

# Autobiographical Memory for Stressful Events, Traumatic Memory and Post Traumatic Stress Disorder: A Systematic Review

Memoria autobiográfica de eventos estresantes, memoria traumática y trastorno de estrés postraumático: una revisión sistemática  
Memória Autobiográfica em Eventos Estressores, Eventos Traumáticos e no Transtorno de Estresse Pós-Traumático: Uma revisão sistemática

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## Abstract

Stressors and traumatic events may contribute in the development of many psychopathologies, especially Post Traumatic Stress Disorder (PTSD). People with this disorder can present significant memory loss, particularly in Autobiographical Memory (AM). This paper aims to present a systematic review of the literature regarding the changes in the Autobiographical Memory in people exposed to potentially traumatic stressors. Therefore a research in the databases PsycINFO, PubMed, Web of Science and Pilots was performed during March 2012. A total of 29 articles were selected. Results demonstrate that people with PTSD present alterations in a larger number of AM components compared to the cases where PTSD did not develop the disorder. In the same way,

subjects who were never exposed to trauma did not demonstrate significant AM alterations when compared to the other groups. The results indicate that the changes in AM are primarily associated with PTSD, yet it was not possible to clarify whether such changes are related to the timely development of the disorder or if they are also observed in traumatic memories even in the absence of the disorder.

*Keywords:* autobiographical Memory; PTSD; Trauma; Traumatic Memory.

## Resumen

Eventos traumáticos y estresantes pueden contribuir en el desarrollo de un sinnúmero de psicopatologías, entre ellas está el Trastorno de Estrés Postraumático (TEPT).

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Personas con este desorden pueden presentar pérdida de memoria, particularmente en la Memoria Autobiográfica (MA). Este artículo tiene como objetivo presentar una revisión sistemática de literatura sobre los cambios en la MA en personas expuestas a potenciales estresores traumáticos. Así, fue realizada una búsqueda en varias bases de datos como PsycInfo, Pubmed, Web of Science y Pilots durante el mes de marzo de 2012. Un total de 29 artículos fueron seleccionados. Los resultados demostraron que personas con TEPT presentaron mayores alteraciones en los componentes de MA que las personas que no desarrollaron TEPT. De la misma forma, personas que nunca fueron expuestas a un trauma no demostraron alteraciones significativas en la MA, cuando fueron comparados con los demás grupos. Los resultados refuerzan la conclusión de que los cambios MA son asociados primariamente al TEPT, sin embargo, no es posible identificar si estos cambios están relacionados con el desarrollo temporal del desorden o si ellos también están siendo observados en memorias traumáticas aun en la ausencia del TEPT.

*Palabras clave:* memoria autobiográfica; trastorno de estrés postraumático, Trauma; memoria traumática.

## Resumo

Eventos estressores e eventos traumáticos podem contribuir para o desenvolvimento de inúmeras psicopatologias, entre elas, o Transtorno de Estresse Pós-Traumático (TEPT). Indivíduos com este transtorno podem apresentar perda de memória, particularmente no sistema de Memória Autobiográfica (AM). O presente estudo objetiva revisar sistematicamente a literatura no que se refere às mudanças de Memória Autobiográfica em sujeitos expostos a estressores, potencialmente estressores traumáticos. Realizou-se uma pesquisa nas bases de dados PsycINFO, PubMed, Web of Science e Pilots no período de março de 2012. Um total de 29 artigos foram selecionados. Resultados demonstram que sujeitos com TEPT apresentam alterações em um grande número de componentes da MA em comparação a sujeitos que não desenvolveram o transtorno. Da mesma forma, sujeitos que nunca foram expostos a eventos traumáticos não demonstraram alterações significativas de AM quando comparados aos outros grupos. Os resultados indicam que mudanças na MA estão primariamente associadas com TEPT, porém não foi possível clarificar se tais al-

terações estão relacionadas temporalmente com o desenvolvimento do transtorno ou se elas também podem ser observadas em memórias traumáticas mesmo sem a presença do diagnóstico.

*Palavras-chave:* memória autobiográfica; TEPT, Trauma; Memória Traumática.

Stressful traumatic events are situations in which the individual has his life or physical integrity threatened either in a real form or in a perceived manner (APA, 2002). These events are risk factors for the development of several mental disorders, including Post Traumatic Stress Disorder (PTSD) (Kazantzis et al., 2009). It is known that PTSD can cause significant damage in different aspects in the individual's life, which include behavioral, social, cognitive and neurobiological impairment (Charney, 2004; Graeff, 2003; McNally, 2003; Yehuda, 2002).

