Attentional Processing of Socially Threatening Faces in Victims of Domestic Violence

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Abstract

Studies on the psychopathology phenomena associated with the process of victimization are currently targeting putative cognitive processes underpinning victims' emotional adjustment. The attentional bias toward threatening environmental stimuli is one of those cognitive processes. Accordingly, the aim of the present study was to test if victims of domestic violence present an attentional bias toward socially threatening stimuli (i.e, stimuli related to the victimization context), and if this bias relates to the victims' emotional adjustment. Two groups of women (victims of domestic violence vs non-victims) were compared in a visual-search task, consisting on the presentation of matrices with target faces displaying anger, fear or happiness, amongst faces showing neutral emotions. Participants were expected to detect, as fast and accurately as possible, the emotional target faces among the distractors (i.e., neutral faces). Findings showed that victims presented an attentional bias towards the angry and fear faces, and not to the happy target faces. However, this bias was not related to their emotional adjustment. Findings show partial evidence for an attentional bias toward socially threatening stimuli in victims of domestic violence.

Keywords: Domestic Violence; Victims; Attention; Visual Search; Psychopathology; Trauma

Introduction

The World Health Organization [1] estimates that approximately 30% of women are victims of domestic violence (DV). DV is expected to have a strong, life-long impact on the victims' psychological well-being, and is often translated into clinical problems relating to depression, anxiety, low self-esteem, helplessness, substance abuse, PTSD, or suicidal ideation [2,3,4]. Furthermore, the revictimization and the multiple forms of victimization (physical, psychological, sexual, and economical) have been shown to cause a cumulative trauma effect on the mental health of DV victims [5,6,7]. Maybe because of this reason, it has been observed that victims of DV seek more health services than the general population, even when they are no longer living in the abusive relationship [8].

While most research within the field of victimology and mental health focus on the effects of the victimization process on individuals' well-being and emotional adjustment, recent studies have targeted the study of the putative underlying cognitive processes that maybe involved on the victims' propensity to develop these types of psychopathological problems. More specifically, these cognitive processes relate to how victims of interpersonal violence process threatening environmental stimuli after they have been victimized, and how the processing of these stimuli may influence the victims' psychological adjustment during and after their recovering process.

Within this regard, the processing of threatening stimuli (e.g., threatening faces) is privileged over the processing of innocuous and non-threatening cues (e.g., flowers, faces expressing happiness) (for a review see [9]). Due to our limited capacity to attend to *all* stimuli in the environment, humans are expected to present an attentional bias toward the relevant stimuli – the stimuli on which survival depends -, while showing a decreased attentional performance over the others [10]. In accordance, the existence of a *fear* module – a putative neuroanatomic structure - has been proposed. This module is believed to underlie the attentional processing of fear relevant stimuli

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Table 1: Sociodemographics.

	DV victims (n = 20)		Non-victims (n = 20)	
	n	%	n	%
Marital Status				
Single	7	35	12	60
Married/Living together	3	15	8	40
Divorced/Separated	10	50	0	0
School Education (grade)				
1st-4th	4	20	2	10
5th-9th	9	45	1	5
10th-12th	5	25	2	10
College degree	2	10	15	75
Employment status				
Employed	9	45	11	55
Unemployed	9	45	3	15
Student	2	10	4	20
Retired	0	0	2	10
Children	18	90	7	35
Living with				
Alone	0	0	3	15
Family/friends	3	15	17	85
Institution	15	85	0	0

Table 2: DV characterization.

	n	%
Type of victimization		
Psychological	20	100
Physical	17	85
Economic	13	65
Sexual	6	30
Type of victimization (combined)		
Psychological and physical	6	30
Psychological, physical and economic	6	30
Psychological, physical, economic and sexual	4	20
Psychological and economic	2	10
Psychological, economic and sexual	1	5
Psychological, physical and sexual	1	5
Frequency of victimization		
Daily	9	45
Weekly	6	30
Occasional	5	25

[11], including facial expressions of fear and anger [12]. These facial expressions are prototypical examples in the access of the fear module [9] particularly after humans started living in communities [13,14], as they act as signals o social threat. Hence, a fast and efficient detection of such stimuli evolved as a result of ancient selection pressures to alert individuals for potential aggressive encounters [15].

