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Relations among peritraumatic dissociation and posttraumatic stress: A meta-analysis

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ABSTRACT

A meta-analysis was performed on the empirical literature which addressed the relationship of peritraumatic dissociation to posttraumatic stress (PTS). Extensive literature searches were conducted to identify as many relevant studies as possible, and revealed 59 independent eligible studies. All studies were coded using a detailed code sheet that included effect measures, variables that indicated the methodological quality of the studies, and substantial variables that might theoretically affect the relationship between peritraumatic dissociation and PTS. A significant positive relation between peritraumatic dissociation and PTS was found. Differences in the methodological rigor between studies — time elapsed since peritraumatic dissociation, design, sample type, and study type — significantly and sufficiently explained the variability in effect sizes between studies. Theoretical variables did not explain such variability. Although results underline earlier findings, due to designs of the reviewed studies no conclusions could be drawn as to causal relations between peritraumatic dissociation and PTS.

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Individuals exposed to (potentially) traumatizing events may report dissociative reactions during or immediately following such events, referred to as *peritraumatic dissociation* (Marmar et al., 1994, 1999). Many authors have argued that the immediate effects of peritraumatic dissociation are adaptive, i.e., protect the individual from intense emotional states such as helplessness, horror, and fear, but that in the long-run, peritraumatic dissociation increases the risk of general psychopathology and of posttraumatic stress disorder (PTSD) in particular (Bennet & Hacker, 2003; Bremner, 1997; Briere, Scott, & Weathers, 2005; Van der Kolk, Van der Hart, & Marmar, 1996; Marmar, Weiss, & Metzler, 1998). In the first meta-analysis of studies on the relationship between peritraumatic dissociation and PTSD following different forms of trauma, Ozer, Best, Lipsey, and Weiss (2003) found that peritraumatic dissociation was the strongest predictor for PTSD and related symptoms compared to other common predictor variables. And in the most recent meta-analysis by Breh and Seidler (2007), a significant effect size of .36 was found. Breh and Seidler compared 34 studies and found the results to be homogenous, indicating no "real" differences between studies; thus, the overall effect size could be computed across all studies. Despite this robust conclusion, Breh and Seidler then conducted two separate meta-analyses, one on studies using quasi-prospective designs, the other on studies with retrospective designs. They made this categorical distinction between designs because retrospective studies resulted in a correlate between peritraumatic dissociation and PTSD, where quasi-prospective studies resulted in an outcome that can be interpreted as a risk factor. Although no formal test on differences between these outcomes was conducted, the fact that results were homogenous across studies implies that no statistical differences between both groups can be found.

The homogeneity that Breh and Seidler (2007) found is remarkable and in contrast to our own conclusions, based on a narrative analysis, that methodological quality of the study and differences in substantive variables results in differences in outcomes between studies (Van der Hart, Van Ochten, Van Son, Steele, & Lensvelt-Mulders, in press). A narrative inspection of the studies on the relation between peritraumatic dissociation and PTS showed a large variability in study results. Even though a majority of studies consistently demonstrated a positive relationship between peritraumatic dissociation and posttraumatic stress (PTS), a significant group of studies failed to replicate this relationship, or found that the relationship between peritraumatic dissociation and PTS disappeared or significantly diminished after other variables were taken into account (Holeva & Tarrier, 2001; Marshall & Schell, 2002; Marx & Sloan, 2005). Candel and Merckelbach (2004) posited that conflicting results of peritraumatic dissociation as a predictor of PTSD could be due to the significant limitations of self-report methodologies on which studies of peritraumatic dissociation rely, because people find it difficult to give accurate descriptions of past emotional states as a general rule (Candel & Merckelbach, 2004).

In the same narrative review we also described the large differences in the methodological quality between studies (Van der Hart et xal., in press): differences as to the measurement of peritraumatic dissociation and posttraumatic stress (including stress reactions, symptoms, and disorder) (PTS); the design of the study; and the very loose identification of the temporal boundaries of the study, which is also related to the large differences between studies of the first measure point of PTS. Such differences are known to affect the validity of data and to result in different outcomes between studies. Moreover, Van der Hart et al. (in press) reported differences in the ways peritraumatic dissociation and PTS are defined, differences between the types of trauma investigated, and differences in age and gender between samples: these may all affect study results. In addition, we identified differences in whether victims perceived traumatizing events as intentionally directed at them, or as a chance of nature. All these differences among studies made it difficult for us to understand how results across studies could have been found to be homogeneous and that a meaningful overall effect size could be computed. Therefore, we decided to extend our narrative review to a meta-analysis.