Among cognitive alterations in PTSD, memory deficits play an important role in the development of the disorder (Berntsen & Rubin, 2007; Ehlers & Clark, 2000; Hauer, Wessel, Engelhard, Peeters & Dalgleish, 2009). Depending on the way the event is perceived, encoded and stored, it interferes in the manner the memory is recovered. Processes of Autobiographical Memory (AM) are mainly affected because they are associated on how past information related to personal events of greater relevance are recovered in the present (Bekinschtein, Cammarota, Igaz, Bevilaqua & Izquierdo, 2007; Rubin, 2011). This recollection processes are significant to the composition of the self and continuity sense on self-identity. It is important considering that the ways of composing life stories is directly related on how the individual comprehends himself (Berntsen & Rubin, 2006). Thus, while remarkable events are crucial in the organization of the individual's life history, the very own organization of the Autobiographical Memory is a source of personal meanings and relevance that a particular event may or may not acquire in the repertoire of experiences.

Changes in the Autobiographical Memories content have been shown to be an important factor for PTSD. The main phenomena related to this issue observed in PTSD cases include traumatic

memory decontextualization, flashbacks and assigning a central role to the traumatic event in the organization of autobiographical knowledge and self (Brewin, 2011), high vividness and emotional intensity of the event's memory (Berntsen, Willert & Rubin, 2003; Megías, Ryan, Vaquero & Frese, 2007), coherence and memory fragmentation (Rubin, 2011), rehearsal (Rubin, Feldman & Beckham, 2004), disconnection (Kleim, Ehlers & Wallott, 2008) and overgeneralization of traumatic memory (Kleim & Ehlers, 2008; Sutherland & Bryant, 2008b).

Overgeneralization is the phenomenon referred to as on how much a memory is vague or unspecific when a subject is enquired to remember about an event in his life (Sumner, Griffith & Mineka, 2011). This phenomenon can be maintained by negative reinforcement as an avoidance strategy of disturbed emotions (Raes, Hermans, Decker, Eelen & Williams, 2003). As a result there is a decreased ability in solving problems and an increased feeling of hopelessness (Sumner et al., 2011).

Overgeneralization is one of the most studied AM phenomena since the work that was carried out by Williams and Broadbent (1986), evaluating the memory of suicidal patients and perceiving that these patients had a tendency to recollect their own past in an overgeneralized manner. This tendency to recover memories in a non specific way is present in mood disorders (Nandrino, Pezard, Poste, Beaune & Reveillere, 2002; Scott, Stanton, Garland & Ferrier, 2000) and in posttraumatic presentations (Harvey, Bryant & Dang, 1998; McNally, 1998).

The more an event is regarded important or fundamental in ones life history, the more it becomes accessible to be recollected and integrated into the narrative of the individual's life. This phenomenon can be conceptualized as a "centrality of event". The centrality could create landmarks, organizing the individual's experience into their life history (Berntsen et al., 2003). Accordingly, to assign centrality to highly negative and unpredictable events could influence on how people attribute meaning to the other events of their lives, causing concern and rumination (Berntsen & Rubin, 2006). A centrality of an event's subcomponent refers to the perception on how it is integrated into the sense of

self, in other words on how it becomes essential to personal identity (Brewin, 2011).

An intense emotional reactivity is expected in PTSD when the stressful event is recalled by the subject (Wessa, Jatzko & Flower, 2006). This reaction is related to a sense of vivacity at the moment of the event's memory recollection (Rubin & Kozin, 1984). It has also been suggested that the memories regarding the event are presented in a fragmented and inconsistent way (Van der Kolk & Fislser, 1995). Such characteristic relates to the subject's autobiographical narrative, which is built while recovering the individual's memory on trauma. Therefore, such a narrative is possibly vague and poorly organized, containing faults and discontinuities (Brewin, 2001; Foa, Molnar & Casman, 1995).

Another phenomenon associated with PTSD that can be related to the changes in AM is in the rehearsing of the traumatic event by the subject (Rubin, 2011). This process is manifested when the subject recalls the event and pursues to talk about it or by repeating it in his thoughts (Rubin, Boals & Kleim, 2010).

The phenomenon of disconnection relates to the disintegration of the traumatic memory regarding the system of memory inherent to the individual (Kleim et al., 2008). The theory of dual representation, according to Brewin, Dalgleish and Joseph (1996), presupposes that there are two (or more) systems where information concerning the event can be represented. Posttraumatic symptoms come forth when the memory of the event is represented mainly in visual and perceptual systems in relation to contextual and verbally accessible systems, making the memory of the event unconnected with the individual's other Autobiographical Memories (Brewin, 2011; Ehlers, Hackmann & Michael, 2004; Brewin, 2007;).

Memories of traumatic events can be understood both in its emotional aspects and in relation to its integration within the individual's history. Even though there is evidence pointing to inherent differences between the recollection of traumatic events and other Autobiographical Memories for non-traumatic events, such findings are mostly based on studies with a clinical population (Brewin, 2007).