Studies using clinical samples have been showing that individuals with anxiety related disorders present an attentional bias toward socially threatening stimuli [16-19]. Such findings imply that an attentional bias toward social threat stimuli may contribute to the onset and/or maintenance of diverse psychopathological phenomena, even though this attentional bias may prevent us from dangerous situations [20]. Accordingly, the attentional processing of social threat may be particularly important for understanding the effects of DV victimization, as DV victims often present psychiatric comorbidities after they have been exposed to serious emotional and physical threats.

Indeed, studies on the attentional bias toward threatening stimuli have considered different classes of victims due to the association between victimization and anxiety problems, including PTSD [21]. Although research is still in its early stage, studies targeting the relationship between victimization and the processing of threatening stimuli suggests that trauma victims present an attentional bias toward trauma-related stimuli (i.e., they have difficulties in disengaging attention from threatening stimuli when compared to non-victims). This outcome has been found in samples of war veterans [22], victims of torture [23], and victims of sexual crimes [24-26]. Within this context, it remains to be seen if this relationship expands to other typologies of victims, including victims of DV.

Against this background, the aim of the present study was to test if victims of DV show an attentional bias towards socially threatening stimuli, as compared to a sample of non-victims. In order to accomplish this goal, we used a visual search task and presented socially threatening target faces (anger and fear faces, compared to happy faces) in an array composed by distractor neutral faces. Participants were instructed to identify the target faces as quickly as possible. We used target faces signaling threat (i.e., fear, and angry) given their ecological value, thus functioning as a signal of physical and emotional threat, particularly for victims of DV. Response accuracy and response times to the detection of the target/emotional faces were selected as proxy indicators of the attentional bias toward threatening faces. Participants were also asked to fill in self-report measures assessing emotional adjustment and emotional regulation strategies, as well as questions targeting past victimization. We considered the following hypotheses:

1) Victims of DV were expected to detect threatening faces more accurately and faster than non-victims, thus showing an attentional bias toward threatening stimuli as a putative result of their victimization process;

2) The detection of threatening faces was expected to vary as a function of the presentation time of the arrays with the faces (600ms *versus* 1200ms), with victims of DV presenting higher accuracy and lower response times in the 600 ms condition, as the process of victimization would be expected to facilitate the detection of threat at an automatic level of processing.

3) Victims of DV were expected to report less emotional adjustment (translated into more psychopathology symptoms) as well as more dysfunctional emotional regulation strategies.

4) Victims' attentional processing of threatening faces (as measured by response accuracy and times to fear and angry faces) was expected to correlate with the scores on emotional adjustment and regulation strategies, such that higher accuracies and faster responses (i.e., bias toward threatening faces) would be related to more psychopathology symptoms and dysfunctional emotional regulation strategies.
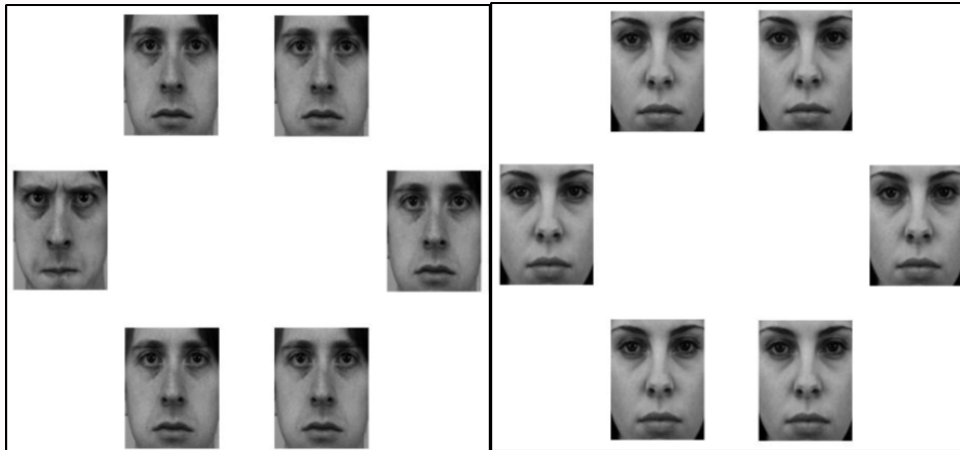
Figure 1: Matrix displaying male faces with *angry* face as emotional target (a); matrix displaying female faces without emotional targets (only *neutral* faces) (b).

