



**Universiteit Utrecht**

Faculteit *Sociale Wetenschappen*

# The factor structure of Posttraumatic Stress Disorder

-A confirmatory factor analysis and  
an exploration of the influence of trauma type on the symptom presentation-

J.T.I. Wassmer  
ID 0016152  
Student Clinical and Health Psychology

Master Thesis  
Utrecht, July 2010

Supervisor Utrecht University: Prof. Dr. R.J. Kleber  
Supervisor OC, MGGZ: Dr. A.R. Rademaker and Dr. E. Geuze

Utrecht University  
Faculty of Social and Behavioural Sciences

## **Index**

### **Preface · 2**

### **Summary · 3**

#### **1. Introduction · 4**

- 1.1 Typical reactions to traumatic events · 4
- 1.2 Development of Posttraumatic Stress Disorder in the Diagnostic and Statistical Manual of Mental Disorders · 5

#### **2. Theoretical framework · 8**

- 2.1 Criticism to the current PTSD diagnosis · 8
- 2.2 Defining PTSD using factor structure · 9
- 2.3 The four-factor model of King et al. (1998) · 10
- 2.4 The four factor model of Simms et al. (2002) · 10
- 2.5 King et al. versus Simms et al. · 11
- 2.6 Trauma type and the symptom presentation of PTSD · 12
- 2.7 Six-factor structure · 13
- 2.8 Present study · 14

#### **3. Methods · 17**

- 3.1 Subjects · 17
- 3.2 Measures · 17
- 3.3 Statistical analyses · 18
  - 3.3.1 *Confirmatory factor analysis* · 18
  - 3.3.2 *Fit indices* · 18
  - 3.3.3 *Factor models* · 19
  - 3.3.4 *Multivariate Analysis of Variance* · 19

#### **4. Results · 20**

- 4.1 CFA · 20
  - 4.1.1 *Assumptions* · 20
  - 4.1.2 *Outcomes* · 20
  - 4.1.3 *Comparison of proposed factor models* · 21
  - 4.1.4 *Factor loadings* · 21
- 4.2 MANOVA · 23
  - 4.2.1 *Assumptions* · 23
  - 4.2.2 *Outcomes* · 23

#### **5. Discussion · 24**

- 5.1 Does the PTSD six-factor model fit the data of a heterogeneous trauma-exposed population? · 24
- 5.2 What is the influence of trauma type on the symptom presentation of PTSD? · 25
- 5.3 Limitations · 26
- 5.4 Strengths · 27
- 5.5 Conclusion and future research · 27

### **References · 29**

### **Appendix · 35**

## **Preface**

This thesis has been written in the context of my research internship at the research centre of the Dutch military mental health care, which I have conducted from October 2009 until February 2010. I have done the research as part of the Master program Clinical Psychology at the Utrecht University. The main themes are Posttraumatic Stress Disorder, its factor structure and the influence of trauma type on the symptom presentation. The aim of this study was to contribute to the existing body of literature that tries to improve the diagnosis of PTSD.

I am indebted to everybody who has been supportive during the period I have been working on this thesis. I would like to mention some people in particular.

The capability and knowledge of my supervisors of the research centre – Dr. A.R. Rademaker and Dr. E. Geuze - was of great value for the process of the research. They were involved from the beginning of the research and their efforts were crucial for the successful analysis of data.

I am very grateful to my supervisor of the Utrecht University, Prof. Dr. R.J. Kleber. I would like to thank him for the welcoming atmosphere in his room. It has been very pleasant and useful to discuss this research project with him.

I express my gratitude to Prof. Dr. A. van Minnen of ‘Overwaal, Centre of Anxiety Disorders’ for providing data.

My immeasurable gratitude goes out to my parents Esther van der Plas and Hans Wassmer for their never ending support. Their ongoing encouragement has always kept me going. I reason that it must be pleasure for them to finally see me finishing my second Master program after nine years of studying.

Last but not least, a warm thank you is extended to my girlfriend Miranda Smit, who was so kind to improve the English writing of my thesis, and critically checked my thesis before I handed it in.

## Summary

---

There is considerable debate about the legitimacy of the PTSD diagnosis. Therefore there is an urge to supplement the diagnostic system with scientific observations, preliminary to the construction of the fifth version of the DSM. This master study investigated the diagnosis of PTSD. Specifically, the current (DSM-IV-TR) factor structure and three alternative factor structures were analyzed and tested on a ‘heterogeneous trauma-exposed population’. The alternative models consisted of a nested six-factor model, the King et al. (1998) model and the Simms et al. (2002) model. The six factor model was designed by Ebberink et al. (2009) and it distinguishes PTSD specific symptoms from dysphoria symptoms and a ‘PTSD a specific’ symptom. To investigate the fit of the factor models on the trauma population, and to compare it to each other, a confirmative factor analysis (CFA) was performed.

The second aim of this study was to explore the relation between trauma type and PTSD, since studies indicate that the symptom presentation of PTSD is related to trauma type. To explore this relation, a multivariate analysis of variance (MANOVA) was performed. The current study used data from the Dutch translation of the Clinician-Administered PTSD Scale (CAPS) that was acquired from 170 clients of two Mental Healthcare Centres: ‘Overwaal, Centre of Anxiety Disorders’ and ‘Hendriks & Rooseboom, specialists in psychological health’. All clients were clinically diagnosed with PTSD.

Comparison of the proposed factor models showed that the DSM-IV-TR model had the worst fit, and the Simms model provided the best fit. These findings are not consistent with the study of Ebberink et al. (2009), and do not support the assumption that the six factor model shows superior fit to the other models. On the contrary, the findings are concordant with the broad acknowledgement that the PTSD symptomatology of re-experiencing is typical for PTSD (Horowitz, 1997; King et al., 1998; Simms et al., 2002; Brewin, 2003). Obvious is that avoidance could be best defined by two symptoms of active avoidance (C1, C2). Furthermore, there was no statistically significant difference among trauma groups on the symptom representation of PTSD.

The present findings suggest that there are many reactions to extreme trauma, but that the Simms model includes a core set of symptoms that applies for all trauma types. The findings support the weighty body of literature that challenges the current DSM-IV-TR PTSD factor structure and support the view that it involves four clusters of symptoms as opposed to three.

---

## **1. Introduction**

### 1.1 Typical reactions to traumatic events

Victims of overwhelming events, such as war, oppression, child abuse, marital violence, robbery, natural disaster or disaster of human origin and life-threatening accidents have a mental and physical response that follows the traumatic event (Brewin, 2003). Such events involve an adaptive reaction, which is associated with elevated levels of stress. Stress could be seen as a functional mechanism, in that it is an emergency reaction in a threatening situation, which goes in conjunction with a discharge of the sympathetic nervous system. It prepares the human body for 'fight', 'flight' or 'freeze'. Because stress involves emotions like anger and fear, and chronic stress is known to cause health problems, people have a negative association with it (van Doornen, 2004).

With stress, cortisol and adrenaline are released that influence the storage of emotional memories by activating the amygdala (van Doornen, 2004). Moreover, in order to anticipate potential danger, 'stressful memories' are highly adaptive and, when appropriate, play a key role in survival. However, when an event overwhelms the individual's 'psychological defenses', he/she cannot return to his/her former state of homeostasis (psycho-biological wellbeing). Instead, an individual develops enhanced stress reactivity and sympathetic arousal.

Most people return to their 'normal state' after a traumatic event as a consequence of their resilience (Bonanno, 2004). However, some people remain on a level of heightened stress reactivity and sympathetic arousal and repeatedly re-experience the traumatic event. Other symptoms that could follow a traumatic event include the avoidance of stimuli associated with the event and emotional numbing. If these symptoms persist for a longer period, these people could develop Posttraumatic Stress Disorder (PTSD), the formal diagnosis of (among others) the American Psychiatric Association (APA) for special suffering that is caused by a traumatic incident.

This master study investigates the diagnosis of PTSD. Specifically, the current factor structure and three alternative factor structures will be analyzed and tested on a 'heterogeneous trauma-exposed population'. The alternative structures consist of two four factor structures and a six factor structure. By means of a confirmatory factor analysis it will be determined which structure has superior fit on the trauma population. Additionally, the influence of 'trauma type' on the symptom presentation of PTSD will be explored. These issues will be elaborated on in chapter two.

## 1.2 Development of Posttraumatic Stress Disorder in the Diagnostic and Statistical Manual of Mental Disorders

Responses to (psychologically) traumatic events have been described since several centuries before Christ. However, these were not studied scientifically until the middle of the 19<sup>th</sup> century. Scientific efforts started after similar signs and symptoms were observed from victims of disasters, such as train crashes, and wars. For example, 'railway spine' was a common syndrome after railway accidents, which consisted of irritability, restlessness, memory loss and malaise (Erichsen, 1867, cited by Rademaker, 2009; Horowitz, 1997). Also, observations of a cluster of symptoms, like shortness of breath, palpitations, head ache and fatigue, had been made of soldiers in the American Civil War, which was later referred to as 'soldier's heart' or 'irritable heart of the soldiers' (Da Costa, 1871, cited by Rademaker, 2009; Horowitz, 1997). Initially, it was thought that victims were malingering. Despite the prevailing controversy, however, later neurologists realised that the aforementioned symptoms could be attributed to unconscious psychological motivational factors (Horowitz, 1997).