Thus, assuming that the phenomenon of traumatic memories not only occurs in people who develop PTSD but in healthy individuals as well, studies become necessary to answer if such traumatic memories differ from other memories on non-traumatic stressors (Sotgiu & Mormont, 2008). In this regard, quantitative and qualitative differences between traumatic and non-traumatic memories still need to be investigated under different methodological aspects and considering the clinical and nonclinical population (Brewin, 2007). This article aims to give an overview of empirical studies that investigated changes in AM by comparing victims of traumatic stressors and individuals with PTSD. Therefore it intends to provide an update of empirical data which explores such issues.

### Method

Studies that were reviewed here during the month of March 2012 were searched in the following databases: Psyc INFO, PubMed, Web of Science and Pilots. The key words used in the syntax were: “PTSD” OR “Post Traumatic Stress Disorder” OR “Trauma” AND “Autobiographical Memory”. These terms were taken from descriptors suggested by MeSH Terms. The search criteria included the presence of keywords in any part of the article in English, published in 2000 to 2012.

Exclusion criteria included: (a) theoretical studies, (b) study sample comprising children, (c) study sample comprising the elderly or adults over 55, (d) studies that did not use instruments to assess posttraumatic symptoms, (e) studies that did not use AM assessment tools, and (f) studies that did not carry out a comparison between different groups (PTSD or trauma or controls).

The abstracts of the studies found throughout the survey were systematically assessed by two examiners independently, according to the inclusion and exclusion criteria. In case there was a disagreement between examiners, the abstract would be reviewed by a third investigator.

### Results

The search identified 2,025 studies. The initial list was reviewed and exclusion criteria were applied. A number of 84 studies were selected by two judges and there was a disagreement in 15 other studies that were analyzed by a third judge. Five other studies were included giving a total of 89 studies, being 88 studies retrieved in full. After reading the full texts, exclusion criteria were reapplied and 29 studies were selected (as seen in figure 1).

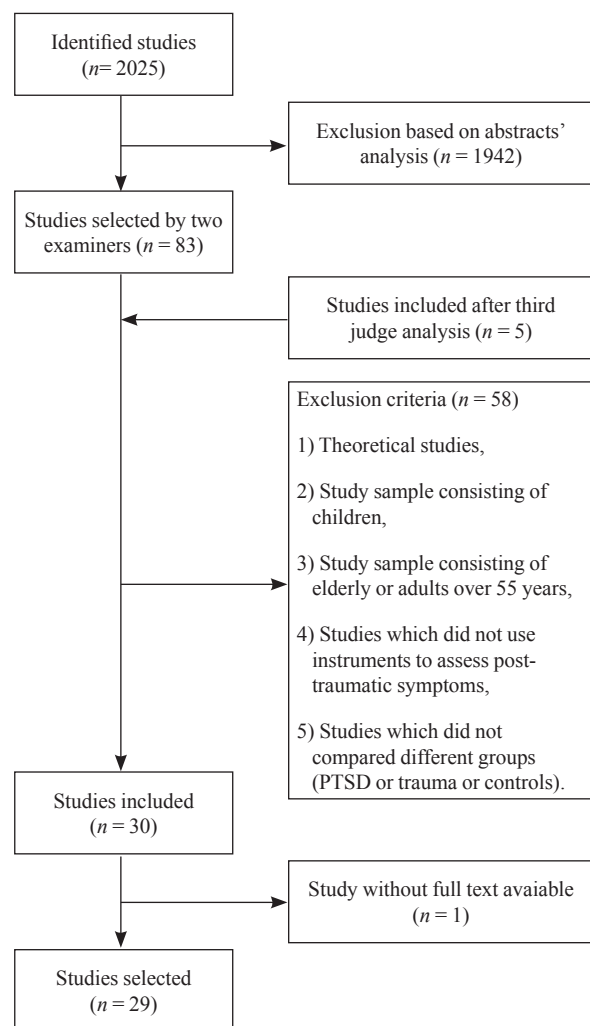


Figure 1. Systematic review flowchart



From 29 selected studies, 19 [65.51%] were characterized by comparing PTSD subjects with those who experienced traumatic events and did not develop this disorder. From these, 10 [34.48%] presented data on the AM overgeneralization component, where 6 studies [20.68%] presented data on the centrality/identity component and another 6 studies [20.68%] presented data on emotional alertness/intensity over the memory of the event. Only one study [3.44%] has proposed the evaluation of AM characteristics for the traumatic event considering the connection or disconnection with Autobiographical Memories with other life events of the individual.