Findings are expected to add to the literature on the impact of DV victimization in the propensity for psychopathological vulnerability.

Materials and Methods

Participants

Forty women (20 DV victims and 20 non-victims) participated in the study. DV victims were aged between 24 and 60 years old (*M* = 37.1; *SD* = 8.86) and non-victims were aged between 21 and 63 (*M* = 36.7; *SD* = 14.12). DV victims were recruited in care institutions in the central region of Portugal where the study took place. The inclusion criterion of DV victims was to have experienced at least one abusive relationship, including psychological, physical, economical, or sexual abuse. Severe psychopathology (e.g., a psychotic disorder) was settled as exclusion criterion because this condition may fully account for an attentional bias toward threatening stimuli (up and beyond the effects of victimization), or disorganize individuals to a level that exceed the cost-benefit of the present study (resulting in an ethical challenge). Institutional reports were inspected in order to check victims' psychiatric condition; no cases of severe/psychotic disorders were found. The inclusion criterion regarding non-victims was the absence of any sort of abusive relationship (including psychological, physical, economical, and sexual). Non-victims were recruited via on-line advertisements posted in institutional web sites. Women willing to participate emailed the researchers; participants gave written informed consent and were not paid for participation. The Declaration of Helsinki's guidelines and the standards of the American Psychological Association (APA) were followed throughout the study. Socio demographics and DV characterization are presented in Table 1 and 2, respectively.

Measures

Both groups responded to a sociodemographic checklist aimed at collecting information on age, marital status, school education, history of abusive relationships and medical/psychiatric conditions. Psychological adjustment and strategies of emotional regulation were further screened through the following self-report questionnaires.

Brief symptom inventory (BSI; [27])

The Portuguese version [28] of the Brief Symptom Inventory was used to assess participants' emotional adjustment. The BSI is a 53-item self-report questionnaire that targets nine psychopathological dimensions (somatization, depression, hostility, anxiety, phobic anxiety, psychoticism, obsessive-compulsive, paranoid ideation, and interpersonal sensitivity). Scores were computed in the Positive Symptoms Index. This index measures the average intensity of self-reported psychopathological symptoms.

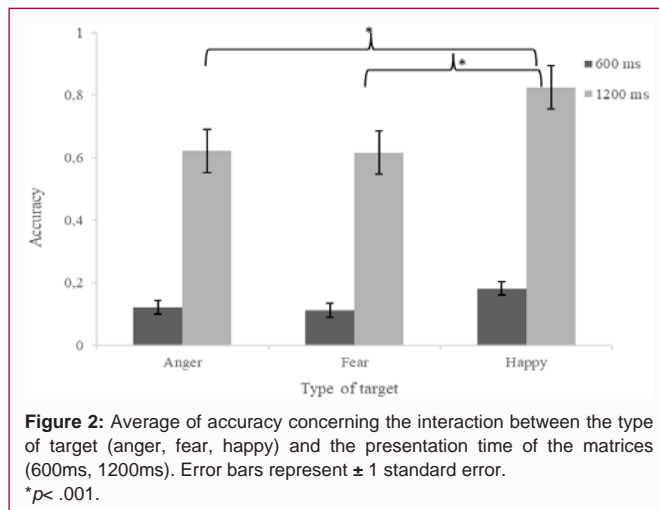### Emotional regulation questionnaire (ERQ; [29])

The ERQ is a 10-item self-report questionnaire aimed at assessing emotional regulation strategies. This questionnaire measures 2 dimensions: 1) cognitive reassessment (reframing the meaning that one gives to an aversive situation), and 2) emotional suppression (suppression of emotions and focus on the behavioral responses given in an aversive situation).

Procedures

The experimental task consisted on a visual search task. This is an effective paradigm to study selective attention (see [30]) and has been widely used with different categories of visual stimuli, namely with human faces (e.g., [9]). Importantly, this task mimics real life settings, in which we are exposed to a myriad of visual information. In the visual search task, participants are shown displays involving several stimuli, shown one at a time. Participants are asked to detect, as quickly and accurately as possible, whether there is a target stimulus – a stimulus that differs from the remaining ones (e.g., an angry face presented among neutral faces), or whether all the stimuli are of the same type (e.g., only neutral faces). The response time and accuracy of participants' decision is recorded; Response time and accuracy represents a measure of selective attention.

