and the back English translation with the original CBRSC, Urdu and English versions were administered to a sample of 10 school teachers. Item to item correlations were computed that ranged from .53 to .92, $p < .0001$, suggesting that items in both versions conveyed the same meaning. The reliability was determined for the CBRS Urdu version (α =.95), and for its subscales ranged from α = .77 to α = .99.

Experimental Task: Emotional STROOP

This experimental task was administered in Urdu consisting of total 75 words stimuli with 4 to 6 letters pertaining to 3 word domains (25 each): emotionally violent words (e. g beat, hate, injury), emotional but non-violent words (e. g. joy, love, kiss) and neutral (non-emotional) words (e.g., gate, star, cat) (see appendix A). Most of the words were selected from two sources (Neshat-Doost, Moradi, Taghavi, Yule, & Dalgleish, 1999; Vasey, Daleiden, William, & Brown, 1995; Vasey, El-Hag, & Daleiden, 1996) but some words were selected especially pertaining to maltreatment situations (e.g. abuse, injury, cry). The words in the three groups were matched on number of letters (NLET) and frequency (FRQ) and using Kucera and Francis's (1967), familiarity (FAM), imagenability (IMG) using machine usable dictionary data from the MRC Psycholinguistic Database version 2.00 (Wilson, 1987).

Table 1: Means of three types of words

Matching characteristics	Emotional Words (n = 25)	Violent	Emotional Words (n = 25)	Nonviolent	Neutral Words (n = 25)
	M		*M*		*M*
Familiarity	551.28		579.88		588.92
lmaginability	487.40		509.68		583.72
KF Frequency	68.04		94.36		97.88
No.of Letters	5.12		5.08		5.20

The words were written in Inpage Urdu software in one of the four colors Blue, Red, Yellow, and Green, and presented in E-prime computer software (Schneider, Eschman, & Zuccolotto, 2002) using a Dell C 600 Latitude laptop with a 14 inch color monitor with a black background. The subject was seated approximately 60 cm from the computer screen with each word approximately 0.6 cm high (0.6 degree of visual angle) and approximately 2 cm wide (2 degrees of visual angle). Each participant was tested individually and the colored words appeared in a fully randomized fashion and remained at the center of screen until a response was made by pressing the fixed keys: X for red, Y for blue, Z for green and W for yellow labeled with the specific colors. Each response was followed by an asterisk appearing on the screen, which preceded the next word (see Appendix A). Prior to the administration of the EST the participants were instructed their task is to ignore the meaning of the words stimuli and just to report the colors in which the words were written as quickly and accurately as possible. Children were also checked for corrected normal colour vision and were screened for being able to read words. It was also made sure that all children were free of medication at the time of experimentation.

Procedure

Children were selected by class teachers who indicated (i) children who appeared to come from a conflicting family background and were suspected of being victims of parental abuse (for the maltreated group), and (ii) children who seemed unlikely to be maltreated (for the control group). The children selected were given the Child Abuse Scale to determine the presence or absence of maltreatment. Approximately 20-30 children from each school were administered the CAS to select subjects for each experimental and control group. Subsequently informed consent was given to the parents/caretakers of the children. The class teachers were then requested to rate each child's behaviour.

The study was approved by institutional IRB and all the ethical statndard were taken into account while planning this study. After the experiment, debriefing/counseling sessions were arranged for each child after the task accomplishment while asking their experience of the experiment. The researchers also remained in touch with school administrations in case the children needed any further help.

Results

Reliabilities

Cronbach's alpha computed for the CAS (α = .99) and the CBRSC (α =.95, p < .0001). The internal consistencies for their subscales ranged from α = .77 to α = .99, p < .0001.