Meta-analysis or quantitative synthesis encompasses a set of methods for the systematic combination of information from different sources. Meta-analysis therefore provides a statistical summary of what is common, and analyses what is different across a set of independent studies. It provides researchers with a quantifiable summary that may be used to evaluate past research and can help identify gaps in knowledge found in the published literature. Therefore, meta-analysis is both an effective tool to summarize what is known about the relation between peritraumatic dissociation and of PTS and to suggest future research in this field.

The goal of this study is to explore the evidence for and against the predicted relation between peritraumatic dissociation and PTS. Our meta-analysis follows, where possible, the recommendations of the Cochrane Collaboration for systematic reviews and meta-analyses (Cochrane Collaboration, 2006).

1. Method

1.1. Retrieval and selection of studies

Between January and May 2007 we conducted a comprehensive search for empirical studies on the predictive relation between peritraumatic dissociation and PTS(D). A systematic computer search was performed using the international silver platter system of the library of Utrecht University, which included the bibliographical databases of JSTOR (Journal Storage Archive), OMEGA, PsychINFO, PUBMED (including MEDLINE and PreMedline), and SSCI (Social Sciences Citation Index). We also searched the PILOTS database, an electronic index to traumatic stress literature, produced and maintained by the National Centre for PTSD (Lerner, 2007). Finally, to acquire as many unpublished papers and reports as possible we contacted known scholars in the field and organizations, such as the Cochrane foundation, the Campbell Collaboration and the National Center for PTSD, with an appeal for help.

Keywords included peritraumatic dissociation, peritraumatic emotional responses, peritraumatic distress, posttraumatic stress, and posttraumatic stress disorder, used individually as well as in search strings. Once an initial pool of articles was obtained, a snow ball search was conducted from the reference section of every article.

Studies were considered eligible for this meta-analysis if: (a) peritraumatic dissociation was assessed; (b) PTS (i.e., posttraumatic stress symptoms, PTSD symptoms, or PTSD) was assessed as a dependent variable; and (c) quantitative methods were used to examine the association between peritraumatic dissociation and PTS. To be included in the database, studies had to report sufficient statistical information to enable the coders to compute a general standardized effect size, for instance statistics such as *t*-value, *F*-value, Chi-square, or correlations, should be given and accompanied by their standard deviations or variances, as well as the number of participants in different conditions (Cooper & Hedges, 1994; Lipsey & Wilson, 2001).

The search protocol resulted in 88 empirical studies. Twenty-one studies were discarded from the analysis because after close reading they proved not to be eligible, i.e. they did not meet the criteria for inclusion noted above (see Appendix A). One study was reported in two separate publications, and the results of these two publications were combined into one case for the meta-analysis (Birmes et al., 2001, 2003). The 2005 study by Shalev was a summary of previous studies and thus all outcomes of the Shalev studies are coded as outcomes nested within one study. Three studies reported on two different studies each (Briere et al., 2005; Halligan, Michael, Clark, & Ehlers, 2003; Murray, Ehlers, & Mayou, 2002), bringing the total number of studies in this meta-analysis to 59. The majority of studies reported only one outcome (the relation between peritraumatic dissociation and PTS[D]); 17 studies used a longitudinal design and thus reported more then one outcome. Such outcomes are not independent but nested within studies, and thus a multilevel structure emerged in the data file. The final database contained 83 outcomes nested in 59 independent studies, and a combined sample of 16,547 respondents.

1.2. Coding and analysis

A detailed coding schedule was developed based on the schedule constructed earlier by Lensvelt-Mulders, Hox, Van der Heijden, and Maas (2005). Four categories of information were coded: (1) information necessary to compute standardized effect sizes; (2) identifying study descriptors; (3) variables related to the quality of the study; and (4) substantive information based on the theories about the relation between PTD and PTSD. The first ten studies were coded by three independent coders using the detailed coding schedule from Appendix B. The independent codings only showed insignificant differences, which were reconciled by discussing the original article and clarifying codings with the authors. Fifty-three studies were coded by two coders (i.e., Breeman and Van Ochten), and interrater reliability was sufficient (Kendall Tau = .93). The remaining six studies were coded by one coder (Breeman), and when the information in the paper was unclear the study was again discussed with the first author (Lensvelt-Mulders).