Only 3 studies [10.34%] compared three groups respectively: PTSD, trauma without PTSD and controls without trauma. Each study addressed, respectively, the components of overgeneralization (LaGarde, Doyon, & Brunet, 2010), details of the event's memory (Moradi, Abdi, Fathi-Ashtiani, Dalglish & Jobson, 2012) and relevance to the identity (Shutherland & Bryant, 2005).

Finally, 7 [24.13%] out of the 29 studies made use of posttraumatic symptoms as a means of comparison between groups. These studies divided the groups in high and low symptoms according to the ratings on the scales completed by the participants. From these, 5 [17.24%] referred to the central component, 3 [10.34%] to emotional intensity, 2 [6.89%] to overgeneralization, 2 [6.89%] to the rehearsal component and 1 [3.44%] to the AM disconnection phenomenon in relation to trauma related to other Autobiographical Memories. The summaries of these studies can be seen in table 1.

A considerable diversity among the studies with regard to the instruments used for the assessment of AM and posttraumatic symptoms can be observed in Table 1. For the AM assessment, 10 studies [34.48%] used the Autobiographical Memory Test (AMT, Williams & Broadbent, 1986), 8 studies [27.58%] used the Centrality of Event Scale (CES, Berntsen & Rubin, 2006), 6 studies [20.68%] used the Autobiographical Memory Questionnaire (AMQ, Rubin, Schrauf & Greenberg, 2003), 3 [10.34%] used the Autobiographical Memory Interview (AMI, Kopelman, Wilson & Baddeley, 1989),

and 8 studies [27.58%] used other forms of assessment, such as scores from life narratives and the quantification of responses from word clues.

To assess the PTSD or posttraumatic symptoms diagnosis, 8 studies [27.58%] used the Clinician Administered PTSD Scale (CAPS, Blake et al. 1995) while 7 studies [24.13%] used the PTSD Check List (PCL-C, Weathers, Huska, & Keane, 1994). Another 7 studies used the Impact of Events Scale (IES, Horowitz, Wilner & Alvarez, 1979), and still another 7 studies used the Post Traumatic Stress Diagnostic Scale (PDS, Foa, 1995) as an assessment instrument. Finally there were 5 studies (17.24%) that used the Structured Clinical Interview for DSM Disorders (SCID-I, Spitzer, Williams, Gibbon & First, 1992) and 3 studies [10.34%] used less frequent instruments bearing in mind our sample of studies. It is important to consider that some of these studies used more than one instrument for measuring AM and posttraumatic symptoms.

## Discussion

This review led to the observation that some specific AM components have been evaluated frequently in literature. In this regard, a comparative analysis was possible among phenomenological differences in trauma victims who developed PTSD and of those who did not develop this disorder, and also among subjects who had never experienced situations considered traumatic. In contrast, relevant components to the understanding of AM in these cases were less investigated. In order to better comprehend the results, they will be discussed below in comparison between groups (PTSD, Trauma, No Trauma and Symptoms).

### Comparison of AM between PTSD and Trauma groups

The AM component that was most frequently observed in the studies was overgeneralization. This indicates that subjects with PTSD tend to recall their memories in a more overgeneralized and less specific way compared to trauma victims and subjects without this disorder. Corroborating

Table 1  
Summaries of studies

Author and Year	Sample	AM instruments / tasks	Assessment Instruments	Results
Berntsen & Rubin, 2006	707 undergraduate students	CES	PCL - BDI	Post-traumatic symptoms are correlated with centrality attribution to the stressor event ( $r=.38, p<.0001$ ).
Berntsen & Rubin, 2007	247 undergraduate students	CES	PCL, DES, BDI, STAI	The attributed centrality to an event is a predictor of PTSD symptoms ( $b=0.37; t=6.33; p<.0001$ ).
Berntsen & Rubin, 2008	118 tsunami victims	CES	PCL	Centrality of event is related to PTSD symptoms ( $r=.65; p<.0001$ ). A2 criterion showed higher correlation with centrality than A1 ( $r=.72; p<.0001$ ).
Berntsen, Willert & Rubin, 2003	130 adults victims of trauma	Questionnaire	PDS	Memory for traumatic event in individuals with PTSD had higher sensorial ( $r=2.16; p<.05$ ) and emotional ( $r=3.67; p<.001$ ) vivacity, and higher key point perception to the identity ( $r=2.36; p<.05$ ).
Boals, 2010	170 undergraduate students	AMQ, CES	IES, BDI, PILL, DES	Memory of negative events that became central to the identity produce greater sense of reliving when retrieved ( $r=.26; p<.001$ ) and is associated to strong visceral reactions ( $r=.31; p<.001$ ).
Brown et al., 2012	PTSD=12 / Trauma=16	AMT	CAPS, BDI, COWAT, CS	Individuals with PTSD showed greater memory overgeneralization in relation to recent events ( $r=6.41; p<.001$ ) and future events that were imagined ( $r=4.54; p<.001$ ).
Bryant, Sutherland & Guthrie, 2007	60 adults victims of trauma	Words / Clues	CAPS, TEQ, BDI	Memory overgeneralization predicts future trauma symptoms ( $\beta=2.80, SE=0.81, \beta=-.51, R^2=.28, \alpha R^2=.19$ ).
Dalgleish, Rolfé, Golden, Dunn & Barnard, 2008	36 adults victims of trauma	AMT	PDS, IES, CFT	The more pronounced were PTSD symptoms, more overgeneralized were memories related to traumatic events ( $prs(33)=-0.33; p<.05$ ).
LaGarde, Doyon & Brunet, 2010	PTSD=21 / Trauma=16 / Control (without trauma) = 17	AMI	PDI, IES - R, CAPS, MINI, BDI-II	PTSD group recovered less specific memories compared to other groups ( $F(df)=9.44(2, 51), p<.001$ ).
Engelhard, van den Hout & McNally, 2008	214 war veteran	PTES	EPQ	Individuals with PTSD tend to increase the number of potentially traumatic events in the second evaluation ( $r=.18; p=.04$ ).