By the end of the nineteenth century Freud discussed the concept of trauma. He thought that overwhelming stimuli (such as sights and sounds) that could not be mastered breach one's 'mental skin' and produce psychological symptoms such as hysterical paralysis and loss of function (1920, cited by Brewin, 2003). Many years later, Januff-Bulman added that trauma shatters people's beliefs about the world and ourselves (1992, cited by Brewin, 2003). Core assumptions help people to sustain in every day life to motivate, to overcome difficulties and to plan for the future. Situations that oppose these assumptions have the potential to be traumatic. According to Bolton & Hill, "a posttraumatic stress reaction is a failure to integrate the trauma into the system of belief about the self and reality" (1996, cited by Brewin, 2003).

Initially, the phenomena that occurred as a consequence of a traumatic experience were most obvious in soldiers of World War I and II. As a result, from the beginning of the twentieth century the symptoms were named in war-related terms: 'combat neurosis', 'combat fatigue', 'combat exhaustion', 'operational fatigue', 'battle fatigue', 'battle neurosis' and 'shell shock' (Horowitz, 1997; Brewin, 2003).

As a consequence of the Vietnam War in the 1960s and '70s, American veterans also suffered from several (psychological) problems and lobbied for acknowledgement of these problems. Meanwhile, empirical research indicated that the syndrome was not only a consequence from war-zone exposure, but from civilian catastrophes as well (Brewin, 2003).

Taken together, this ultimately led to the inclusion of PTSD in the DSM-III from the APA in 1980.

The acknowledgement that different types of trauma can lead to a single disorder was a critical turning point in the history of traumatic stress studies (Kelley et al., 2009). Since then, research on PTSD was increasingly focused on other types of traumas (Brewin, 2003).

The initial criteria of PTSD were largely based on informal studies describing the symptoms of combat veterans, survivors of the Holocaust, or individuals exposed to other extreme stressors. Horowitz was one of the first to carry out experimental research in this field. His work proposed a model that described how people adapt to events that overwhelm mental defences. It involved a structure of intrusive, re-experiencing symptoms alternating with avoidance and emotional numbing. He suggested that these interlinked processes are inclined to occur in temporal phases to enable change in mental structures increasingly in a manageable way (Horowitz, 1976).

Figure 1. *PTSD criteria in the DSM IV-TR edition, ranging from B till F.*

- |   |
|---|
| <p>B. The traumatic event is persistently reexperienced in at least one of the following ways:</p> <ul style="list-style-type: none"><li>- Recurrent and intrusive distressing recollections of the event;</li><li>- Recurrent distressing dreams of the event;</li><li>- Acting or feeling as if the traumatic event were recurring;</li><li>- Intense psychological distress at exposure to cues that symbolize or resemble an aspect of the traumatic event;</li><li>- Physiological reactivity upon exposure to events that symbolize or resemble an aspect of the traumatic event;</li></ul> <p>C. Persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness (not present before the trauma), as indicated by at least three of the following:</p> <ul style="list-style-type: none"><li>- Efforts to avoid thoughts, feelings or conversations associated with the trauma;</li><li>- Efforts to avoid activities, places or people that arouse recollections of the trauma;</li><li>- Inability to recall an important aspect of the trauma;</li><li>- Markedly diminished interest or participation in significant activities;</li><li>- Feelings of detachment or estrangement from others;</li><li>- Restricted range of affect;</li><li>- Sense of a foreshortened future;</li></ul> <p>D. Persistent symptoms or increased arousal (not present before the trauma), as indicated by at least two of the following:</p> <ul style="list-style-type: none"><li>- Difficulty falling or staying asleep;</li><li>- Irritability or outbursts of anger;</li><li>- Difficulty concentrating;</li><li>- Hypervigilance;</li><li>- Exaggerated startle response;</li></ul> <p>E. Duration of the disturbance (symptoms in criteria B, C, and D) is more than one month.</p> <p>F. The disturbance causes clinically significant distress or impairment in social, occupational or other important areas of functioning (APA, 2002).</p> |
|---|

After the inclusion of PTSD in the DSM-III and substantial scientific discourse on PTSD several revisions have been made. One major point of debate was about criterion A. It describes certain types of traumatic events that could ultimately lead to PTSD. In the DSM-III the events were to cause “significant symptoms of distress in almost everyone”; in the DSM-III-R edition a second feature was added: the traumatic event should be “outside the range of usual experience”. In the DSM IV edition the emotional response to stress was also added as a criterion, and criterion A was divided into two parts (Breslau & Kessler, 2001). PTSD is almost unique among psychiatric diagnoses, because of its link with an external cause (Dobbs, 2009). The other diagnostic criteria for Posttraumatic Stress Disorder are outlined in figure 1.



## **2. Theoretical framework**

### 2.1 Criticisms to the current PTSD diagnosis

Preliminary to the construction of the fifth version of the DSM, there is an urge to supplement the diagnostic system with scientific observations, since there is still considerable debate about the legitimacy of the diagnosis. Firstly, considering criterion A, only a minority of the people that experience a traumatic event develop PTSD (Keane et al., 2006). This implies that the event itself is not a sufficient explanation. Trauma severity is one of the strongest predictors of PTSD, but any event is appraised and assimilated in the context of a human being's history and the existing emotional and cognitive set. Therefore, traumatic events produce idiosyncratic responses (Horowitz, 1997; Keane et al., 2006). Moreover, it remains unclear whether there is a link between extreme stress and PTSD. It has been questioned whether supposedly typical traumatic reactions exist and, if so, what the underlying mechanism is of these reactions. The association between experiencing intense fear, helplessness, or horror at the time of trauma seems to be too restrictive (Brewin, 2003).

Secondly, there is considerable symptom overlap between PTSD and other psychiatric disorders. As Brewin (2003, p. 35) noted "emotional and physiological arousal are found in phobic disorders; detachment, loss of interest and hopelessness about the future are found in depression; sleeplessness, irritability, and concentration problems are found both in depression and generalized anxiety disorder, which is also typified by hyper vigilance and exaggerated startle". Furthermore, Horowitz argues that PTSD and complicated grief, which is no formal psychiatric disorder, also have corresponding criteria, such as avoidance, sleeping disturbances and diminished interest or participation in significant activities (Horowitz, 1997; Van den Bout et al., 2001). Although intrusions of the event are claimed to be the most distinctive symptom, they are not unique to PTSD. It is well-established that a high proportion of depressed patients without PTSD (Brewin, 2003) and people suffering from complicated grief (Stroebe et al., 2004) report intrusions of stressful events. However, the nature of the intrusions differs among the disorders (Brewin, 2003; Stroebe et al., 2004). There are indications that complete flashbacks to traumatic events, as opposed to more common intrusive memories, are exceptional in other conditions than PTSD (Brewin, 2003).

Thirdly, the diagnosis of PTSD shows heterogeneous clinical presentations among individuals (Horowitz, 1997; Simms et al., 2002). Two persons can be diagnosed with PTSD without sharing any symptom.

The fourth point of discussion, comorbidity, refers to the second and the third. PTSD often occurs together with other psychiatric disorders. There is substantial comorbidity with other anxiety disorders and depressive disorders (Horowitz, 1997; Simms et al., 2002) as with personality disorders, such as antisocial and paranoid personality disorder (Resick, 2001). The high comorbidity rates make it difficult to determine which symptoms belong to PTSD and which do not, because it is just one of many possible reactions to a traumatic event.

Finally, as a consequence of the symptom overlap and heterogeneity, different core components of the syndrome have been theorized (e.g. Horowitz, 1997; King et al., 1998; Simms et al., 2002; Feeny et al., 2000b). Accordingly, much discussion has come into existence about what category of disorders PTSD belongs to. Since numbing and depression seems to be significant predictors of chronic PTSD (Feeny et al., 2000b), one could theorize that the syndrome is a mood disorder. However, other studies centralize the dissociative phenomena of PTSD (Feeny et al., 2000a; Hagedaars et al., 2010). Additionally, some studies interpret the structure of PTSD as a dimensional construct (e.g. Ruscio & Ruscio, 2002), or argue for a dimensional construct (Ford et al., 2009), which means that the syndrome is not a qualitative unique reaction to extreme stress, but rather a reflection of the far end of a continuum of stress reactions (Brewin, 2003).

## 2.2 Defining PTSD using factor structure

Regarding the aforementioned criticism of symptom overlap, symptom heterogeneity and comorbidity, confirmation of the coherence of PTSD symptoms is still required. One way is to examine the structure of PTSD symptoms and to see whether they form latent variables that correspond with the DSM-IV-TR factors. Usually, factor analysis is employed to accomplish this, a statistical technique that attempts to recognize latent factors that can elucidate the interrelationships among a set of variables (King et al., 1998; Simms et al., 2002).

As a consequence of the discussion about the PTSD symptoms, extensive research concerning the factor structure of PTSD has been performed the past few decades. Many studies found that the contemporary DSM structure with three factors does not provide the best fit in various trauma populations (King et al., 1998; Simms et al., 2002; Rasmussen et al., 2007; Naifeh et al., 2008; Cox et al., 2008; Saul et al., 2008; Ford et al., 2009; Lancaster et al., 2009). Subsequently, alternative models have been suggested. Two of these have been replicated many times: the four-factor model of King et al. (1998) and the four factor model of Simms et al. (2002).