1.3. Coding of effect size (ES)

Most studies (65 = 78%) reported the correlation between peritraumatic dissociation and PTS as outcome measure. We therefore recomputed all other outcome measures into a standardized correlation (ρ), using the transformations as provided by Cooper and Hedges (1994), and Lipsey and Wilson (2001). The standardized correlation (ES_{z_r}) is computed as:

$$ES_{z_r} = .5\log_e\left[\frac{1+ES_r}{1-ES_r}\right] \quad (ES_r = r) \tag{1}$$

Studies have to be weighted according to the number of respondents, studies using larger numbers of respondents need greater weight. We used the inverse sampling variance to weight each effect size:

$$\omega_{z_r} = n - 3 \tag{2}$$

In publications in which groups were compared and no effects size was given, a *t*-value was computed using the means, standard deviations and *n* as provided in the original paper:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \tag{3}$$

This *t*-statistic is then transformed into an ES_r, using Eq. (4):

$$ES_r = \frac{t}{\sqrt{t^2 + n_1 + n_2 - 2}} \tag{4}$$

In studies where the χ^2 with 1 *df* (2 by 2 contingency tables) was reported we transformed this into an ES_r using Eq. (5):

$$|ES_r| = \sqrt{\frac{\chi^2}{N}} \tag{5}$$

1.4. Coding identifying study descriptors

We used several general study characteristics to identify each study, coding the publication year, the country in which the study was conducted, the number of study conditions, and the number of longitudinal waves.

1.5. Coding indicators for the quality of the study

We coded the following as indicators of the methodological and statistical quality of a study: (a) type of publication of a study (paper in a peer reviewed journal, book chapter, unpublished manuscript or technical report); (b) design (group comparisons versus correlational designs); (c) sample type (general population or clinical sample); (d) study type (retrospective–prospective); (e) measures of severity of PTS (full PTSD according to DSM-IV standards versus posttraumatic stress symptoms); and (f) time between trauma and first measurement of peritraumatic dissociation and PTS, (g) a variable that indicated if the study controlled for mediating variables, and (h) finally measures for the studies non-response and for longitudinal studies a measure for wave attrition (i).

1.6. Coding substantive variables

The following were coded as indicators of theoretically relevant or substantive explanatory variables: (a) mean age of the sample; (b) percentage of females of the sample; (c) whether or not victims were first responders [i.e., police, fire-brigade, ambulance personnel] or not; (d) whether or not victims experienced events involved interpersonal threat versus natural disasters or accidents; (e) specific type of potentially traumatizing events (e.g., car accident, earthquake, rape, war); and (f) instruments used to measure peritraumatic dissociation and PTS.