In the present experiment, fourteen face images (seven of each gender; all by different actors, with each actor expressing one of the emotions – fear, anger, happiness, and neutral) were selected. Faces were selected from the Karolinska Directed Emotional Faces (KDEF; [31]). Angry and fear faces are a potent emotionally charged stimulus, as both signal a potential threat. More specifically, while faces expressing anger signal an imminent aggression towards the observer, faces expressing fear suggest a potential danger in the environment.

In order to reduce potential discriminating elements within each picture, all images were processed into monochromatic (with Windows Fotor application, 265x270 pixels). Six images of the same individual were presented in each matrix or array (Figure 1). Neutral faces were presented in half of the trials (emotionally target absent

Figure 2: Average of accuracy concerning the interaction between the type of target (anger, fear, happy) and the presentation time of the matrices (600ms, 1200ms). Error bars represent ± 1 standard error. *$p < .001$.

Figure 3: Average of response times concerning the interaction between type of facial expressions (anger, fear, happy) and type of group (DV victims, non-victims). Error bars represent ± 1 standard error. *$p < .05$.

matrix); in the other half, one emotional discrepant target (fear, angry or happy) was presented among five neutral faces (emotional target present matrix). Additionally, half of the matrices was presented for 600ms and the other half for 1200ms. The experimental task was further divided into three blocks, each with 48 trials, with a total of 216 matrices being presented. Between each block, participants could rest for one minute. The target location in the matrix was randomized; matrices, presentation times and gender of the faces were counterbalanced. Each trial began with the appearance of a cross in the center of the monitor. Afterwards, the cross was replaced by a matrix of six images that remained for one of the two different presentation times (600 or 1200 ms).

Participants sat at 70cm from the monitor and registered their responses by pressing the "different" button every time a discrepant facial expression (i.e., a face displaying anger, fear, or happiness) was presented among the other five neutral faces, and by pressing the "same" button every time the matrix presented only neutral faces. Responses were given during the 600/1200ms presentation time plus two seconds following the matrices presentation. After this period, the task continued automatically to a new fixation point and then a new matrix was presented.

The task was executed in a 17 inches' monitor and programmed using E-Prime software [32]. The duration of the visual search task was approximately 25 minutes. Data were collected individually; while victims of DV performed the task at the care institutions, non-victims completed the experiment in a quiet room at the Psy Lab, University of Aveiro. Participants were debriefed after the experimental session and none reported emotional or physical distress.

Design and statistical analysis

Scores on BSI and ERQ, were factor analyzed by group condition (DV victims *vs* non-victims) using *t*-tests. For the visual search task, average response times (i.e., the time to press the "different" or "same" keys) and accuracy (i.e., to press the "different" key when the emotional target was present and the "same" key when all the faces in the matrix were neutral) were analyzed independently. The response time analysis excluded error trials and outliers greater than ± 3*standard deviations (SD) from the mean, which were replaced by the individual's mean ± 3*SD (corresponding to 3.75% of the data). Only target-present trials were analyzed, since target absent trials were of no theoretical relevance [33].
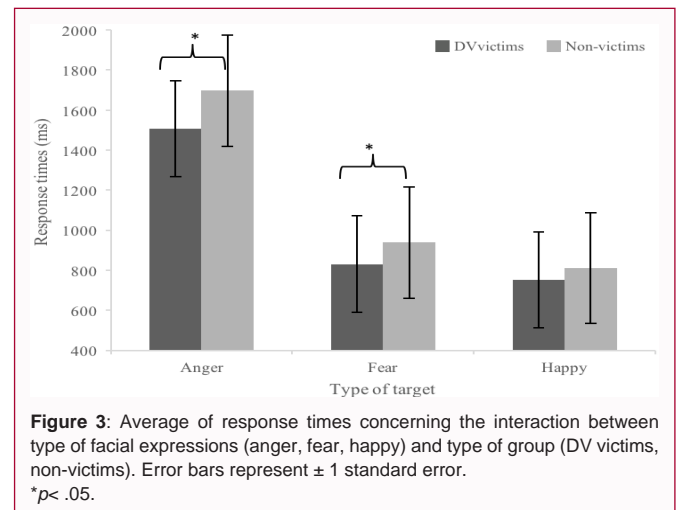
Accuracy was analyzed with a mixed factor ANOVA with two within-subjects factors (Presentation Time: 600 and 1200ms, Target: happy, anger and fear) and one between-subjects factor (Group: DV victims and non-victims). Given that the accuracy for the 600 ms trials was low, thus resulting in a small number of trials, this factor was eliminated from the response time analysis. Follow-up tests were conducted using Bonferroni. Significance levels were set at $p < 0.05$, and partial $\eta^2(\eta_p^2)$ was used as estimate of effect sizes. The association between the behavioral markers of attentional bias (accuracy/response time) and psychological adjustment (psychopathological symptomatology/emotional regulation strategies) was tested with Pearson product-moment correlations in the sample of DV victims.