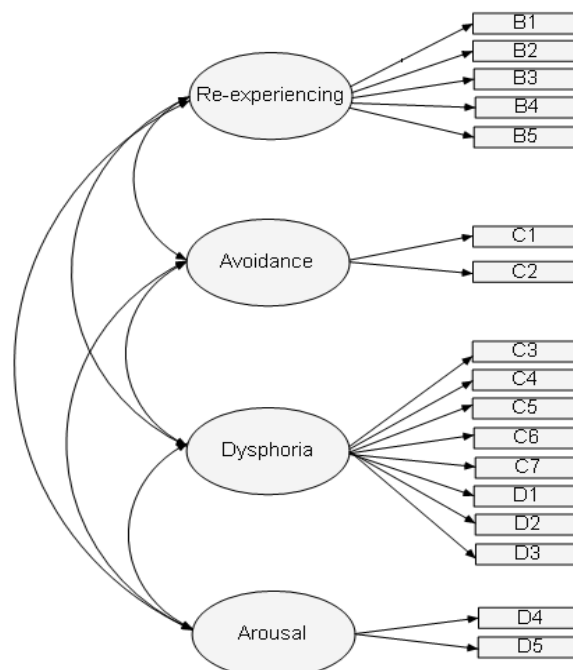
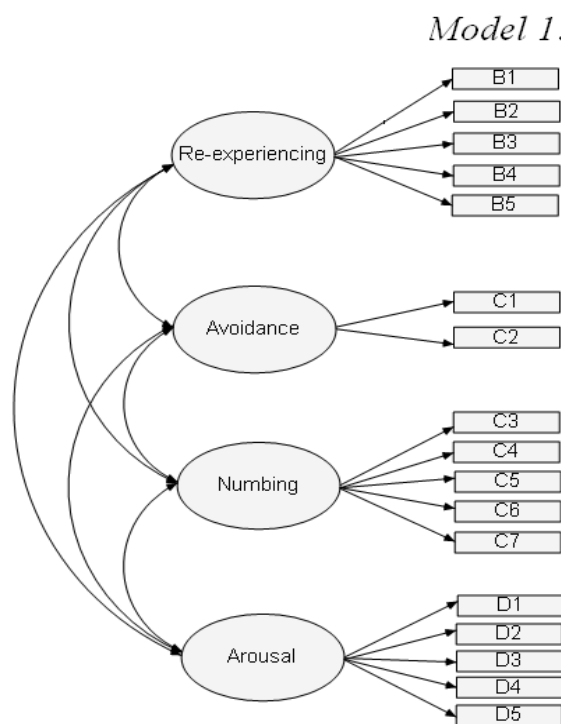
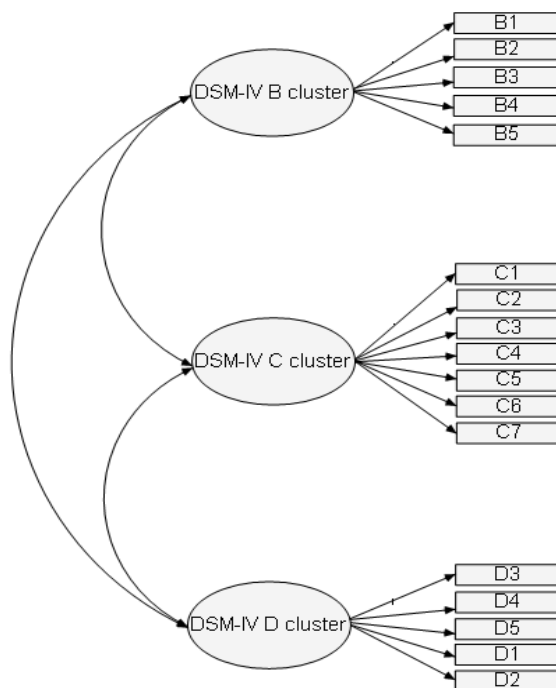
### 2.3 The four-factor model of King et al. (1998)

The confirmative factor analytic study of King et al. (1998) was performed on a large population of male, treatment seeking Vietnam veterans. Their data did not fit the DSM-IV-TR model well. Firstly, the item ‘memory loss’ was unrelated to the other symptoms. As a consequence, they suggested the possibility of a separate ‘memories difficulties’ factor. Secondly, King et al. found that the deliberate avoidance symptoms (C1 and C2) are independent from the emotional numbing symptoms (C3-C7). This resulted in a factor structure, which consisted of ‘re-experiencing’, ‘avoidance’, ‘emotional numbing’ and ‘arousal’, in which criterion C was divided in two factors. The model, hereafter referred to as the “King model”, has been affirmed in later studies with a variety of populations, such as in a ‘U.S. national sample of individuals’ with lifetime PTSD (Cox et al., 2008), in ‘heterogeneous trauma-exposed, general medical patients’ (Naifeh et al., 2008), in ‘West and Central African Refugees’ (Rasmussen et al., 2007), and in ‘trauma-exposed adolescents’ (Saul et al., 2008; Ford et al., 2009).

### 2.4 The four factor model of Simms et al. (2002)

In 2002, Simms et al. presented another four-factor model, hereafter referred to as the “Simms model”, in which the factors ‘intrusions’, ‘avoidance’, ‘hyperarousal’ and ‘dysphoria’ were distinguished. The dysphoria factor combined (DSM-IV-TR) symptoms of hyperarousal (D1-D3) with symptoms of emotional numbing (C3-C7), reflecting the non-specific component of PTSD, which is shared with other anxiety and mood disorders. As a consequence, the avoidance and hyperarousal factors were considered to embody fewer symptoms compared to the DSM-IV-TR model (respectively C1-C2 and D4-D5), and were hypothesized to reflect ‘mid-level constructs’ common to many anxiety disorders. The intrusions factor remained unchanged and was considered to reflect a specific component of PTSD. The Simms model was tested on a large sample of deployed and nondeployed veterans of the Gulf War and provided a good fit (Simms et al., 2002). In recent studies the model has been affirmed in other populations, such as in ‘West and Central African Refugees’ (Rasmussen et al., 2007), individuals from the ‘National Epidemiological Survey on Alcohol and Related Conditions’ that met criterion A for PTSD (Shevlin et al., 2009) and ‘college students exposed to a range of traumatic events’ (Lancaster et al., 2009). Figure 2 displays the symptoms and their latent factors according to the DSM-IV-TR model, the King model and the Simms model.

Figure 2. Symptom structure of the proposed confirmatory factor models.



### 2.5 King et al. versus Simms et al.

Several studies have included both four-factor models. In most of these, the Simms model shows the best fit as opposed to the King model (e.g. Shevlin et al., 2009; Lancaster et al., 2009). However, Elhai et al. (2009), differentiated between a specific trauma (worst

trauma in a lifetime) or general trauma (overall trauma history) population and this study proposed that these two populations fit different models. That is, a ‘heterogeneous specific trauma-exposed population’ fitted the Simms model better, and the King model had the best fit in a ‘trauma-general population’. Furthermore, a ‘non-trauma-exposed population that had dealt with life stressors’ had the best fit with the latter model as well. This differentiation seems to be applicable for the outcomes of the studies of Elhai et al. (2009), Naifeh et al. (2008) and Shevlin et al. (2009). These studies show that symptom-rating to the most traumatic event leads to a better fit of the Simms model, whereas the King model has a better fit when participants rate their symptoms globally (without reference to a specific traumatic event). Thus, assessment methodologies tend to influence the data fit of the factor models. More specifically, it turns out that symptom rating with reference to a specific traumatic event is in favour of the Simms model, whereas symptom rating without reference to a specific traumatic event, or to non traumatic life stressors, is in favour of the King model.

## 2.6 Trauma type and the symptom presentation of PTSD

Studies indicate that the symptom presentation of PTSD is related to trauma type. Kelley et al. (2009) argue that there is a difference between symptoms related to interpersonal trauma (such as sexual assault and the loss of a loved one) and symptoms related to fear invoking trauma (such as sexual assault and accidents). They argue that the higher overall PTSD symptom severity of ‘sexual assault victims’, relative to ‘victims of an accident’ or ‘bereaved persons’, may be attributable to the cumulative impact of both types of symptoms. In addition, blame, which can be considered as a symptom of interpersonal trauma, increases risk for PTSD (Yasan et al., 2009; Brewin, 2003).

Moreover, in a study concerning PTSD and trauma type, Shercliffe et al. (2009) demonstrated higher rates of distress (worry, depression, suspiciousness) and fear with ‘victims of crime’ compared to ‘victims of accidents’. They also argued that similar studies have elucidated relatively higher rates of anger and distress with ‘combat veterans’ and relatively higher rates of depression with ‘victims of sexual assault’.

In one of these studies MMPI-2 profiles were compared for a ‘combat trauma group’ and a ‘sexual assault trauma group’ (Kirz et al., 2001). First, it was argued that these groups should differ on PTSD etiology. Whereas a combat trauma seems to pose a threat to life, sexual assault seems to pose a threat to physical integrity. Furthermore, the etiology could be influenced by whether the trauma was experienced individually or collectively and whether it concerns an interpersonal trauma or not. Second, the study proposed that trauma groups

should differ regarding the role of the traumatized persons. Kirz et al. (2001) reasoned that the 'combat trauma veterans' were both victim and agent of trauma, whereby themes such as shame and guilt play a role. In contrast, the 'sexual assault survivors' were solely victim, and as a consequence they reasoned this group suffers more from paranoia and anxiety.

Whether or not these arguments form the basis for their findings, the study proved differences in PTSD etiology between 'combat veterans' and 'sexual assault survivors'. The former group showed more symptoms and signs of pathology, and externalized negative affect via anger, cynism, antisocial acts, and distrust of others. With the latter group negative affect was internalized through depression, somatic complaints, and anxiety. However, some of these differences were associated with gender differences (Kirz et al., 2001).