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Author and Year	Sample	AM instruments / tasks	Assessment Instruments	Results
Hauer et al., 2009	35 women victim of complicated childbirth	AMT	BDI II, PSS-SR, IES, POMS, NLE/TQ, RPM Trauma severity	The recovery of less specific memories is related with higher post-traumatic symptoms ( $r=.44; p=.008$ ). The specificity of memory predicts symptoms ( $F(4, 30)=2.91; p=.04; R^2=.28$ ).
Jacques, Botzung, Miles & Rubin, 2010	PTSD=15 / 14 Control (without trauma)	Instrument similar to AMT (words from ANEW with different valences)	CAPs - PCL - BDI - WASI (full, verbal e performance), FMRI	Memories for stressor events were more vivid in the PTSD group ( $r=.2,44; p=.05$ ), even when it was controlled the type of event and the time since its occurrence.
Kangas, Henry & Bryan, 2005	20 adults with cancer	words / clues	ASDI, BDI, MINI Mental Cancer	ASD subjects recovered more overgeneralized memories in relation to the event ( $F(1, 38) = 15.64; p=.001$ ). However, this factor was not predictive for PTSD development ( $\beta=0.01; t=0.17; p=.05$ ).
Kleim & Ehlers, 2008	203 adults victims of trauma	AMT	SCID	Reduction of overgeneralization predicted PTSD six months after the stressor event ( $\chi^2(1, N=181)= 3.68; p = .055$ ).
Kleim, Wallott & Ehlers, 2008	PTSD=25/ Trauma=25	Answering AMI questions while imaging the assault	SCID, BDI, PDS, SDQDPS, LBS	PTSD patients spent more time to recall others AMs during trauma than other negative events ( $F(1, 65) = 4.04; p = .049$ ). It may indicate that trauma AM is not connected with other AMs.
Moradi et al., 2008	37 adults victims of trauma	AMT	SCID, PDS	Overgeneralization is correlated with flashbacks ( $r=.34, p = .04$ ), cognitive ( $r=.54; p = .001$ ) e behavioral ( $r=0.46; p = .006$ ) avoidance. It was not found correlation between overgeneralization and symptoms of intrusive memories.
Moradi, Abdi, Fathi-Ashtiani, Dalgleish & Jobson, 2012	PTSD=25 / Trauma=25 / Control =25	AMT	IES-R, BDI,WMS-III	Significant decrease in AM specificity among three groups on the episodic ( $F(2,72) =249.69; p < .001; \eta^2 = .87$ ) and semantic ( $F(2, 72) = 14.63; p < .001, \eta^2= 0.29$ ) aspects.
Megias, Ryan, Vaquero & Frese, 2007	210 undergraduate students	MCQ	PDS	The traumatic memory in PTSD group was more vivid and visual ( $r=.25; p<.001$ ) considered more central in its identity ( $r=.55; p<.001$ ) with greater consequences for life and more emotional ( $r=.55; p<.001$ ). Traumatic memories were recalled in more detail than other events ( $r=.23; p<.001$ ). There were no differences in the item "fragmentation" in subjects' memories.
Robinaugh & McNally, 2010	179 adults	AMQ, CES	SSGI, TRGI, PCL, CES-D	Increase in centrality of events involving shame and guilt is associated with increased depression and PTSD symptoms ( $r= .58; p<.05$ ).