Differences across groups for variables

Different between-subjects ANOVAs were computed to determine the differences between experimental and control groups (maltreated vs. control) across different personality and demographic variables, where the groups differed for a particular factor, we included that factor in subsequent analyses of group differences in the Emotional Stroop task. In each analysis we included both group (maltreated vs. control) and gender (male vs. female) as factors. On the measure of behavioural problems, there were reliable main effects of group, F (3, 96) = 5933.25 and gender F (3, 96) = 164.23, p <.0001, and a significant interaction, F (3, 96) = 232.33, p <.0001. The maltreated group showed greater behavioural problems than the control group, and this was especially in case of boys. There were also main effects of group, F (3, 96) = 4.02, p <.05, and gender, F (3, 96) = 5.16, p <.02, for the measure of social class. The control group tended to have a higher social-economic status than maltreated group and females tended to come from families with higher status than the males. There was no interaction (F<1.0). Although the groups did not differ in terms of whether they came from a nuclear family or joint family set up F (1,96) = 2.67, p<.05), there was an effect of gender, F (1, 96) = 4.18, p <.05. The females tended to be more likely to come from joint (rather than nuclear) families, compared with the males.

Differences across Emotional STROOP Task

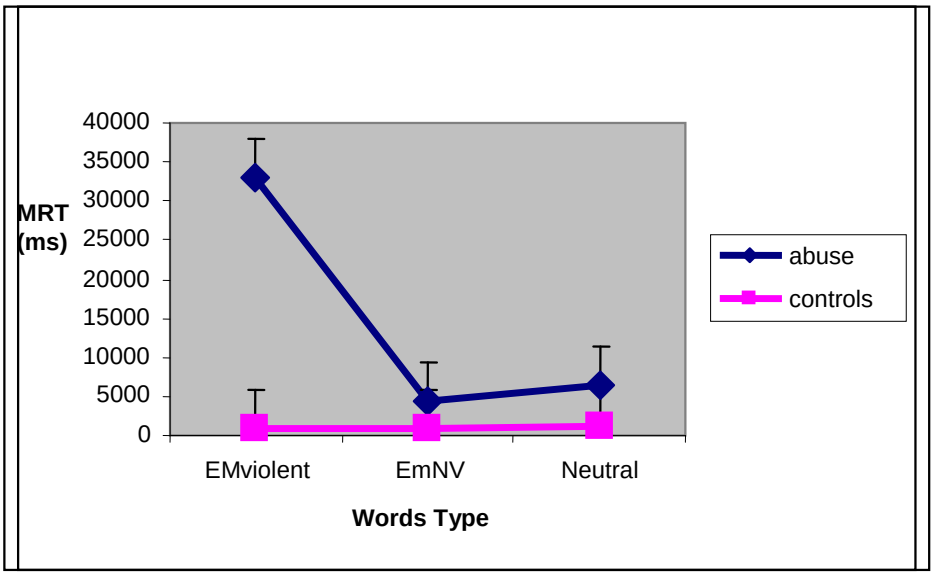
Reaction times

RTs for the EST were analyzed using a 3 x 2 x 2 ANOVA with groups and gender as between-subject factors with the type of word (emotional violent, emotional nonviolent, neutral) as a within-subjects factor.

The factors family size, social class and degree of behavioural problem were included as co-variates. The overall main effect for word type (emotional violent, emotional nonviolent, neutral), was not reliable F (2, 186) = .203). There were highly significant interactions for word type and gender F (2, 186) = 11.08, p < .0001, and word type, group and gender F (2, 186) = 10.65, p < .0001. These effects remained even when the variance due to differences in behavioural problems, socio-economic status and family status was removed. The three-way interaction was broken down for boys and girl separately. For boys, there were main effects of word type, F (2, 96) = 40.82, and group F (2, 96) = 48.51, p < .0001 and a group x word type interaction, F (2, 96) = 40.89, p < .0001. The maltreated boys were much slower to respond when there was an emotional violent Stroop word than when the word was emotional but nonviolent, t (24) = 6.40, p < .0001. In addition, RTs with both types of emotional word were slower than neutral words, t (24) = 2.99, and 6.43, both p < .0001, for the respective comparisons of emotionally violent and non-violent words with neutral words. In contrast, the control boys showed no reliable differences between the emotional violent and emotional nonviolent stimuli, t (24) <1.0, or between the emotional non violent and neutral words t (24) <1.0, though there were reliable differences between the emotional violent and the neutral words t (24) = 2.04, p < .05.