### 2.7 Six-factor structure

Factor analytic studies have shown there is a lack of consensus about what is the most suitable structure of PTSD symptoms. With the purpose to explore the validity of an alternative model, Ebberink et al. (2009) have designed a six-factor model with two higher order factors. They distinguished PTSD specific symptoms from dysphoria symptoms related to general stress. The PTSD specific factor comprised of the first order factors re-experiencing and avoidance. The dysphoria factor consisted of the first order factors emotional numbing, anhedonia and hostility. The inclusion of the latter three factors is based on factor analytic studies, which indicate that anger and depressive symptomatology are central features of PTSD. In the six factor model the symptom 'trauma specific amnesia' was indicated as an independent factor (PTSD a specific). Moreover, the hyperarousal factor was removed from the model because of its heterogeneity, and its symptoms were added to other clusters.

Ebberink et al. (2009) conducted a confirmative factor analysis to compare their six-factor model with the DSM-IV-TR three-factor model, the King model and the Simms model. In a trauma population of 'Dutch peacekeeping veterans', who served in the Balkan, the nested six-factor model provided the best fit. The superiority of the six-factor model supports the assumption that PTSD is composed of specific symptomatology as well as dysphoria symptoms. The results also indicated that anhedonia and hostility represent solid factors. Furthermore, the findings demonstrated a poor factor loading of 'trauma specific amnesia', in conjunction with other studies (e.g. King et al., 1998).

Table 1 displays the symptoms and their latent factors according to the DSM-IV-TR model, the King model, the Simms model and the six-factor model. Furthermore, figure 3 depicts the symptom structure of the six-factor model.

Table 1. *Item mapping for proposed confirmatory factor models*

DSM-IV-TR PTSD-symptoms	Model			
	1	2a	2b	3
B1. Intrusive thoughts of trauma	R	R	R	R/S
B2. Recurrent dreams of trauma	R	R	R	R/S
B3. Flashbacks	R	R	R	R/S
B4. Emotional reactivity to trauma cues	R	R	R	R/S
B5. Physiological reactivity to trauma cues	R	R	R	R/S
C1. Avoiding thoughts of trauma	A/N	A	A	A/S
C2. Avoiding reminders of trauma	A/N	A	A	A/S
C3. Inability to recall aspects of trauma	A/N	N	D	As
C4. Loss of interest	A/N	N	D	An/D
C5. Detachment	A/N	N	D	N/D
C6. Restricted affect	A/N	N	D	N/D
C7. Sense of foreshortened future	A/N	N	D	An/D
D1. Sleep disturbance	H	H	D	An/D
D2. Irritability	H	H	D	Hos/D
D3. Difficulty concentrating	H	H	D	An/D
D4. Hypervigilance	H	H	H	R/S
D5. Exaggerated startle response	H	H	H	R/S

*Note: Model: 1. DSM-IV-TR; 2a. King model; 2b. Simms model; 3. Six-factor model.*

*Factors on which symptoms were loaded: R=re-experiencing, A=avoidance, N=numbing, D=dysphoria, H=hyperarousal. Hos=hostility, An=anhedonia, S=PTSD specific, As=PTSD a specific.*

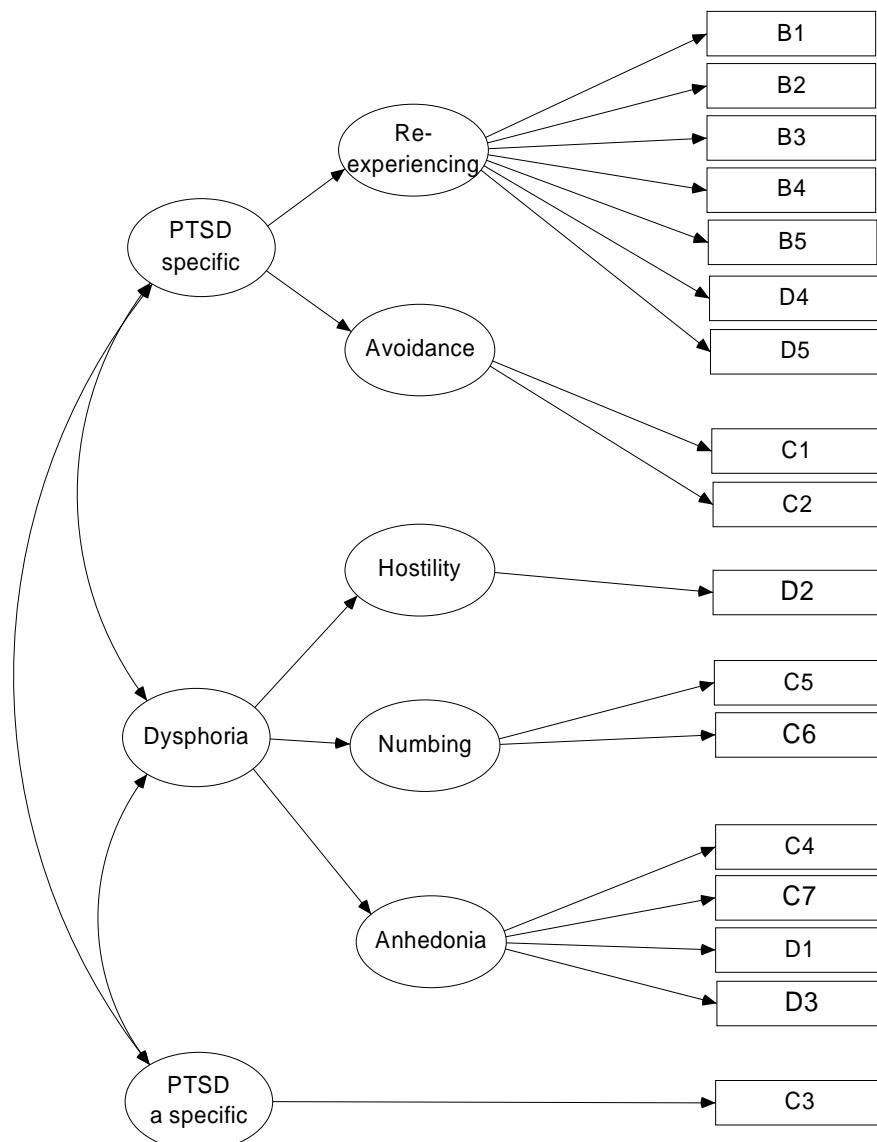
## 2.8 Present study

The present study had two aims. The first aim was to test the validity of the nested six-factor model in a civilian trauma sample and compare it to the existing factor models of the DSM IV-TR, King et al. (1998) and Simms et al. (2002). Related to this, the first research question of this thesis was:

1. Does the PTSD six-factor model fit the data of a heterogeneous trauma-exposed population?

The six-factor model was assumed to show a better fit on a ‘heterogeneous trauma-exposed population’ than the existing factor models of the DSM IV-TR (2002), King et al. (1998) and Simms et al. (2002).

Figure 3. Symptom structure of nested six-factor model.



*Model 3: six-factor model*

Differences among PTSD factor models have partially been explained by differences in trauma populations (e.g. Naifeh et al. 2008). This implies that the nature of symptoms



relates to the specific trauma type. The second aim of this study was to explore the relation between trauma type and PTSD. This has led to the second research question:

2. *What is the influence of trauma type on the symptom presentation of PTSD?*

Because different types of traumatic events involve different kind of reactions, it was hypothesized that trauma type relates to the factor score of PTSD. Therefore, it was expected that the dysphoria factor scores differ per PTSD subtype, as a consequence of trauma type. On the contrary, the PTSD specific factor scores were expected to be equal among different subtypes of PTSD.

### **3. Methods**

This study investigated the fit of several factor models of PTSD (the DSM-IV-TR model, 2002; the King et al. model, 1998; the Simms et al. model, 2002; and the six-factor model, Ebberink et al. 2009) in a ‘civilian, population with PTSD’. Next, the fit indices of the models were compared to decide which model classifies the symptoms of PTSD best. Finally, it was assessed whether trauma type influences the symptom presentation of PTSD.

#### 3.1 Subjects

The current study used data that was acquired from 170 clients of two Mental Healthcare Centres: ‘Overwaal, Centre of Anxiety Disorders’ and ‘Hendriks & Rooseboom, specialists in psychological health’. All clients were clinically diagnosed with PTSD. Clients were originally recruited for a ‘d-cycloserine’ study or a ‘PTSD-treatment’ study. Prior to their PTSD-treatment, clients were asked whether they wanted to participate and were informed about the content of the study. Measurements were done by therapists (a psychology-student, a psychologist or a ‘Health Care’ psychologist). All participants had given permission to use their data for research.

Subjects were included in the current study if they were interviewed with the Dutch translation of the Clinician-Administered PTSD Scale (CAPS) and the CAPS score was greater than or equal to 45. One hundred and sixty-one subjects were included. Participants’ mean age was 36.6 (SD=11.4); 81 % of participants were women, and 19% were men.

#### 3.2 Measures

The CAPS is a structured, clinical interview of 30 items. Among these items 17 items correspond with the PTSD symptoms of the DSM-IV-TR (2002), which are categorized in three symptom clusters: re-experiencing, avoidance and hyper arousal. Each item was scored on a five-point scale of frequency and of intensity. The total score of the CAPS was the sum of the total score of each cluster. The instrument can be used to diagnose both current (in the last month) and lifetime PTSD (Blake et al. 1995).