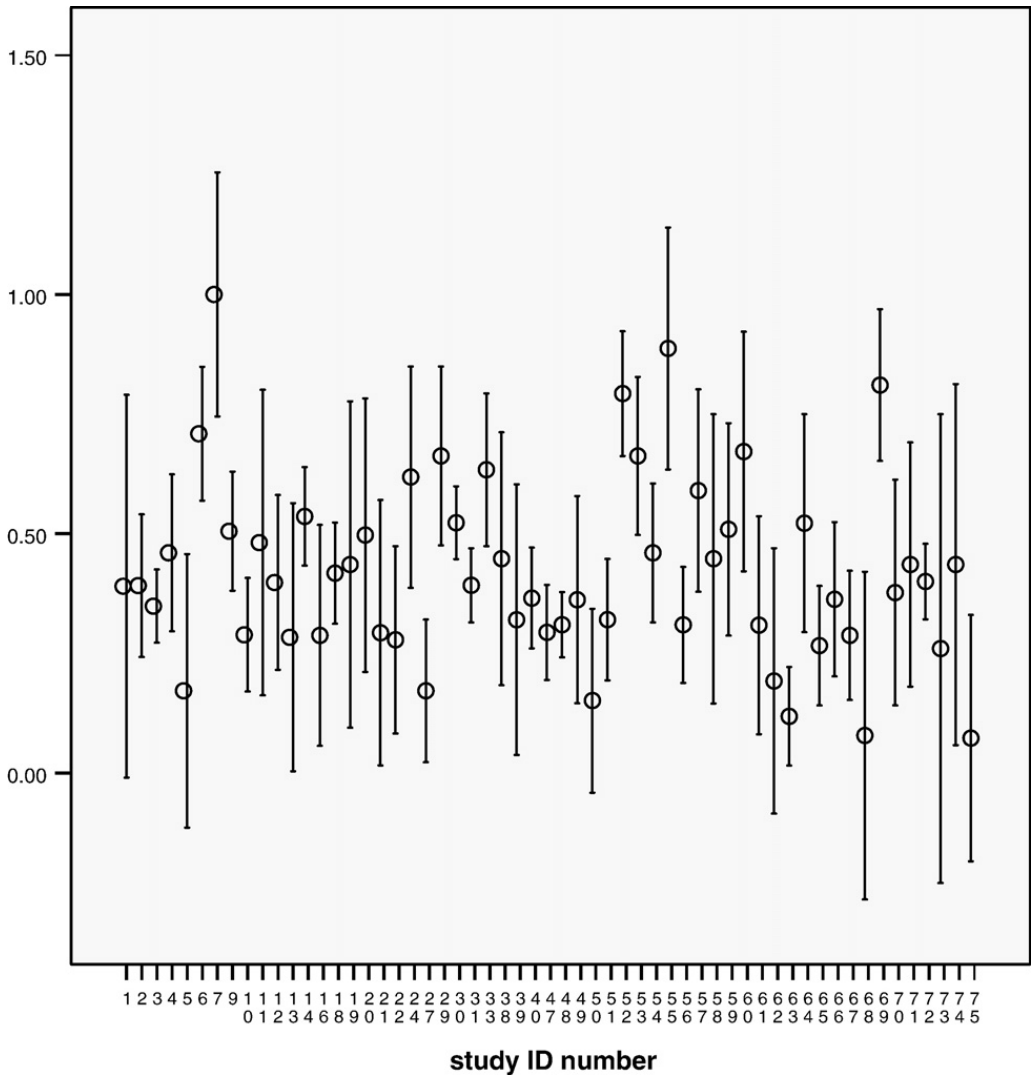

Fig. 1. Forest plot of all studies included in the meta-analysis. ○ = mean effect size, – = upper and lower 95% confidence interval.

2. Analysis

The data set includes 59 independent studies with 83 outcomes, thus the data structure can be defined as a multilevel model, with conditions nested within studies (Hox, 2002). Such a data set warrants a multilevel approach to meta-analysis (Lensvelt-Mulders et al., 2005; Maas, Hox, & Lensvelt-Mulders, 2004). However, preliminary analyses using multilevel meta-analysis showed that the sample size of about 1.4 conditions per study is too small to reliably separate study-level and condition-level variance (Hox & De Leeuw, 2003; Raudenbush & Bryk, 2002). Therefore, the data were analyzed using standard meta-analysis procedures with conditions as the unit of analysis.

First, a total effect size across all studies was computed, using SPSS macros originally developed by Wilson (2000) and adapted by Hox (2002). The overall effect size was significant, but showed a large and significant variability between outcomes which could not be attributed to mere sample variance. Therefore, the effect sizes reported below are based on the random effects model, including weighted multiple regression estimation using a maximum likelihood procedure. All categorical variables were transformed into dummy variables for the meta-regression, and dichotomous variables were coded as 0 and 1. We also attempted to explain the unexplained part of the variance (τ) using meta-regression running a fixed effects model.

3. Results

3.1. Descriptors

Of the 59 independent studies, 54 were published in peer reviewed journals, along with one book chapter, and four technical reports. The publication year ranged from 1992 to 2007, peaking in 2005 with 15 eligible papers. Twenty-nine studies were conducted in the USA, 19 in Europe (UK = 9, The Netherlands = 6, France = 2, Germany = 2), and 11 in other countries. Forty-seven studies reported on a one wave study, twelve reported studies involving multiple waves (longitudinal studies).

Eight different types of potentially traumatizing events were coded: 9 studies related to combat experiences, 17 studies to accidents and related injuries, 7 studies on natural and other disasters, 2 studies on terrorist attacks, 5 studies on violence against persons, 5 studies regarding problematic child birth, 3 studies on (childhood) abuse, 2 studies on cancer diagnosis, and 9 studies on miscellaneous events.