Similar analyses performed for the girls indicated overall highly significant main effects of word type (emotional violent, emotional nonviolent, neutral) F (2, 96) = 52.99, and of group F (2, 96) = 45. 93, p < .0001. The group x word type interaction was also highly reliable F (2, 96) = 44.73 p <.0001. The maltreated girls showed a highly significant difference between emotional violent and emotional nonviolent words, t (24) = 7.44, p < .0001, between emotional violent and neutral words t (24) = 7.34, p < .0001 and between emotional nonviolent and neutral words t (24) = 2.24, p < .03. In contrast, the control girls showed no reliable differences between the three types of word. The RTs for boys and girls from the experimental and control groups have been depicted in Figures 1 and 2.

Figure 1: Mean correct RTs (ms) for boys from the maltreated vs. control groups for the types of word

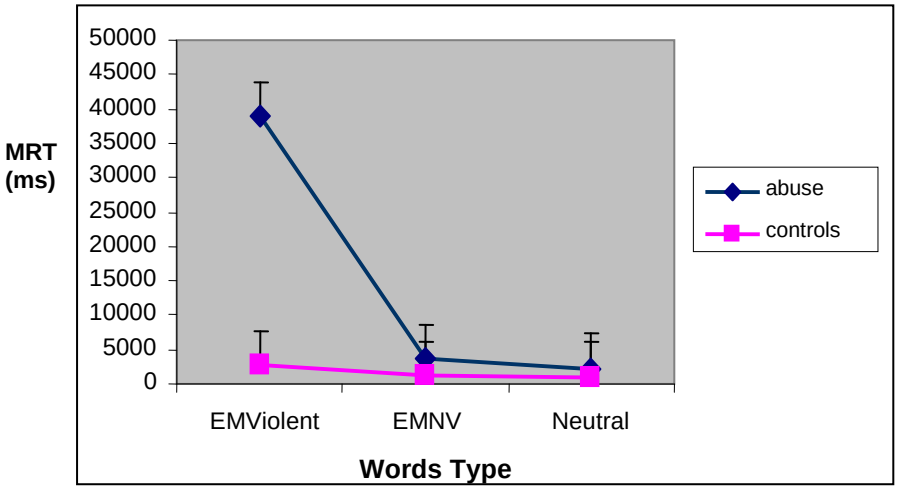


Error bars = 1 SE

Errors

EST accuracy data were also analyzed using a 3 x 2 x 2 ANOVA with groups and gender (as between-subject factors with the type of word as a within-subject factor and family size, social class and degree of behavioural problems as co-variates. There was a reliable main effect of word type F (2, 186) = 3.81, p < .02. The interaction effects of words type x group, F (2, 186) = 6.03, p < .001, words type x gender F (2, 186) = 3.71, p < .01 and word type x group x gender F (2, 186) = 4.50, 1.23, p < .01 were also reliable. The three-way interaction was broken down for gender separately. The maltreated boys showed reliable accuracy differences between the emotional violent and neutral words t(24) = 2.59, p < .01, but non-reliable differences for emotional nonviolent and neutral words, t (24) <1.0 and the emotional violent and nonviolent words, t (24) <1.0. In contrast, the accuracy differences for the control boys were reliable for the contrasts between all three types of words (emotional violent vs. emotional nonviolent words, t (24) = 7.33, p < .0001; emotional violent vs. neutral, t (24) = 13.26, p < .0001 and emotional nonviolent vs. neutral, t (24) = 7.33, p < .0001. The maltreated girls showed a highly significant difference between emotional nonviolent and neutral words t (24) = 3.44, p < .001, but non significant differences between emotional violent and emotional nonviolent words t (24) <1.0 or between emotional violent and neutral words, t (24) <1.0.