Furthermore, the CAPS appears to have outstanding psychometric properties. In their review article of the CAPS, in which they re-evaluate CAPS-related research of the first 10 years, Weathers et al. (2001) concluded that “it has excellent reliability”. This concerned internal consistency, test-retest reliability, and inter-rater reliability. Furthermore, they concluded that there is sufficient validity to use the CAPS for diagnosing PTSD and measuring symptom severity. Content-validity was established by its direct association with

the DSM-IV diagnostic criteria for PTSD. Additionally, it was developed and revised by experts in the field of traumatic stress and by clinicians and investigators who have used the tool. Regarding the construct validity, Weathers et al. (2001) conclude that evidence indicates that the CAPS has strong convergent and discriminant validity. Finally, they claimed that it has a strong diagnostic usefulness and that it is “sensitive to clinical change” (Weathers et al. 2001).

### 3.3 Statistical analyses

#### *3.3.1 Confirmatory factor analysis*

To investigate the fit of the factor models on the trauma population a confirmative factor analysis (CFA) was performed with the software package AMOS (Arbuckle, 2006). For a detailed description of CFA assumptions see Grimm (1993), Kline (2005) and Pallant (2007). This method was adjusted to the study of Ebberink et al. (2009).

#### *3.3.2 Fit indices*

To evaluate the fit of the factor models with the sample data, various fit indices can be used. In the current study the selection of various fit indices was based on evaluations of indices which were obtained from literature (Garson, 2009; Hooper et al. 2008; Hox, 1999; Marsh & Balla, 1994).

The chi-square value ( $\chi^2$ ) is a long-established measure for evaluating general model fit (Hooper et al. 2008). A significant  $\chi^2$  indicates a non-satisfactory model fit, which means that the specified model's covariance structure is dissimilar from the observed covariance matrix. There is a good model fit if the  $\chi^2$  is not significant (Garson, 2009). However, there are a few limitations to its use, one of which is its sensitivity to sample size (Garson, 2009; Hooper et al. 2008; Marsh & Balla, 1994). Therefore, alternative fit indices have been developed. One of these is the relative chi-square, also called normal or normed chi-square ( $\chi^2/d.f.$ ). To make the  $\chi^2$  less dependent on sample size, the chi-square fit index was divided by degrees of freedom (Garson, 2009). In the current study a  $\chi^2/d.f.$  ratio  $> 2$  represented an inadequate fit (Garson, 2009; Tabacchnick & Fidell, 2007).

The Root-Mean-Square-Error of Approximation (RMSEA) was recommended by Hooper et al. (2008) and Hox (1999) and was used in this study, whereby a RMSEA less than or equal to .08 represented an adequate fit (Garson, 2009). The Comparative Fit Index (CFI) was recommended by Hooper et al. (2008); values equal to or greater than .90 indicate a good

fit (Garson, 2009). The Tucker-Lewis index (TLI) was recommended by Hox (1999) and Marsh & Balla (1994). TLI (=NNFI) values .95 indicate a good model fit (Garson, 2009). Finally, the Akaike Information Criterion (AIC) was used to compare well-fitting models. Although the absolute value of AIC offers little insight into model fit, it can be used as a comparative index when examining competing models whereby the smallest AIC value indicates the best-fitting model (Garson, 2009).

### 3.3.3 Factor models

As described in the introduction, the current study investigated several factor models: the DSM-IV-TR model (2002); the King et al. model (1998); the Simms et al. model (2002); and the six-factor model (Ebberink et al. 2009). In figure 2 and 3 these models are outlined graphically.

Estimation of matrices of the covariances among CAPS total scores was based on Maximum Likelihood Estimation (Kline, 2005; Garson, 2009). Covariances between measurement errors were set to 0.

### 3.3.4 Multivariate Analysis of Variance

To investigate the influence of ‘trauma type’ on the symptom representation of PTSD a multivariate analysis of variance (MANOVA) was performed. In the current study the factor scores of the best fitting model were compared between several trauma groups. Table 2 shows the trauma groups and their sample sizes. Three cases were excluded from MANOVA because trauma type was unknown.

Table 2. *Trauma types and*

<i>Trauma group</i>	<i>Sample size</i>
Sexual assault, with or without violence	68
Violence	47
Accident	12
Other, including war experiences	31

The differences in the PTSD symptom presentation among trauma groups were investigated by means of the factor scores. Symptom scores were calculated by multiplying the CAPS score with the corresponding factor loading. Factor scores were calculated for each participant by adding up the matching symptom scores.

## 4. Results

### 4.1 CFA

#### 4.1.1 Assumptions

Data was normally distributed; all variables had skewness and kurtosis values between 2 and -2. A missing value analysis was performed on the seventeen symptom-variables. Each variable consisted of two components: the frequency (F) of the symptom and the intensity (I) of the symptom. In three cases both components of a variable were not filled in and replaced by 0. In seven cases only one component was missing of one or more variables. For these missing values the mean values were calculated. Mean values were calculated for the missing components on the basis of values of the same component (F or I) that were filled out in other cases having the same value for the related component. For example, if the I-component was missing for variable 16 where F was 3, all the other 'I scores' belonging to variable 16, where F was 3, were averaged. This averaged value was then entered for the missing I-component.

To accomplish multivariate normality a Box-Cox transformation was executed using Minitab 15.0 (Minitab Inc, 2007). Mahalanobis distance analysis showed that data still had multivariate outliers ( $MAH > 20.515$  at  $p < .001$ ) after transformation.

#### 4.1.2 Outcomes

Results (see table 3) indicated that the proposed factor models did not demonstrate an adequate fit on all measures.

Table 3. *Goodness-of-fit indices for each confirmatory factor model.*

Model	Fit indices								
	<i>n</i>	<i>p</i>	<i>df</i>	$\chi^2$	$\chi^2/d.f.$	RMSEA	CFI	TLI	AIC
<i>161</i>									
<i>DSM-IV-TR</i>		.000	116	236.491	2.039	.081	.612	.545	344.491
<i>King et al. 1998</i>		.000	113	191.253	1.693	.066	.748	.697	305.491
<i>Simms et al. 2002*</i>		.001	113	164.173	1.453	.053	.835	.802	278.173
<i>Six-factor model</i>		.000	113	178.252	1.577	.060	.790	.747	292.252

*\*iteration limit was set to 2000*

All models had a significant  $\chi^2$  which indicated a non-satisfactory model fit. The CFI values (all <.9) and TLI values (all<.95) also indicated that all models have an inadequate fit. Regarding the relative chi-square ( $\chi^2$ /d.f.) and the RMSEA only the DSM-IV-TR model ( $\chi^2$ /d.f.>2 and RMSEA>.8) revealed an inadequate fit.

#### *4.1.3 Comparison of proposed factor models*

Comparison of the proposed factor models does not lead to an unambiguous ‘best fitting model’. The DSM-IV-TR model had the worst fit, since all fit indices indicated a bad fit. The other models were indicated as a ‘fitting model’ only by the  $\chi^2$ /d.f. and the RMSEA values. Because the Simms model had the lowest  $\chi^2$ /d.f. (1.453) and the lowest RMSEA value (.053), it fitted this sample best.

Moreover and more important, the AIC, which is useful to compare between well-fitting models, also indicated the Simms factor model (AIC = 278.173) had a better fit.

Taken together, the hypothesis that the six-factor model of Ebberink et al. (2009) demonstrated a superior fit in a ‘heterogeneous trauma-exposed population’ should be rejected.

#### *4.1.4 Factor loadings*

Table 4 reveals the factor loadings of the PTSD symptoms on the (first-order) factors of each model. The factor loadings varied from very low (.00) to high (.84). Items with factor loadings equal to or greater than .30 were considered to be a significant part of their latent factor (Brace et al. 2006). Striking is that item C3 (inability to recall) loaded very low in each model (except for the six-factor model, where the unstandardized regression coefficient was set to 1). Items B3 (flashbacks) and D2 (irritability) also had a low factor loading in each model; around or below .30. Remarkably, the avoidance items C1 and C2 had a poor loading in the DSM-IV-TR model and a moderate (C2) or high (C1) loading in the King model, the Simms model and the six-factor model. It is noticeable that some items have a negative factor loading: item C3 in the DSM-IV-TR model and the items C4, C5, C6 and C7 in the King model, which could mean that these items have a negative relation to their associated factor. However, the negative factor loadings may be due to negative correlations between the original and the transformed variables.

The items D4 (hypervigilance) and D5 (exaggerated startle response) had notably higher factor loadings in the Simms model than in the other models. Compared to the DSM IV-TR model and the King model, D5 had a relatively high factor loading in the six-factor

model as well. Furthermore, although differences are small, the items D1 (sleep disturbance) and D3 (difficulty concentrating) had higher factor loadings in the Simms model and the six-factor model.

Table 4. *Factor loadings of PTSD indicators on the first-order factors.*

	<i>Model</i>			
	<i>DSM-IV-TR</i> 2002	<i>King et al.</i> 1998	<i>Simms et al.</i> 2002*	<i>six-factor</i> 2009
<i>DSM-IV-TR PTSD-symptoms</i>				
B1. Intrusive thoughts of trauma	.44	.42	.42	.40
B2. Recurrent dreams of trauma	.35	.34	.33	.32
B3. Flashbacks	.32	.28	.28	.25
B4. Emotional reactivity to trauma cues	.74	.74	.75	.71
B5. Physiological reactivity to trauma cues	.53	.56	.56	.54
C1. Avoiding thoughts of trauma	.29	.84	.73	.75
C2. Avoiding reminders of trauma	.12	.37	.43	.41
C3. Inability to recall aspects of trauma	-.06	.05	.00	1.00**
C4. Loss of interest	.52	-.56	.58	.60
C5. Detachment	.58	-.60	.59	.61
C6. Restricted affect	.51	-.57	.55	.56
C7. Sense of foreshortened future	.42	-.41	.41	.42
D1. Sleep disturbance	.44	.41	.45	.46
D2. Irritability	.29	.31	.27	1.00**
D3. Difficulty concentrating	.43	.41	.46	.47
D4. Hypervigilance	.31	.37	.68	.37
D5. Exaggerated startle response	.06	.12	.46	.31

\*iteration limit was set to 2000.