3.2. Effects sizes

The standardized correlation between peritraumatic dissociation and PTS across studies was .401 ($p<.001$, 95% C.I. is .364–.438). This result clearly indicates a positive relation between peritraumatic dissociation and PTS, i.e. experiencing dissociation during or shortly after a potentially traumatizing event does increase the probability of PTS later in life. A standardized correlation of .401 can be regarded as a medium effect size (Cohen, 1962). Fig. 1 shows the forest plot for all studies, it includes the mean standardized effect size per study and its accompanying confidence interval. As can be seen there is only one serious outlier (standardized ES above 1). This study was eliminated from the analysis.

To investigate robustness of the overall effect size, a fail-safe *N* was computed, as there is a bias towards not publishing studies with non-significant results. These studies are often not even submitted: they disappear into a file drawer. The existence of many such unpublished studies could seriously challenge the significant results of the meta-analysis (Lipsey & Wilson, 2001). The fail-safe *N* estimates the number of studies with non-significant results that is needed to reduce the cumulated effects across studies to be non-significant.

The fail-safe *N* is computed as:

$$k_0 = k\left(\frac{ES_k}{ES_c} - 1\right)$$

Where k_0 is the number of non-significant studies needed to reach ES_c, the criterion effect size (non-significant=.01 or small=.15), ES_k is the effect size of the meta-analysis and k is the number of studies in the analysis. In order to nullify the overall result of this meta-analysis, there would need to be 249 additional studies with non-significant results. In order to lower the overall effect from medium (.401) to small (.15), we should have missed 138 studies reporting non-significant results. These results show that this meta-analysis is rather robust. Fig. 2, the funnel plot, adds to these results, the inverted funnel shape is an indication for the absence of a serious bias effect.

The weighted mean effect size was .401. The homogeneity test was significant ($Q=379.95$, $p<.001$), indicating that these results are not homogeneous, contrary to the findings of Breh and Seidler (2007). In other words, the observed variability is much larger than can be expected based on mere sampling error. We conclude that there are differences among the independent studies that could theoretically explain varying results across studies. These differences are explained using a random model meta-regression based on maximum likelihood estimations in a two step procedure (Cooper & Hedges, 1994). First, we independently analyzed the different effects for (1) the indicators of the quality of the study, and (2) the theoretical variables. Then, we added all variables that significantly affected the outcome into a single overall regression analysis.