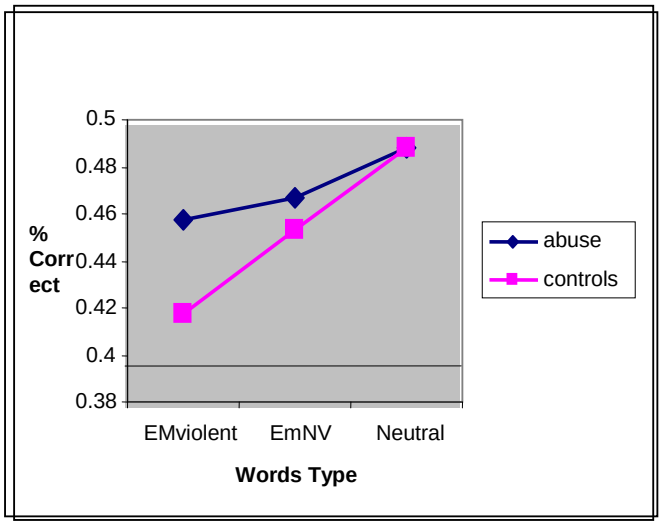
Figure 2: Mean RTs (ms) for girls from the maltreated vs. control groups for three types of word



Error bars = 1 SE

In contrast, the control group girls showed accuracy differences between the three words categories (emotional violent vs. neutral words, t (24) = 12.03, emotional violent vs. emotional nonviolent words, t (24) = 8.66 and emotional nonviolent vs. neutral, t (24) = 7.33 ($p < .0001$). The mean accuracy percentage differences for boys and girls from the experimental and control groups are depicted in Figures 3 and 4.

Figure 3: Response Accuracy Boys ((abuse vs. control)



We also examined the diagnostic potential of emotional Stroop task as an instrument for classifying the maltreated and non-maltreated groups. For this analysis we computed the means and SDs for the differences between the three classes of words for the control participants and considered children whose scores fell outside this distribution. In the maltreated group 80% (40 out of 50) of the children had RTs above the cut off for the contrast between emotional violent and emotional nonviolent words; 82% were above the cut-off for the contrast between emotional violent and neutral words, and 14% were above the cut-off for the contrast between emotional nonviolent and neutral words. This indicates that the response to emotional violent words, in contrast to other types of word, may have diagnostic potential for the diagnosis of child maltreatment. Figure 5 clearly shows the differences between the maltreated and control groups for the different cut off scores.

Figure 4: Response Accuracy Girls (abused vs. control)