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Author and Year	Sample	AM instruments / tasks	Assessment Instruments	Results
Rubin, Feldman & Beckham, 2004	50 adults	AMQ	DTS, DES, MSCR	Traumatic memories were no more incoherent and fragmented than others. Involuntary traumatic memories are more frequent and more impactful in the mood, but it does not occur in the voluntary memories.
Rubin, Boals & Klein, 2010	92 undergraduate students	AMQ	IES, PCL	People with high posttraumatic symptoms attributed their events as being less real ( $F(1, 108)=5.68; p<.05$ ) and with greater emotional intensity when recovered ( $F(1, 108)=49.77; p<.0001$ ).
Rubin, Dennis & Beckham, 2011	PTSD=75/ Control (without trauma)=52	AMT to different positive and stressor events	SCID	AM in PTSD was characterized by greater emotional intensity ( $r=5.94; p<.001$ ). Greater centrality ( $r=3.30; p>.01$ ), and greater reenactment ( $r=4.73; p<.001$ ). Memories were not more incoherent.
Rubin, Boals & Berntsen, 2008	115 undergraduate students	AMQ, CES, LSM	PCL, BDI, DTS, DES, NEO	Subjects with PTSD consider all their memories (not only traumatic) with greater emotional intensity ( $r=3.79; p<.001$ ) and centrality ( $r=7.99; p<.0001$ ). This suggests that people who experience memories more intensely are predisposed to PTSD. In addition, involuntary memory were more overgeneralized in PTSD ( $F(1, 79)=20.02; p<.0001$ ).
Rubin, 2011	PTSD=15/ Trauma=15	CES, AMQ,	BDI-II, CAPS, DES, PCL	In both groups, traumatic memories were not more incoherent than other memories. The traumatic memory was considered more central in PTSD group ( $F(2, 28)=12.60; p<.0001$ ).
Schonfeld et al, 2007	42 victims of trauma	AMT, there were two groups. One of them tried to suppress the thought.	PDS, BDI, BAI, RIQ, RS, TCQ, MHV, WMIS	Subjects with PTSD recovered more overgeneralized memories than trauma group, ( $F(1, 40)=7.81; p<.05$ ). The generalization effect increased with the instruction of the suppression of thought ( $F(1, 40)=6.38; p<.016$ ).
Sutherland & Bryant, 2008a	PTSD=20 / Trauma=21	AMT	MEPS, CAPS, SCID, BDI, BAI	Group PTSD recovered more overgeneralized memories ( $F(1, 39)=58.59; p<.001$ ). In addition, the PTSD group presented greater response latency ( $F(1, 39)=11.85; p<.001$ ).
Sutherland & Bryant, 2008b	PTSD=17 / Trauma=16	Words	CAPS, BDI, PDS	PTSD group tends to report the memories of the traumatic event as more self-defining ( $r=.46; p<.01$ ).
Sutherland & Bryant, 2005	PTSD=17/ Trauma=16/ Control (without trauma)=16	L-SM	CAPS, BDI II, IES, BAI	Participants with PTSD have more self-defining memories related to the traumatic event when compared to the trauma group and the control group ( $F(4, 90)=5.00; p<.001$ ).

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Author and Year	Sample	AM instruments / tasks	Assessment Instruments	Results
Smeets, Griesbrecht, Raymaekers, Shaw & Merckelbach, 2010	213 adults	CES	PSS-SR, ISE, DES, LEIDS-R	The more PTSD symptoms, the more is the assignment of traumatic memory as a central event in the individual's life ( $r = .46, p < .001$ ). The centrality was found to correlate with all groups of evaluated symptoms: reliving ( $r = .43; p < .001$ ), avoidance ( $r = .43; p < .001$ ) and increased excitability ( $r = .38; p < .001$ ).