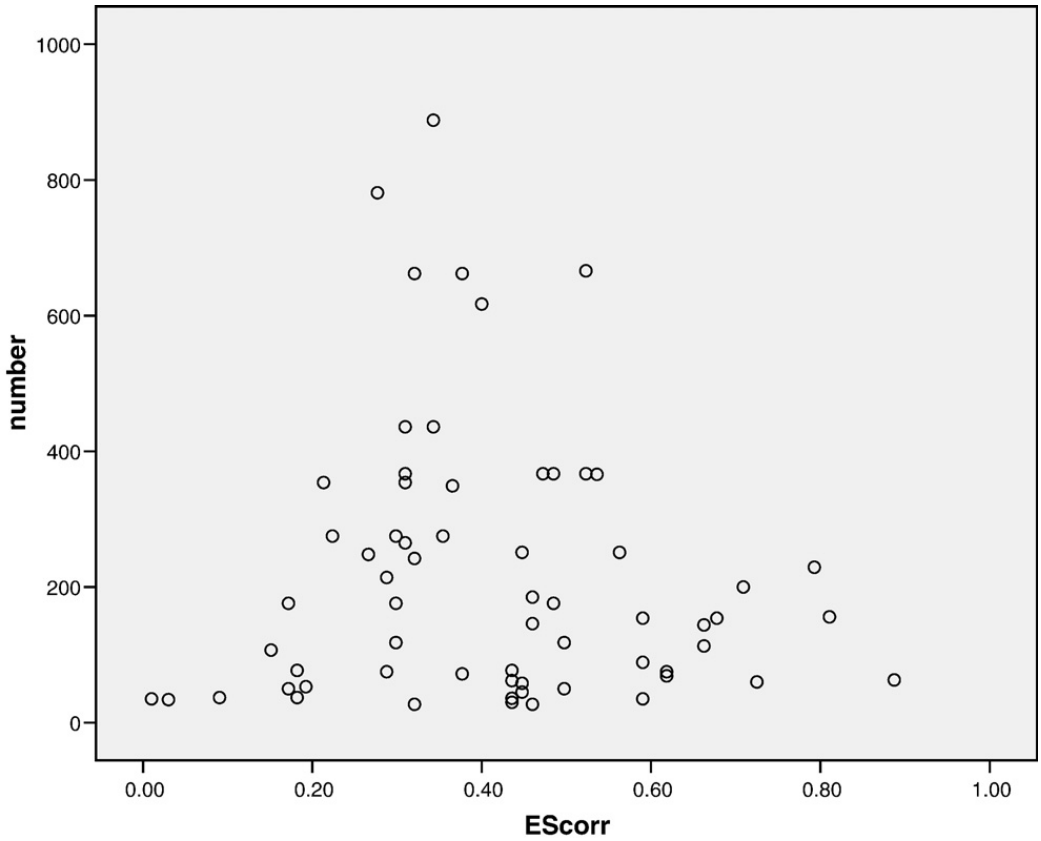

Fig. 2. Funnel plot of all studies in meta-analysis, sample size (*y*-axis) plotted against the effect size (rho).

3.3. Effects of quality indicators

In the first meta-regression we included all coded indicators for study quality (Table 1). The overall effect size ES_r was .40 ($p<.001$). The model explained 34.2% of between studies variance.

As shown in Table 1, a model including these five quality indicators significantly and sufficiently explains the random variance between studies. When all variables are added to the regression equation, heterogeneity disappears ($Q=38.92$, $p<.00$), which becomes even more clear in a non-significant residual variance ($Q=74.90$, $p=.264$).

The type of study, i.e., prospective (1) or retrospective (0), positively adds to the relation between peritraumatic dissociation and PTS, with prospective studies showing a stronger relation between peritraumatic dissociation and PTS than retrospective ones. The design of the study, i.e., correlational studies (1) versus studies that used a test for differences between groups (0), also added to the model, with correlational studies showing a stronger relation between peritraumatic dissociation and PTS. The type of sample, i.e., general population versus a clinical/patient sample also significantly adds to the relation between peritraumatic dissociation and PTS, with clinical samples showing stronger relations. Publication type did not add to the explanatory power of the model: No significant differences in results were found between studies published in peer reviewed journals, book chapters, or technical reports.

3.4. Effects of theoretical variables

The only theoretical variable that significantly added to the explanatory power of the model was “victim perception of the meaning of the event,” i.e., the variable that indicated if the type of (potentially) traumatizing event was experienced as interpersonal versus natural disasters and accidents. Victim perception had a significant regression weight: When the (potentially) traumatizing event is regarded as deliberately aimed at the individual, the relation between peritraumatic dissociation and PTS is stronger. However, the overall ES became .396 and the model explained only 9.7% of the random variance, thus failing to account for significant variance across studies ($Q=7.43$, $p=283$). The results are summarized in Table 2.

The instruments used to measure peritraumatic dissociation or PTS did not affect the outcome relations. In 70% of the studies, peritraumatic dissociation was measured with the PDEQ. Using a different instrument did not change the outcome relation. The same holds for the diagnostic instruments for PTSD: The choice of an instrument did not influence the resulting relationship between peritraumatic dissociation and PTS. Because of the fact that the combination of instruments was randomly distributed across studies, there were no coded variables that could explain the choice for a specific instrument. The combination of

Table 1
Model including only indicators of study quality

Homogeneity analysis	*Q*	*df*	*p*
Model	38.92	5	.000
Residual	74.90	68	.264
Total	113.83	73	.002
Regression coefficients	***B***	**s.e.**	**Beta**
Design	.2019**	.048	.42
Time	.0914**	.028	.96
Sample	.1243**	.043	.30
Studtyp	.2722**	.100	.79
Publication type	.1875	.162	.11

*: $p<.05$, **$p<.01$. Abbreviations: Design = the study resulted in a correlation or a comparison of group means; Time = the time gap between the trauma and the first measurement of peritraumatic dissociation Sample = clinical or general population; Studtyp = study is retrospective or (quasi) prospective; Publication type: study is published as a paper in a peer reviewed journal or not.

instruments did not affect the outcomes. Differences in gender and age of the respondents in the studies did not explain a significant part of the differences in effect size between the studies, as shown in non-significant regression weights (age: $\beta=.037$, $p>.05$ and gender $\beta=.019$, $p>05$).