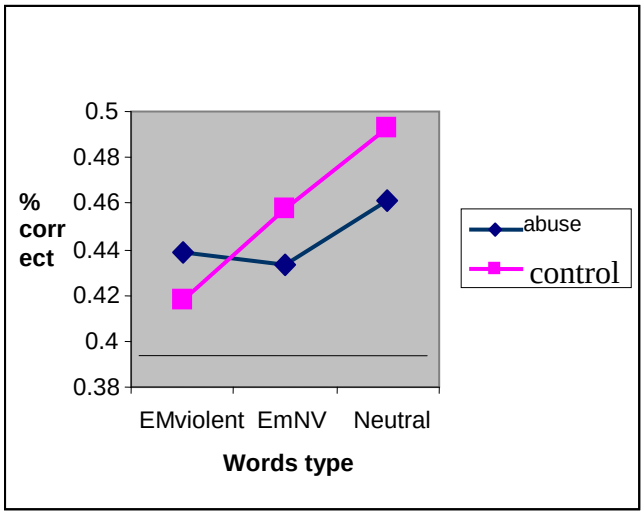
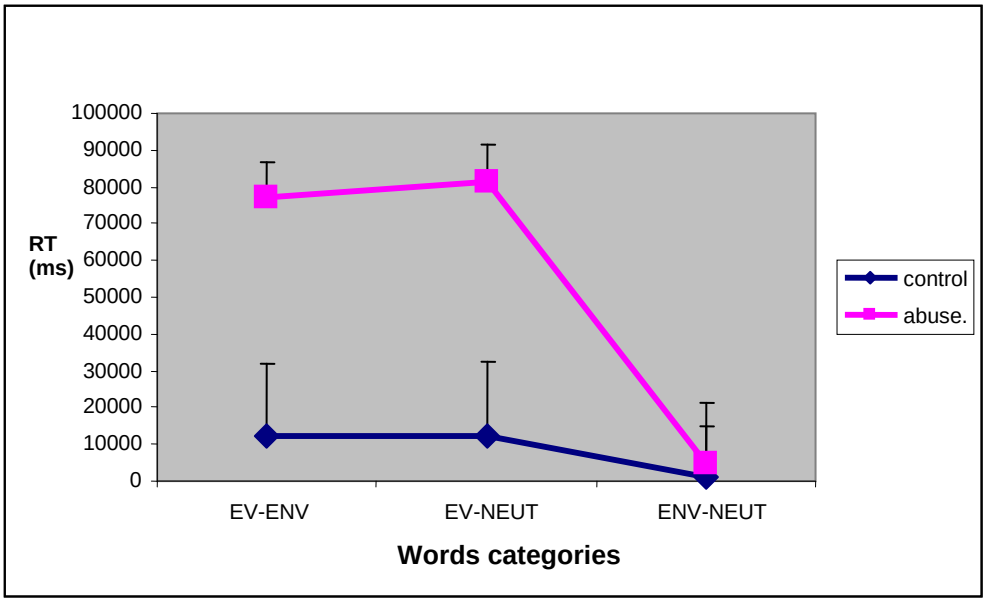


Figure 5: Mean RT differences (in ms) between each class of word for abused and control groups. Error bars = 1 SE



Discussion

The present results show a clear picture. Children from the maltreated group showed extremely long RTs to identify the colour of emotionally violent words compared with emotional but non-violent words and neutral words. The large magnitude of this effect (the maltreated male children generated a mean RT of nearly 2 minutes when confronted with emotionally violent words) suggests that there is a form of emotional startle effect, with the children then pausing for a very long time beofre responding. In absolute terms these effects were larger on maltreated boys than girls (boys were on average 125 sec slower for emotionally violent than neutral words; girls were 38.8 sec slower). However, maltreated boys were slower than girls on the neutral stimuli (6.5 sec vs. 2.2 sec), so the relative sizes of the emotional startle effect for each gender, when scaled by their mean RTs on neutral trials, did not differ greatly (the size of the interference effect for emotionally voilent words was 19.2 times the base RT for males, while it was 17.6 times the base rate for the feamles). We conclude that both groups of maltreated children showed emotional startle effect for emotional violence-related words, and that the effect was relatively the same size on both groups. In addition to this, the maltreated children showed generally longer reaction times than the controls and also showed relatively slow responses to emotional but non-violence related words, compared with neutral words, suggesting some increased sensitivity to the emotional valence of words. One difficulty for the above argument, for a much greater emotional Stroop effect on maltreated compared with control children is that the controls tended to generate more errors and, if anything produced a stronger emotional Stroop effect on errors than the maltreated children.

However, the magnitudes of the effects on errors were small (a maximum 4% difference between the maltreated and control boys, on emotional violent words; this effect however was reversed for the girls), and in no way is comparable to the massive effects on RTs. Hence we do not think that the RT results reflect a speed-accuracy trade-off, and the large differences in RTs cannot simply be attributed to the controls making slightly more errors. We do note, though, that the controls did find the emotional violent words more difficult than the other types indicating that these words did disrupt response selection for all children; with the effects on RTs being by some magnitude larger for maltreated than for control children. The importance of the RT result is also highlighted by our examination of the use of the 'emotional Stroop index' for diagnosing maltreatment. Using cut-offs based on RT differences between performance with emotional violent words and other words types in the control population, we were able to diagnose over 80% of the maltreated children as belonging to that group.