CES= Centrality of Event Scale/**PCL**=PTSD Checklist/**BDI**=Beck Depression's Inventory/**DES**= Dissociative Experience Scale/**STAI**=State-Trait Anxiety Inventory/**PDS**= Posttraumatic Stress Diagnostic Scale/**AMQ**=Autobiographical Memory Questionnaire/**IES**=Impact of Event Scale/**PILL**=Pennebaker Inventory of Limbic Language/**AMT**=Autobiographical Memory Test/**CAPS**= Clinician-Administered PTSD Scale/**COWAT**= Controlled Oral Word Association Test/**CS**=Combat Exposure Scale/**AMI**= Autobiographical Memory Interview/**TEQ**= Traumatic Events Questionnaire/**CFT**= Cattell's Culture Fair Test of "g" —Scale 2, Form A/**MINI**= The semi-structured Mini International Neuropsychiatric Interview/**BDI-II**=Beck Depression Inventory-Sixth Edition/**AMI**= Autobiographical Memory Interview/**IES-R**= Impact of Event Scale-Revised/**EPQ**= Eysenck Personality Questionnaire/**PTES**= Potentially Traumatizing Events Scale/**PSS-SR**= PTSD Symptom Scale - Self Report version/**POMS**= Profile of Mood States/**NLEIQ**= Negative Life-Events Trauma Questionnaire/**RPM**= Raven's Progressive Matrices/**WASI**= Weschler Abbreviated Scale of Intelligence/**FRMI**= Functional Magnetic Resonance Imaging / **ANEW**= Affective Norms for English Words Database/**ASDI**= Acute Stress Disorder Interview/**MINI Mental Cancer**=Mini-Mental Adjustment to Cancer Scale/**WMS-III**/**MCO**= Memory Characteristics Questionnaire/**SSGI**= State Shame and Guilt Inventory/**TRGI**= Trauma-Related Guilt Inventory/**CES-D**= Center for Epidemiological Studies-Depression Scale/**MSCR**=Mississippi Scale for Combat-Related PTSD/**NEO**= NEO Personality Inventory/**LSM**= Life Script Measures/**BAI**= Beck Anxiety Inventory/**RIQ**= Response to Intrusions Questionnaire/**RS**= Rumination Scale/**TCQ**= Thought Control Questionnaire/**MHW**= Mill Hill Vocabulary Scale/**WMIS**= Wechsler Intelligence and Memory Scales/**MEPS**= Means-End Problem-Solving Procedure/**ISE**= Index of Self-Regulation of Emotion/**LEIDS-R**= Leiden Index of Depression Sensitivity-Revised/**PDI**= Peritraumatic Distress Inventory/**DPS**= Data-driven Processing Scale/**LBS**= Lack of Binding Scale/**SDQ** = State Dissociation Questionnaire.

this finding, a study (Moradi et al., 2012) points out that subjects with trauma remember a stressful event in more detail compared to subjects who have developed PTSD.

The overgeneralization of AM is a cognitive avoidance strategy (Sumner, 2012; Williams et al., 2007) in which higher levels of overgeneralization in individuals with PTSD are associated with a range of avoidance strategies, such as dissociation and thought suppression (Schönfeld & Ehlers, 2006). This association occurs in people who try to delete trauma memories from their conscience (Lemogne et al., 2009; Moradi et al., 2008; Schönfeld & Ehlers, 2006; Schönfeld, Ehlers & RiefBöllinghaus 2007). The association between overgeneralization and avoidant strategies, as for instance in dissociation, is consistent with the recent model of AM, which infers that individuals who are affected by their memories of traumatic experiences are most likely to develop recovery strategies for nonspecific memories (overgeneralized) so as to avoid emotional disturbance (Sumner, 2012).

The studies in this review permits the demonstration on how centrality and the sense of relevance to identity were more evident in memories of traumatic events in individuals with PTSD compared to those who have experienced a traumatic situation. These findings are consistent with previous reports in literature with reference to events that become central in the history of life and its importance in shaping the subject's identity (Berntsen & Bohn, 2010). Negative events can become central by causing disturbances and strong negative reactions associated with emotional stress (Berntsen, Rubin & Siegler, 2011) that causes an immediate mobilization (Taylor, 1991) and numbly feeling.

Studies supporting the hypothesis that flashbulb memories are related to PTSD were also included (Berntsen & Rubin, 2007; Megías et al., 2007; Rubin et al., 2004; Rubin, 2011). In the most extreme case of flashbulb memory that could occur after a trauma experience, is the specific and highly intrusive memory that contains event details, which is a characteristic of PTSD (Conway & Pleydell-Pearce, 2000). This idea is supported in the fact that the vividness of the recollection of the traumatic event with the emotional intensity triggered by the

memory are more frequently observed in people who developed PTSD compared to those who experienced trauma but did not develop the disorder.

Brewin's (1996) hypothesis of the dual representation was experimentally tested in only one study (Kleim et al., 2008), which measured the response latency of AM issues while assault victim subjects, with and without PTSD, imagined the traumatic event. The results pointed out a greater response of latency in the PTSD group, suggesting insufficient integration of the event's recollection in the verbally accessible system and consequently in the AM of the subjects.

Accordingly, it is possible to perceive that the alterations in the AM of subjects with PTSD are significantly related to the components relative to overgeneralization, vividness and emotional intensity, centrality and relevance to the self-identity. In a contrast, the exact same components were less evident in subjects who had not developed the disorder, suggesting that AM changes may be related to predisposing factors for PTSD. Furthermore, prospective studies apparently seem to confirm this hypothesis (Berntsen & Rubin, 2007; Bryant, Sutherland & Guthrie, 2007; Hauer et al., 2009).