Results and Discussion

Psychopathology symptoms and emotional regulation in DV victims *vs* non-victims

Findings on the psychopathology symptoms(BSI) showed that DV victims presented significantly more intense symptoms: $t(38) = 6.58$, $p < .001$($M_{DV\ victims} = 2.22$, SD= .54; $M_{non-victims} = 1.33$, SD= .28). Additionally, findings on emotional regulation (ERQ) also showed that DV victims reported significantly more emotional suppression than non-victims: $t(38) = 2.35$, $p = .02$($M_{DV\ victims} = 22.60$, SD= 6.33; $M_{non-victims} = 18.15$, SD= 5.64). No significant differences were found regarding cognitive reassessment: $t(38) = 0.66$, $p = .51$ ($M_{DV\ victims} = 24.55$, SD= 7.61; $M_{non-victims} = 25.95$, SD= 5.62).

Response accuracy to emotional faces

Findings on response accuracy showed no main or interaction effects for the group condition. As for the target condition, happy faces ($M = .50$, SD = .03) were detected more accurately than angry ($M = .37$, SD = .03) and fear faces ($M = .37$, SD = .03), as shown by the *Target* main effect [$F (2, 76) = 22.90$, $p < .001$, $\eta p^2 = .38$]. Interestingly, an interaction between *Target* and *Presentation Time* showed that this difference was only observed when the matrices were presented for longer durations (1200ms), while no significant difference between the target emotional faces were observed for matrices displayed for shorter durations (600ms), $F(2, 76) = 9.16$, $p < .001$, $\eta p^2 = .19$ (Figure 2). Finally, the results revealed a main effect of *Presentation Time*, showing that participants were more accurate at detecting targets when the matrices were shown for longer durations ($M = .69$, SD = .04), compared to when they were presented for shorter durations ($M = .14$, SD = .03), $F(1,38) = 317.46$, $p < .001$, $\eta p^2 = .89$.

Response times to emotional faces

Findings showed a significant Group x type of Target interaction effect [$F(2, 76) = 3.31$, $p = .042$, ηp2 = .08]. This finding was consistent with our hypothesis as DV victims were significantly faster at detecting threatening facial expressions (angry and fear), compared to happy ones ($p<.05$; Figure 3). Results further showed a main effect of the group condition [$F(1,38) = 5.39$, $p = .026$, $\eta p^2 = .12$]; DV victims, compared with non-victims, were faster at detecting a target in the matrix ($M = 1030$, $SD = 35.99$; and $M = 1148.92$, $SD = 35.99$, respectively).

Finally, the results showed that participants were overall faster at detecting happy targets ($M = 781.84$, $SD = 20.10$), compared to angry ($M = 1602.72$, $SD = 41.72$) and fear targets ($M = 884.94$, $SD = 21.40$), as indicated by the main effect of *Target*, $F(2, 76) = 606.31$, $p< .001$, $\eta p^2 = .94$. No other main effects or interactions were observed.

Association between attentional bias toward fear/anger faces and emotional adjustment

Because findings revealed a significant Group x type of Target interaction effect for the response times (at the 1200ms condition) Pearson product-moment correlations were performed to assess the degree of association between the response time to 1) fear and 2) anger faces, and scores on the BSI and ERQ in the sample of DV victims. Findings revealed no significant correlations, contrarily to our hypothesis. Correlations between response times to fear faces and emotional adjustment were: $r_{BSI}=-.25$ ($p>.05$), $r_{ERQ}=.30$ ($p>.05$); correlations between response times to anger faces and emotional adjustment were: $r_{BSI}=-.33$ ($p>.05$), $r_{ERQ}=.25$ ($p>.05$).