Given that it may often be difficult to elicit reliable direct signs of child maltreatment, the magnitude of the Emotional Stroop effect specific to words with violent connotations may provide a useful indicator for further investigation. Pollak, Cicchetti, and Klorman (1998) suggested that histories of trauma may enhance the relevance of the negative emotional expression or diminish the salience of positive emotional expressions for maltreated children, therefore the association of affective stimuli with traumatic experiences could alter the meaning or content of the representations activated by those emotions. Whether or not there is an altered concept relating to emotional words, the data indicate that the maltreated children found violent, emotional words in particular extremely distracting, disrupting their response to the color. Somewhat similar results were reported by Schwartz, Snidman, and Kagan (1996) who presented emotional Stroop stimuli to children classified as behaviorally inhibited or uninhibited as infants and noted a greater number of delayed reactions to threatening words for the inhibited than for the uninhibited group. Similarly, in studies with adults, it has been consistently documented that words closely related to trauma produce more interference than negative words less closely related to trauma (McNally, Lasko, Macklin, & Pitman, in press; Thrasher, Dalgleish, & Yule, 1994).

Overall the data are consistent with the automatic vigilance hypothesis of Pratto and John (1991), who proposed that unpleasant stimuli show stronger interference than pleasant stimuli due to the stronger attention-grabbing power of negative information, which distracts attention away from the task-relevant color dimension that is indicative of the effect occurring automatically. While showing stronger effects of the emotional and (particularly) emotional violent words, the maltreated children were also slower overall than controls. These results match the proposals of Perry (2001) that abused infants and toddlers can experience developmental delays across a broad spectrum of abilities, including cognitive, language, motor, and socialization skills. Such deficits may arise because maltreatment during infancy and early childhood negatively affects early brain development and can have enduring repercussions into adolescence and adulthood. As far longer Rts. overall are concerned a number of studies where participants had no prior contact with experimental stimuli also found reliably increased RTs to negative versus neutral or positive stimuli (Carretie et al. 2001a; Huang & Luo, 2006; Lang et al., 1990, McNeely et al., 2004).

Barnat et al. (2001) had participants' rate mood adjectives daily for 28 days on a Likert type scale prior to recording ERPS to the stimuli. However, when same mood adjectives were presented on the computer screen, the participants showed longer ERPs with higher amplitude P3s to unpleasant than pleasant words. The present children were certainly unused to being scientifically tested, and may have shown the startle reaction when confronted with these words in a novel experimental situation. Moreover Geller and Shaver (1976) noted that more interference was produced in naming the color of self referent words if a participant had to perform in front of an observer. The present data were collected with an observer present. It would be interesting to examine performance when the observer was absent. Teachers' ratings for child behavioral problems indicated that almost all children in the abused group had their overall mean score well above the cut off score for CBRSC i.e., 211.

Children with behavioral problems (including oppositional-conduct disorder, aggression, impulsivity, and defiant behaviour high) showed attentional deficits on the emotional Stroop task (Avila, 2004). However, behavioural deficits alone fail to account for our results on the EST, since the differences between the abused and control groups remained even when the variance associated with behavioural problems was factored out. Similarly the increased Emotional Stroop effects were present even when differences in socio-economic status and family organisation were taken into account. While poor socio-economic status may be one of several factors that precipitate maltreatment of children (Garbarino, Guttman, & Seeley, 1986; MacMillan, 2002), it seems that this alone does not cause the group differences in the startle effect we observed; rather it is the association with maltreatement itself that seems to be crucial.