\*\*unstandardized regression weights were set to 1.

Table 5 displays the factor loadings of the first-order factors on the second-order factor loadings in the six-factor model. It is noticeable that re-experiencing and numbing had factor loadings larger than one in magnitude, which had to do with the inter correlations between the factors. If factors are correlated (oblique), the factor loadings are regression coefficients and not correlations (Jöreskog, 1999).

Remarkably, hostility had a poor loading on dysphoria. Moreover, avoidance loaded moderately on the PTSD specific factor. Except for C3 (for which the unstandardized

regression weight was set to 1), the other factors had a high (anhedonia) or very high (re-experiencing and numbing) factor loading.

Table 5. *factor loadings on second-order factors of the ‘nested’ six factor model.*

<i>Factor</i>	<i>PTSD specific</i>	<i>Dysphoria</i>	<i>PTSD a specific</i>
<i>Re-experiencing</i>	<i>1.25</i>		
<i>Avoidance</i>	<i>.58</i>		
<i>Hostility</i>		<i>.27</i>	
<i>Numbing</i>		<i>1.09</i>	
<i>Anhedonia</i>		<i>.84</i>	
<i>C3. Inability to recall trauma</i>			<i>1.00*</i>

*\*unstandardized regression weight was set to 1.*

## 4.2 MANOVA

### *4.2.1 Assumptions*

A one-way between-groups multivariate analysis of variance was performed to investigate differences in the PTSD symptom presentation among trauma groups. The independent variable was trauma type. The dependent variables consisted of the factors of the Simms model: re-experiencing, avoidance, dysphoria and arousal. Preliminary assumption testing was conducted to account for normality, linearity, univariate outliers, and homogeneity of variance-covariance matrices. There were no serious violations. The assumption of equality of variance was violated for the dependent variable ‘avoidance’,  $F(3, 154) = 3.356, p=.020$ .

### *4.2.2 Outcomes*

There was no statistically significant difference among trauma groups on the combined dependent variables re-experiencing, avoidance, dysphoria and arousal,  $F(12, 400) = 1.258, p=.241$ ; Wilks’ Lambda=.907 partial eta squared=.032.



## 5. Discussion

### 5.1 Does the PTSD six-factor model fit the data of a heterogeneous trauma-exposed population?

In order to test its validity, a CFA of the nested six-factor model in a civilian trauma sample was performed and compared to the existing factor models of the DSM IV-TR, King et al. (1998) and Simms et al. (2002). Various fit-indices indicated that the six-factor model fitted data, but that the Simms model had an overall best fit. The DSM IV-TR model did not fit data. Furthermore, the factor loadings of the PTSD symptoms on the (first-order) factors showed some peculiar results. Striking was that ‘inability to recall’ (C3) loaded very low, and ‘flashbacks’ (B3) and ‘irritability’ (D2) loaded low, in each model. Second, compared to the DSM-IV-TR model the items ‘avoiding thoughts of trauma’ (C1) and ‘avoiding reminders of trauma’ (C2) loaded remarkably better in the King model, the Simms model and the six-factor model. Third, ‘hypervigilance’ (D4) and ‘exaggerated startle response’ (D5) had notably higher factor loadings in the Simms model than in the other models.

The findings are not consistent with the study of Ebberink et al. (2009), and do not support the assumption that the six factor model shows a better fit than the other models on a ‘heterogeneous trauma-exposed population’. Consequently, the assumption that PTSD is composed of specific symptomatology, consisting of re-experiencing and avoidance, and dysphoria symptoms, with anhedonia, numbing and hostility as solid factors, and an ‘a specific symptom’ should be rejected as well.

Moreover, the dysphoria component of the six-factor model included heterogeneous symptom clusters with the symptoms of hostility, numbing and anhedonia as separate factors. Regarding their (second order) factor loading, anhedonia and numbing are part of dysphoria, and hostility is not. This finding is not consistent with the study of Ebberink et al. (2009) in which hostility represented a solid factor. However, as they noted themselves, the “identification of a hostility factor may represent a military idiosyncrasy”. As a consequence of the homogeneous population (deployed veterans) the hostility symptoms, which are typical among deployed veterans (Orth et al., 2006), may be overrated.

On the contrary, the findings are concordant with the broad acknowledgement that the PTSD symptomatology of re-experiencing is typical for PTSD (Horowitz, 1997; King et al., 1998; Simms et al., 2002; Brewin, 2003; Ford et al., 2009), and that it represents a solid factor. In accordance with the assumption of King et al. (1998) and Simms et al. (2002) about the avoidance factor, the current study confirmed the fact that the avoidance factor is

composed of ‘avoiding thoughts of trauma’ (C1) and ‘avoiding reminders of trauma’ (C2). The other avoidance items, C3-C7 (‘inability to recall aspects of trauma’, ‘loss of interest’, ‘detachment’, ‘restricted affect’, ‘sense of foreshortened future’) should be assigned to another factor.

The Simms model and King model differ with respect to the structure of the emotional numbing and the hyperarousal items. The present findings support the structure of the Simms model, which considers the dysphoria symptoms as the non-specific component of PTSD, which is shared with other anxiety and mood disorders. Moreover, avoidance and hyperarousal reflect ‘mid-level constructs’ common to many anxiety disorders (Simms et al., 2002).

It should be noted however, that the current study used symptom scores that were rated to the most traumatic event. As noted in paragraph 2.5, it turns out that symptom rating with reference to a specific traumatic event is in favour of the Simms model, whereas symptom rating without reference to a specific traumatic event, or to non traumatic life stressors, is in favour of the King model. Consequently, the current findings, which favour the Simms model, could have been influenced by the assessment method that was used (CAPS).

The current study endorses a hyperarousal factor with the prototypical symptoms ‘hypervigilance’ (D4) and ‘exaggerated startle response’ (D5), as was defined by Simms et al. (2002). Furthermore, ‘inability to recall’ (C3) does not seem to belong to any of the factors of the Simms model or the King model. Due to constraints in the model design it was not possible to assess the factor loading of ‘inability to recall’ (C3) as an ‘a specific symptom’, but it seems justified to compose it as a separate factor.

## 5.2 What is the influence of trauma type on the symptom presentation of PTSD?

Regarding the second research question, no relation between trauma type and the factor score of PTSD was found. Therefore, the assumptions that the dysphoria factor scores differ per PTSD subtype, as a consequence of trauma type, was rejected. The findings suggest that there are many reactions to extreme trauma, but that the Simms model includes a core set of symptoms that applies for all trauma types. However, the findings are inconsistent with studies of Kirz et al. (2001), Kelley et al. (2009) and Shercliffe et al. (2009), who found differences in symptom scores between trauma types.

Idiosyncratic responses result from many factors, such as one’s disposition regarding personality structure, habitual defences, cognitive and coping style, behavioural patterns, and the relationship of these with his or her family and society (Horowitz, 1997). Other factors

include cultural beliefs, duration of the symptoms, presence and degree of childhood trauma and so on (Brewin, 2003). The current study did not differentiate on these factors, and therefore one is limited to draw conclusions with respect to the relation between trauma type and symptom presentation. Possibly, the homogeneous trauma reactions could be ascribed to one or more other factors. In addition, the research population was comprised of clients that were clinically diagnosed with PTSD and whom sought help from a mental healthcare centre. This implies that all participants suffered seriously and probably from many symptoms. In that respect, it was already a homogeneous population, and therefore it is not obvious there is not much differentiation in symptom severity. Possibly, differentiation between trauma types could be made on a more detailed level of symptoms. For example, regarding avoidance, one trauma type may involve avoidance of places, while another trauma type may involve avoidance of the perpetrator.

### 5.3 Limitations

For a factor model with multiple factors, at least 2 indicators are advised (Kline, 2005). One limitation of the six-factor model is the inclusion of two ‘one item factors’, because these factors often are not identified in Amos (Arbuckle, 2006). Consequently, the model could only be analysed with additional constraints, which has limited the obtained information. That is, no factor loadings of ‘inability to recall’ (C3) and ‘irritability’ (D2) were acquired because their unstandardized regression weights were set to 1.

Apart from this, the current study had two additional limitations. First, the data had multivariate outliers, also after Box-Cox transformation. Lack of multivariate normality involves two risks. It inflates the chi-square statistic, and other fit indices, such that a model is biased toward a Type I error (rejecting it, while it should not be rejected). Violation of multivariate normality also tends to assess regression paths and factor/error covariances to be statistically significant more often than they should be. However, many if not most SEM studies in the literature fail to concern themselves with this assumption in spite of its importance (Garson, 2009). Second, some items of the DSM-IV-TR model and the King model had negative factor loadings, which make them hard to interpret. This limitation is an indirect consequence of the lack of multivariate normality, because they may ‘have changed direction’ as a result of the Box Cox transformation (Minitab Inc, 2007).

Another (methodological) limitation of the current study (regarding the second research question) was the constraints that had to be set in Amos (Arbuckle, 2006). As mentioned above, this could result in unreliable regression paths and factor/error covariances,

thus unreliable factor loadings. Since these factor loadings were used to calculate factor scores for Manova, the outcome may be unreliable as well.