Although differences in the type of (potentially) traumatizing events did not explain differences in outcomes between studies, we checked these effects for all types of these events separately. Dummy variables for all (potentially) traumatizing events were coded and inserted in a third meta-regression. Only studies on (childhood) abuse proved to explain a significant part of the differences in effect size between the studies (see Table 3).

Finally, all variables that significantly contributed to the explanation of the random variance were put into one overall model (see Table 4). The overall ES was .40 ($p<.00$); this model explained 37% of the variance between studies.

In this final model, "victim's perception of the event" did not contribute significantly to the model any longer. Closer inspection of the data showed that this variable is strongly related to the time that elapsed between the first measure of peritraumatic dissociation and the (potentially) traumatizing event. This is because "victim perception" included studies investigating the effects of disasters, accidents and problems experienced during child birth, which are also often studies that use a 'prospective' design. Since this variable is a significant predictor of the established relation between peritraumatic dissociation and PTS (time, $\beta=.633$, $p=.024$), it suppresses the effect of "victim perception" in the latter meta-regression. Also, the variable (childhood) abuse does not significantly contribute to the overall model. However, the small initial effect has not disappeared completely. The final and best fitting model thus includes the variables of time (time elapsed since peritraumatic dissociation was measured for the first time), design (correlational versus other), sample type (clinical versus general population), and study type (longitudinal versus retrospective). This model explains the variance in the effect size across studies significantly and sufficiently.

4. Discussion

In this article we explored the relationship between peritraumatic dissociation and subsequent PTS. To find evidence for this relationship, a meta-regression was conducted including 59 independent empirical studies. We coded 59 eligible studies, with 83 conditions within studies and the final data file included the results of 16,547 participants. A significant positive effect was established, the across study correlation between peritraumatic dissociation and the development of PTS later in life was .401. This

Table 2
Model including theoretically relevant variables

Homogeneity analysis	*Q*	*df*	*p*
Model	7.43	6	.283
Residual	69.50	62	.239
Total	76.93	68	.214
Regression coefficients	***B***	**s.e.**	**Beta**
Age	−.0008	.003	−.037
Instruments PD	−.0431	.053	−.110
instruments PTSD	−.0877	.073	−.164
First responder samples	−.0693	.062	−.163
Victim perception	.1182*	.049	.290

*: $p<.05$, **$p<.01$.

Table 3
Meta-regression on types of trauma

Homogeneity analysis	*Q*	*df*	*p*
Model	19.17	8	.014
Residual	81.11	72	.216
Total	100.29	80	.062
Regression coefficients	***B***	**s.e.**	**Beta**
Combat	.067	.068	.135
Road accidents	−.070	.063	−.164
(Natural) disasters	.092	.066	.197
Violence to person	.081	.081	.123
(Childhood) abuse	.233*	.106	.244
Cancer diagnosis	.219	.139	.168
Miscellaneous	.090	.075	.158
Terrorist attacks	.134	.139	.100

*: $p<.05$, **$p<.01$.

result is in line with earlier meta-analyses and comparable with the finding of Breh and Seidler (2007), who found a correlation of .36 in a meta-analyses of 34 studies. Thus this result adds to the body of evidence that there is a robust significant and relevant relationship between peritraumatic dissociation and the development of PTS later in life.

Although this outcome suggests that experiencing dissociation during or shortly after a potentially traumatizing event increases the probability of PTS later in life, this should not be interpreted as proof for a causal relationship. Causality can only be proved in studies using rigorous prospective designs. The number of studies that use a prospective design, including a measurement of peritraumatic dissociation that is obtained during or very shortly after the potentially traumatic event occurred, is currently too small to give reliable insights in the process that leads dissociation to cause PTS.

Our combined studies were too heterogeneous in their outcomes to compute an overall effect size or grand mean. The differences in the effect sizes between the studies could be significantly and sufficiently explained by differences in the methodological rigor of the studies. These differences involved the following aspects in order of relationship strength: time elapsed between first measurement PTD and the traumatic event, design effects (correlational versus mean comparison, and retrospective versus prospective), and type of sample.