The present study defined maltreatment in broad terms, primarily linked to physical abuse. Of course, physical abuse itself is associated with other forms of abuse and abused children do tend to suffer multiple forms of trauma (Cohen, Deblinger, Mannarino, & Steer, 2004; Malik, 2004, Cohen, Mannarino, Murray, & Igelman, 2006). It is posisble that these additional forms of abuse might have been critical here, playing a critical, causal role in the increased Stroop effect for emotional violent words. This requires further work, aimed at teasing apart the most important factors related to maltreatment and to the emotional startle effect. A further limitation of our research is that the data were collected only from school populations of children in an urban area. Given the inhomogeneity of Pakistani society, it is clearly important to assess if similar effects might arise in a more rural populous. It would also be critical to move beyond the cross-sectional design presented here, to establish a direct link between maltreatment and sensitivity to the emotional content of words using a longitudinal design, where the level of maltreatment could be directly measures and linked to the level of Stroop interference. It may also be possible to use data on cognitive biases in children as an indicator of possible maltreatment, or at least to register this as an increased risk factor – though this too will depend on further work which, for example, tries to establish the test-retest reliability of the measures as well as establishing its external validity in relation to other measures of maltreatment. The present study is but the first step towards assessing whether variations in the emotional Stroop effect can be applied in more real-life settings, as a possible indicator of physical and emotional trauma.

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Appendix A

List of 3 Types of Words

Emotional Violent Words					Emotional Non-Violent Words					Neutral Words				
WORDS	**FAM**	**IMG**	**KFFRQ**	**NLET**	**WORDS**	**FAM**	**IMG**	**KFFRQ**	**NLET**	**WORDS**	**FAM**	**IMG**	**KFFRQ**	**NLET**
BEAT	536	406	68	4	LAUGH	594	528	28	5	GATE	540	545	37	4
MURDER	528	549	75	6	LOVE	619	569	232	4	BROTHER	598	589	73	7
HATE	552	462	42	4	CARE	563	383	162	4	SISTER	588	613	38	6
GUN	495	483	118	3	FRIENDLY	603	587	133	6	STAR	574	623	25	4
ABUSE	519	613	27	5	COMFORT	566	421	43	7	MILK	588	638	49	4
ANGRY	600	492	45	5	SECURE	507	373	30	6	FAN	556	527	34	3
DEATH	581	498	277	4	PASS	535	479	89	4	TABLE	599	582	198	5
CRY	566	506	64	3	KISS	592	633	17	4	CHAIR	617	610	66	5
INJURY	568	551	27	6	RELAX	547	439	35	4	FLOWER	566	618	23	6
THREAT	524	408	42	6	PLAYING	582	464	101	7	COUNTRY	592	539	324	7
PAIN	569	502	88	4	MOTHER	632	638	216	6	MONKEY	531	588	39	6
BLAME	534	419	34	5	FATHER	591	646	183	6	SUMMER	612	618	134	6
SLAP	581	443	39	4	SMILE	594	615	58	5	WINTER	615	621	83	6
ENEMY	523	497	88	5	STORY	578	491	151	5	POTATO	612	617	15	6
BURDEN	584	380	44	6	SUCCESS	568	443	93	7	TIGER	513	606	47	5
AFRAID	575	451	57	6	GENTLE	570	429	93	6	DOOR	630	599	312	4
STICK	560	471	39	5	DESIRE	550	368	79	6	SPOON	612	584	46	5
REJECTED	509	372	32	7	JOKE	545	533	40	3	BLUE	593	569	143	4
PUSH	564	395	37	4	GLAD	564	445	40	4	GREEN	583	609	116	5
FAILURE	542	437	89	7	GAME	574	521	123	4	BOOK	643	591	193	4
ATTACK	542	501	105	6	WARMTH	613	441	67	4	GIRL	645	634	220	4
FIRE	580	634	187	4	HOPE	561	421	28	4	BUS	523	571	34	3
KNIFE	573	633	76	5	PROUD	561	421	50	5	GARDEN	567	635	60	6
VIOLENCE	528	517	44	8	TEACHER	599	575	80	7	WINDOW	621	602	119	6
BAD	592	388	142	3	TRUST	589	419	39	5	TELEPHONE	605	655	76	9

Note: FAM = Familiarity, IMG = Imaginabaility, KFFRQ = Kucera and Francis's Frequency, NLET = number of letters