#### 5.4 Strengths

Despite the aforementioned limitations, some strengths can be acknowledged in the current study as well. First, the usage of CAPS to diagnose clients with PTSD was an important strength, because it demonstrates outstanding psychometric properties (Blake et al., 1995; Weathers et al., 2001). Furthermore, it has been used successfully in many studies with different trauma populations (Blake et al., 1995). One should be careful in comparing these findings with results from studies with other measures. A number of studies illustrate that PTSD self-report measures may yield a somewhat different PTSD structure than information obtained from interview measures (e.g. Shevlin et al., 2009). Moreover, not all PTSD measures have items parallel to the DSM-IV symptoms, regarding content and number of items. As a consequence, factors could have different meanings. For example, King et al. (2009) state that numbing in the *Impact of Event Scale-Revised* (IES-R) does not have exactly the same meaning as that of the DSM-IV, because it “does not overtly assess feelings of detachment from others, isolation, or other facets of intimacy or relationship quality” (p. 183).

Another strength of the current study is that it elaborates on factor analytical studies that assess the most optimal factor structure. Specifically, several existing models were replicated, but additionally, this study for the first time tested the validity of the nested six-factor model. Furthermore, in contrast with most factor analytic studies, the current study investigated whether factor scores differed per trauma type, since differences among PTSD factor models have partially been explained by differences in trauma populations (e.g. Naifeh et al., 2008).

#### 5.5 Conclusion and future research

In summary and in closing, the current study indicates that the Simms model has the best factor structure among the DSM-IV-TR model, the King model and the six factor model. Furthermore, it proved that the PTSD symptomatology of re-experiencing is typical for PTSD, and that avoidance could be defined best by ‘avoiding thoughts of trauma’ (C1) and ‘avoiding reminders of trauma’ (C2). The dysphoria symptoms could be considered as the non-specific component of PTSD. The present findings support the weighty body of literature that challenges the current DSM-IV-TR PTSD factor structure and support the view that the PTSD factor structure involves four clusters of symptoms as opposed to three

Additionally, the proposed diagnostic criteria in the fifth version of the American Psychiatric Association's diagnostic manual, correspond to the Simms model, that is, it also adds a fourth cluster. More specifically, criterion C (avoidance and numbing) has been split into C and D. Criterion C (new version) now solely comprises avoidance of behaviors or physical or temporal reminders of the traumatic experience(s) (C1-C2). Moreover, criterion D focuses on negative alterations in cognition and mood associated with the traumatic event(s), which are dysphoric symptoms as in the Simms model. However, these do not include the 'hostility', 'sleep disturbance', and 'difficulty concentrating' as in the Simms model. The cluster contains two new symptoms (D3, D4) one expanded symptom (D6), and four largely unchanged symptoms (D1, D2, D5, D7) specified in the DSM-IV-TR (2002). Criterion E (formerly D) focuses on increased arousal and reactivity, and contains one modestly changed (E6), one entirely new (E2), and four unchanged symptoms. For a more detailed description of the proposed diagnostic criteria changes see Appendix.

The current study raises some questions for further research, to elaborate on these issues. First, the present findings demonstrated a relatively poor factor loading of 'trauma specific amnesia', in agreement with other studies (e.g. King et al., 1998; Ebberink et al., 2009). Prior to the release of the DSM-V, more clarity about whether or not this symptom belongs to the factor arousal, or even to PTSD, should be required. Secondly, in contrast to the study of Ebberink et al., (2009) hostility was not identified as a distinct factor. Future research may investigate whether this symptom is more typical for specific trauma types than for others. Thirdly, since anhedonia loaded highly on dysphoria (in the six-factor model) in the current study, it might be worthwhile to test an alternative nested four-factor model, with numbing and anhedonia as separate factors within dysphoria.

Regarding the influence of trauma type, future research could investigate whether differentiation could be made on a more detailed level. It is important to understand the relation between trauma type and the symptom presentation of PTSD because it might give suggestions for different therapeutic approaches. Consequently, trauma type may be a key variable in understanding the patient (Kirz et al., 2001).

## References

- Ainsworth, A. (2010). *MANOVA basics, lecture 10*. Cited on May 25, 2010. Available at the World Wide Web:  
[http://www.csun.edu/~ata20315/psy524/docs/Psy524%20Lecture%2010%20MANOVA1.ppt#256,1,MANOVA Basics](http://www.csun.edu/~ata20315/psy524/docs/Psy524%20Lecture%2010%20MANOVA1.ppt#256,1,MANOVA%20Basics).
- American Psychiatric Association (2002). *Diagnostic and statistical manual of mental disorder (DSM-IV-TR)*. Washington DC: American Psychiatric Association.
- American Psychiatric Association (2010, May 20). *Proposed revisions of Posttraumatic Stress Disorder*. Cited on July 1, 2010. Available at the World Wide Web:  
<http://www.dsm5.org/ProposedRevisions/Pages/proposedrevision.aspx?rid=165>.
- Arbuckle, J.L. (2006). Amos (Version 7.0) [Computer Program]. Chicago: SPSS.
- Blake, D.D., Weathers, F.W., Nagy, L.M., Kaloupek, D.G., Gusman, F.D., & Charney, D.S. (1995). The development of a clinician-administered PTSD scale. *Journal of Traumatic Stress, 8*, 75–90.
- Bonanno, G.A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist, 59*, 20-28.
- Bout, J. van den, Boelen, P.A. & Keijsers, J. de (Eds.) (2001). *Behandelingsstrategieën bij gecompliceerde rouw en verliesverwerking*. Houten: Bohn Stafleu Van Loghum.
- Brace, N., Kemp, R., & Snelgar, R. (2006). *SPSS for psychologists*. Houndmills, Basingstoke, Hampshire: Palgrave Macmillan.
- Breslau, N. & Kessler, R.C. (2001). The stressor criterion in DSM-IV Posttraumatic Stress Disorder: An empirical investigation. *Biological Psychiatry, 50*, 699-704.

- Brewin, C.R. (2003). *Posttraumatic stress disorder: Malady or myth?* London: Yale University Press.
- Cox, B.J., Mota, N., Clara, I., & Asmundson, G.J.G. (2008). The symptom structure of posttraumatic stress disorder in the National Comorbidity Replication Survey. *Journal of Anxiety Disorders, 22* (8), 1523-28.
- Dobbs, D. (2009). The Post-Traumatic Stress Trap. *Scientific American, April 2009*, 64-69.
- Doornen, van, L. (2004). *Stress: een psychobiologisch perspectief*. Universiteit Utrecht: The Netherlands.
- Ebberink, F., Rademaker, A.R., de Kloet. C., Vermetten, E., Geuze, E. (2009). Posttraumatic stress disorder: a tentative search for a uniform symptom structure. *For submission to Journal of Psychiatric Research*.
- Elhai, J.D., Engdahl, R.M., Palmieri, P.A., Naifeh, J.A., Schweinle, A., & Jacobs, G.A. (2009). Assessing Posttraumatic Stress Disorder with or without reference to the single, worst traumatic event: examining differences in factor structure. *Psychological Assessment, 21* (4), 629-634.
- Feeney, N.C., Zoellner, L.A., & Foa, E.B. (2000a). Anger, dissociation, and posttraumatic stress disorder among female assault victims. *Journal of Traumatic Stress, 13* (1), 89-100.
- Feeney, N.C., Zoellner, L.A., Fitzgibbons, L.A., & Foa, E.B. (2000b). Exploring the roles of emotional numbing, depression, and dissociation in PTSD. *Journal of Traumatic Stress, 13* (3), 489-498.
- Ford, J.D., Elhai, J.D., Ruggiero, K.J., & Frueh, B.C. (2009). Refining Posttraumatic Stress Disorder diagnosis: evaluation of symptom criteria with the national survey of adolescents. *Journal of Clinical Psychiatry, 70* (5), 748-755.
- Garson, G.D. (2009) *Statnotes: Topics in Multivariate Analysis, from North Carolina State*

*University, Public Administration Program.* Cited on May 25, 2010. Available at the World Wide Web: <http://faculty.chass.ncsu.edu/garson/PA765/structur.htm>.

Grimm, L.G. (1993). *Statistical Applications for the Behavioral Sciences.* United States of America: John Wiley & Sons, inc.

Hagenaars, M.A., van Minnen, A., & Hoogduin, K.A.L. (2010). The impact of dissociation and depression on the efficacy of prolonged exposure treatment for PTSD. *Behaviour research and Therapy*, 48 (1), 19-27.

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural equation modelling: guidelines for determining model fit [electronic version]. *Electronic Journal of Business Research Methods*, 6 (1), 53-60. Cited on February 22, 2010. Available at the World Wide Web: <http://www.ejbrm.com/vol6/v6-i1/Hooperetal.pdf>

Horowitz, M. J. (1976). *Stress Response Syndromes.* New York: Jason Aronson Inc.

Horowitz, M. J. (1997). *Stress Response Syndromes.* London: Jason Aronson Inc.

Hox, J.J. (1999). Principes en toepassing van structurele modellen. *Kind en adolescent*, 20 (3), 200-217.

Jöreskog, K.G. (1999, June 22). How large can a standardized coefficient be? Cited on June 3 2010. Available at the World Wide Web: <http://www.ssicentral.com/lisrel/techdocs/HowLargeCanaStandardizedCoefficientbe.pdf>.