### **Comparison of AM among PTSD, Trauma and No Trauma groups**

Only a few studies that were included in this review addressed changes in AM components in order to compare people who have experienced trauma with and without PTSD to people who have never experienced a traumatic situation. Only one study explained that subjects with PTSD tend to overgeneralize memories compared to subjects with or without traumatic experiences and with no PTSD (LaGarde et al., 2010). The study of Moradi et al. (2012) found that subjects with trauma remember a stressful event in greater detail compared to subjects who developed PTSD, which is consistent with findings concerning overgeneralization. This corroborates the hypothesis of a continuum in which the posttraumatic symptoms is distributed in an increasingly way for an event and for the phenomenon of overgeneralization.

A study by Sutherland and Bryant (2005) showed that people with PTSD have higher self-defining memories related to trauma compared to people who had not developed PTSD along with the group that had never suffered traumatic events. It indicates that trauma can be considered a precipitating factor for PTSD once viewed as a central event and being relevant to the individual's identity.

In this review, the studies that compared the PTSD group with the trauma group with no disorder along with subjects without any trauma experience did not encounter differences in the AM coherence and fragmentation. The discrepancy between these findings and literature can be explained in different employed methodologies (Brewin, 2007). Studies in this review investigated the AM phenomenology in trauma and in PTSD whereas studies that encountered differences in these components were focused on the narrative of the subjects (Jacobs & Nadel, 1998).

Comparison of AM among subjects with high and low PTSD symptomatology. Studies that were included in this group presented results based on PTSD symptoms by separating individuals with high and low symptoms and not specifying the experience of traumatic situations in individuals with low symptoms.

The higher symptoms indicate the existence of PTSD, the more central the stressor event in the lives of the individuals becomes. Thus the association between high posttraumatic symptoms and a greater event centrality attribution was discovered (Berntsen & Rubin, 2006; Berntsen & Rubin, 2007; Rubin, Boals & Berntsen, 2008; Boals, 2010; Smeets, Giesbrecht, Raymaekers, Shaw & Merckelbach, 2010). This relation between the symptoms and the centrality of the event supports Brewin's postulation (2011) in which the impact of trauma on the individual's identity is proportional to the negative consequences triggered by the stressful event. With regard to the overgeneralization of the memory, studies comparing symptoms corroborate the findings in studies with different experimental designs so that individuals with high symptoms have an even more overgeneralized memory once compared to the group with low symptoms.

The studies in this review have also pointed out that the more intense the posttraumatic symptoms, the more emotionally intense a memory is perceived by the subject, which also occurs with the experience of the memory's sensorial and corporal vividness (Rubin et al., 2008; Rubin et al., 2010; Boals, 2010). This indicates that there may be a difference in recalling memories regarded as traumatic in relation to those considered non-traumatic (Rubin, Dennis & Beckham, 2011). Higher levels of disconnection between memories of trauma and other memories were also observed in people with high PTSD symptoms (Smeets et al., 2010). Disconnection of the memory for traumatic events can be conceived as a strategy for regulating emotions where the disconnection reduces emotional intensity generated by the recollection of the event (Kleim et al., 2008).

Another characteristic presented by subjects with high symptoms is that the phenomenon of rehearsal occurs with more frequency than with subjects with low symptoms (Rubin et al., 2008). This can be observed in several manners of manifestation such as talking about the event or even in subtle ways like pondering about the event (Rubin et al., 2004). Moreover, the difference between the manifest and the subtle rehearsal discovered by Rubin et al., (2004) agrees with the hypothesis that extremely negative events are not so spoken as recalled by memory (Pennebaker, 1997).

Studies that compare the symptoms have the limitation of not specifying whether or not the subjects meet the diagnostic criteria. Moreover, such studies do not specify the types of traumatic events that are related to symptoms, nor the time elapsed between event and evaluation. However, this kind of study can be of useful means for accessing AM components related to posttraumatic reactions in general and further back up the findings of comparative studies.

### Final Considerations

The results of this systematic review allow us to conclude that there are Autobiographical Memory (AM) components that are associated with the Post Traumatic Stress Disorder (PTSD) diagnosis. In

most studies, individuals with this disorder differ from individuals who experienced trauma and did not develop PTSD in measures of specific AM components. Characteristics such as overgeneralization and centrality are factors that are related to the severity of posttraumatic symptoms and may be considered as predictors in the development of the PTSD (Berntsen & Rubin, 2007; Kleim & Ehlers, 2008). Future studies should be carried out in order to clarify if these changes are related to the timely development of the disorder or if such differences are also being observed in the traumatic memory. Furthermore, empirical studies must be delineated in order to act in response on what are the underlying mechanisms for the AM changes, such as the emotional regulation and dissociation. Evidence has been encountered in a few studies where AM in subjects without traumatic experiences differ significantly from the AM in subjects with trauma and also in subjects with PTSD. Therefore, in order to clarify what characterizes a traumatic memory in relation to other memories for non-traumatic stressors, a future research should attempt delineations that can control trauma victims with and without the disorder along with subjects who were never exposed to traumatic situations throughout their entire life.

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