Discussion

Recently, it has been suggested that victims of interpersonal crimes may develop an attentional bias toward trauma-related stimuli as a result of the victimization process [22-25]. This attentional bias is of interest because it can influence the victims' post crime emotional adjustment. For this reason, this study was aimed at testing whether DV victims present an attentional bias toward threatening faces (faces displaying anger or fear compared to faces expressing happiness).

Findings revealed that DV victims, compared to non-victims, were particularly fast at detecting faces of anger and fear. Findings thus suggest an attentional bias toward threatening stimuli in DV victims as captured by their faster response times to these stimuli. Such attentional bias seems to overlap the attentional patterns found in victims of torture and sexual assault (as described in the introduction section), suggesting that DV victims may also present an attentional bias toward trauma-related cues. Accordingly, this bias may act as a predisposal mechanism to the psychopathological phenomena often associated with DV victimization, which seems to persist even when the victims are no longer living in the abusive relationship. Within this regard, cognitive models on the etiology of PTSD emphasize that individuals presenting PTSD preferentially attend to trauma-related stimuli as these cues are stored in memory and organized into fear structures [20]. When trauma-like cues emerge in the environment, fear structures are automatically activated preventing individuals from reappraising new information, and adjusting to new life contexts [34]. However, despite data on the response times for the Group x Target interaction condition supported the assumption of an attentional bias toward trauma-related cues in DV victims, the hypothesis on automaticity was not corroborated (i.e., the process of domestic victimization was expected to facilitate the detection of

threat at the implicit level of processing – 600ms). It is possible that the trials presented for 600ms presentation times were cognitively demanding for both groups.

Findings regarding the psychopathology symptoms and emotional regulation strategies showed that DV victims reported more severe symptoms as well as more emotional suppression strategies. While these strategies may have an adaptive function when the victims are living in the abusive relationship (in order to ensure rapid protective behavioral responses in violent situations), they can also result in a maladaptive mechanism when victims are no longer living in the abusive relationship. In fact, emotional suppression is often associated with negative affect, avoidant relationship styles, inefficient coping skills, limited supportive networks [35] and higher frequency of intrusive memories about traumatic events [36].

The final goal of this work was to test the association between the attentional bias toward trauma-related stimuli and the levels of emotional adjustment (BSI and ERQ scores) in DV victims. The assumption behind this goal was that an attentional bias toward socially threatening stimuli would have an etiological or maintenance effect on DV victims' psychological adjustment. This mechanism is congruent with the cognitive conceptualization of PTSD and other anxiety related problems. However, and even though DV victims have presented more psychopathology symptoms and emotional suppression, findings did not reveal an association between the attentional bias toward fear and angry faces and the lack of psychological adjustment. We may consider that the limited number of participants in the victims' condition may eventually account for the lack of a significant relationship. Alternatively, we must acknowledge that the present experimental paradigm may not be suitable to capture this effect. For this reason, future studies should improve these conditions in order to disentangle whether the attentional bias toward trauma related cues impairs the psychological adjustment of DV victims.

This study presents some limitations. First, findings may vary as a function of the presentation modality (static versus dynamic presentations); given that dynamic presentations favor the detection of threat [37], the current findings, based on a static presentation of socially threatening stimuli, may lack ecological validity as compared with findings from studies using dynamic presentations. Secondly, DV victims are usually the recipient of both psychological and physical violence. However, some victims only report psychological victimization. For this reason, futures studies, with higher sample sizes, are required to test the specific effects of the victimization type (e.g., psychological *versus* physical) in the attentional bias toward trauma related stimuli. Finally, to our knowledge, this is the first study testing the attentional bias toward trauma-related stimuli in DV victims. For this reason, the present findings must be regarded as preliminary.

Conclusion

In general, data partially corroborated the assumption that DV victims present an attentional bias toward socially threatening stimuli. The current findings add to the existing literature by showing that, despite the differentiating features characterizing DV (i.e., long-term relationship with the aggressor; sharing of family and emotional bonds), DV victims may present the same cognitive bias as victims of other interpersonal crimes (namely, victims of torture and sexual crimes). Future studies are thus expected to extend upon these

findings and contribute to the knowledge on the mechanisms behind the mental health and emotional well-being of DV victims.

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