Keane, T.M., Marshall, A.M., & Taft, C.T. (2006) Posttraumatic Stress Disorder: etiology, epidemiology, and treatment outcome. *Annual Review of Clinical Psychology*, 2, 161-197.

Kelley, L.P., Weathers, F.W., McDevitt-Murphy, M.E., Eakin, D.E., & Flood, A.M. (2009) A comparison of PTSD Symptom Patterns in Three Types of Civilian Trauma. *Journal of Traumatic Stress*, 22, 227-235.



- King, D.W., Leskin, G.A., King, L.A., & Weathers, F.W. (1998). Confirmatory factor analysis of the Clinician-Administered PTSD Scale: Evidence for the dimensionality of posttraumatic stress disorder. *Psychological Assessment, 10*, 90-96.
- King, D.W., Orazem, R.J., Lauterbach, D., King, L.A., Hebenstreit, C.L., & Shalev, A.Y. (2009). Factor structure of Posttraumatic Stress Disorder as measured by the Impact of Event Scale-Revised: stability across cultures and time. *Psychological Trauma: Theory, Research, Practice, and Policy, 1* (3), 173-187.
- Kirz, L.J., Frescher, K.D., Klein, J.L., Gusman, F.D., & Schwarz, M.F. (2001). MMPI-2 assessment of differential Post-Traumatic Stress Disorder patterns in combat veterans and sexual assault victims. *Journal of interpersonal violence, 16* (7), 619-639.
- Kline, R.B. (2005). *Principles and practice of structural equation modeling*. New York: Guilford Press.
- Lancaster, S. L., Melka, S. E., & Rodriguez, B. F. (2009). A factor analytic comparison of five models of PTSD symptoms. *Journal of Anxiety Disorders, 23*(2), 269-274.
- Marsh, H.W., & Balla, J. (1994). Goodness of fit in confirmatory factor analysis: the effects of sample size and model parsimony. *Quality & quantity, 28*, 185-217.
- Minitab 15 Statistical Software (2007). [Computer software]. State College, PA: Minitab, Inc. (www.minitab.com)
- Naifeh, J.A., Elhai, J.D., Kashdan, T.B., Grubaugh, A.L. (2008) The PTSD Symptom Scale's latent structure: An examination of trauma-exposed medical patients. *Journal of Anxiety Disorders, 22* (8), 1355-68.
- Orth, U., & Wieland, E. (2006). Anger, hostility, and posttraumatic stress disorder in trauma-exposed adults: A meta-analysis. *Journal of consulting and Clinical Psychology, 74* (4), 698-706.

- Pallant, J. (2007). *SPSS survival manual. A step-by-step guide to data analysis using SPSS version 15*. Maidenhead, Berkshire: Open University Press.
- Rademaker, A.R. (2009). *Personality and Adaption to Military Trauma. Proefschrift*. Utrecht: Universiteit Utrecht.
- Rasmussen, A., Smith, H., & Keller, A.S. (2007). Factor Structure of PTSD among West and Central African Refugees. *Journal of Traumatic Stress, 20* (3), 271-280.
- Resick, P. A. (2001). *Stress and trauma*. Hove: Psychology Press.
- Ruscio, A. M., Ruscio, J., & Keane, T. M. (2002). The latent structure of posttraumatic stress disorder: A taxometric investigation of reactions to extreme stress. *Journal of Abnormal Psychology, 111*, 290-301.
- Saul, A.L., Grant, K.E., & Smith Carter, J. (2008) Post-traumatic reactions in adolescents: how well do the DSM-IV PTSD criteria fit the real life experience of trauma exposed youth? *Journal of abnormal child psychology, 36*, 915-925.
- Sheehan, D. V., Lecrubier, Y., Harnett-Sheehan, K., Knapp, E., Sheehan, M., & Lecrubier, Y. (1998). M.I.N.I. Mini International Neuropsychiatric interview (M.I.N.I.). *Journal of Clinical Psychiatry, 59*, 34–57.
- Shercliffe, R.J., & Colotla, V. (2009). MMPI-2 profiles in civilian PTSD. An examination of differential responses between victims of crime and industrial accidents. *Journal of interpersonal violence, 24* (2), 349-360.
- Shevlin, M., McBride, O., Armour, C., & Adamson, G. (2009). Reconciling the differences between the King et al. (1998) and Simms et al. (2002) factor models of PTSD. *Journal of anxiety disorders, 23*, 995-1001.
- Simms, L. J., Watson, D., & Doebbeling, B. N. (2002). Confirmatory factor analyses of posttraumatic stress symptoms in deployed and nondeployed veterans of the Gulf war. *Journal of Abnormal Psychology, 111*, 637-647.

Stroebe, M., Hansson, R.O., Stroebe, W. & Schut, H. (Eds.) (2004). *Handbook of bereavement research: Consequences, coping and care*. Washington: American Psychological Association.

Tabacnick, B.G., & Fidell, L.S. (2007). *Using multivariate statistics*. Boston: Pearson/Allyn and Bacon.

Weathers, F.W., Keane, T.M., & Davidson, J.R.T. (2001). Clinician-Administered PTSD Scale: A review of the first ten years of research. *Depression and Anxiety*, 13, 132-156.

Yasan, A., Saka, G., Ozkan, M., & Ertem, M. (2009). Trauma type, gender, and risk of PTSD in a region within an area of conflict. *Journal of traumatic stress*, 22 (6), 663-666.

## **Appendix. Proposed revision of the Posttraumatic Stress Disorder \* in DSM-V (APA, 2010)**

A. The person was exposed to the following event(s): death or threatened death, actual or threatened serious injury, or actual or threatened sexual violation, in one or more of the following ways: \*\*

1. Experiencing the event(s) him/herself
2. Witnessing, in person, the event(s) as they occurred to others
3. Learning that the event(s) occurred to a close relative or close friend; in such cases, the actual or threatened death must have been violent or accidental
4. Experiencing repeated or extreme exposure to aversive details of the event(s) (e.g., first responders collecting body parts; police officers repeatedly exposed to details of child abuse); this does not apply to exposure through electronic media, television, movies, or pictures, unless this exposure is work related.

B. Intrusion symptoms that are associated with the traumatic event(s) (that began after the traumatic event(s)), as evidenced by 1 or more of the following:

1. Spontaneous or cued recurrent, involuntary, and intrusive distressing memories of the traumatic event(s). **Note:** In children, repetitive play may occur in which themes or aspects of the traumatic event(s) are expressed.
2. Recurrent distressing dreams in which the content and/or affect of the dream is related to the event(s). **Note:** In children, there may be frightening dreams without recognizable content. \*\*\*
3. Dissociative reactions (e.g., flashbacks) in which the individual feels or acts as if the traumatic event(s) were recurring (Such reactions may occur on a continuum, with the most extreme expression being a complete loss of awareness of present surroundings.) **Note:** In children, trauma-specific reenactment may occur in play.
4. Intense or prolonged psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event(s)
5. Marked physiological reactions to reminders of the traumatic event(s).

C. Persistent avoidance of stimuli associated with the traumatic event(s) (that began after the traumatic event(s)), as evidenced by efforts to avoid 1 or more of the following:

1. Avoids internal reminders (thoughts, feelings, or physical sensations) that arouse recollections of the traumatic event(s)
2. Avoids external reminders (people, places, conversations, activities, objects situations) that arouse recollections of the traumatic event.

D. Negative alterations in cognitions and mood that are associated with the traumatic event(s) (that began or worsened after the traumatic event(s)), as evidenced by 3 or more of the following: **Note:** In children, as evidenced by 2 or more of the following:\*\*\*\*

1. Inability to remember an important aspect of the traumatic event(s) (typically dissociative amnesia; not due to head injury, alcohol, or drugs).
2. Persistent and exaggerated negative expectations about one's self, others, or the world (e.g., "I am bad," "no one can be trusted," "I've lost my soul forever," "my whole nervous system is permanently ruined," "the world is completely dangerous").
3. Persistent distorted blame of self or others about the cause or consequences of the traumatic event(s)
4. Pervasive negative emotional state -- for example: fear, horror, anger, guilt, or shame
5. Markedly diminished interest or participation in significant activities.
6. Feeling of detachment or estrangement from others.
7. Persistent inability to experience positive emotions (e.g., unable to have loving feelings, psychic numbing).

E. Alterations in arousal and reactivity that are associated with the traumatic event(s) (that began or worsened after the traumatic event(s)), as evidenced by 3 or more of the following:

**Note:** In children, as evidenced by 2 or more of the following:\*\*\*\*

1. Irritable or aggressive behavior
2. Reckless or self-destructive behavior
3. Hypervigilance
4. Exaggerated startle response
5. Problems with concentration
6. Sleep disturbance -- for example, difficulty falling or staying asleep, or restless sleep.

F. Duration of the disturbance (symptoms in Criteria B, C, D and E) is more than one month.

G. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

H. The disturbance is not due to the direct physiological effects of a substance (e.g., medication or alcohol) or a general medical condition (e.g., traumatic brain injury, coma).

*Specify if:*

*With Delayed Onset:* if diagnostic threshold is not exceeded until 6 months or more after the event(s) (although onset of some symptoms may occur sooner than this).

***\* Developmental manifestations of PTSD are still being developed. The term 'developmental manifestation' in DSM-V refers to age-specific expressions of one or another criteria that is used to make a diagnosis across age groups.***

***\*\* For children, inclusion of loss of a parent or other attachment figure is being considered.***

***\*\*\* An alternative is to retain the DSM-IV criterion.***

***\*\*\*\* The optimal number of required symptoms for both adults and children will be further examined with empirical data.***