The time elapsed between the potentially traumatizing event and the moment the participant entered the study is a predictor for the resulting relation between peritraumatic dissociation and PTS: The more time elapsed between these events and the first measurement, the higher the correlation between peritraumatic dissociation and PTS. These stronger correlations could be the result of using self-reports. In some of the analyzed studies, peritraumatic dissociation was first measured 20 years after the traumatic experience took place. It is assumed that people are less able to give accurate descriptions of (long) past emotional states (Candel & Merckelbach, 2004; Harvey & Bryant, 2002). But more important could be the fact that most studies with a large time interval between the traumatic event and the measurement of peritraumatic dissociation are also studies using clinical samples, thus people seeking treatment for PTSD, were overrepresented in this category. It is possible that in clinical samples self-reports are affected by the current state of mind of the subjects, the past is defined in the light of the present situation, resulting in stronger correlations between dissociations at the moment of the trauma and current PTSD. This is an important finding that at first sight seems to supports the view of Candel and Merckelbach (2004), who posited that conflicting results of peritraumatic dissociation as a predictor of PTS might be due to significant limitations of the retrospective methodology.

In contradiction to this explanation is the fact that this meta-analysis *also* shows that longitudinal studies reported a stronger positive relation between peritraumatic dissociation and PTS than the retrospective studies. Both outcomes taken together might

Table 4
Final model including all significant explanatory variables

Homogeneity analysis	*Q*	*df*	*p*
Model	28.61	6	.000
Residual	75.93	64	.146
Total	104.54	70	.005
Regression coefficients	***B***	**s.e.**	**Beta**
Time	.0651*	.028	.633
Design	.1880**	.056	.361
Sample type	.1015*	.055	.265
Study type	.2132*	.102	.571
Victim perception	.0537	.049	.148
(Childhood) abuse	.0810	.101	.087

*: $p<.05$, **$p<.01$.

indicate that memories of peritraumatic dissociation are less distorted than assumed, at least in clinical samples, and that self-reports on peritraumatic dissociation many years after the potentially traumatizing event could still be sufficiently reliable. These, at first sight contradictory, results both add to the cumulative evidence that the significant relation between peritraumatic dissociation and PTS is not a mere artefact of biased self-reports.

Finally, differences in the relation between peritraumatic dissociation and PTS can be explained by the type of study designs. Correlational designs showed a stronger relation between peritraumatic dissociation and PTS than comparisons between groups with and without PTS. This is surprising, since studies that investigate the difference between conditions are generally more powerful. But in this case, the observed difference could be the result of a restriction of range: Correlational studies include respondents with all levels of peritraumatic dissociation as well as PTS, whereas studies involving group comparisons use well defined groups of people suffering from PTSD versus people not suffering from PTSD.

From all theoretical variables, (childhood) abuse was the only one that significantly explained the variance between studies. Studies on (childhood) abuse showed a significantly stronger relation between dissociation at the moment of the event and PTS later in life. As this finding pertains only to three studies, we cannot draw strong conclusions, but this result suggests that future research should focus more on clinical populations in which childhood abuse and abuse later in life constitute the (potentially) traumatizing events.

In short, the results of our study may be considered to support the predictive value of peritraumatic dissociation for subsequent PTS(D). But large variations between studies in design and participant groups make it impossible to draw causal conclusions. Therefore, we can only stress the need for thorough research on the relationship between peritraumatic dissociation and PTS. Prospective longitudinal studies are needed to fully disentangle the process that connects peritraumatic dissociation to the subsequent development of full PTSD or severe posttraumatic stress symptoms later in life. Ideally, these prospective longitudinal studies should follow a more stringent design that assesses personal characteristics and medical and psychological history prior to the potentially traumatizing events and involves assessment of peritraumatic dissociation during or very shortly after the event.

Also more research is needed on the more fundamental theoretical question of what constitutes peritraumatic dissociation. Although the instruments used to measure peritraumatic dissociation did not affect the outcome relations, it might still be worthwhile to reconsider the question whether the unclear conceptual basis of what peritraumatic dissociation is (Van der Hart et al., in press), could also be at the heart of the contradictory results across studies. Unclear conceptualization would not by definition result in differences between the instruments as predictor for the relation between peritraumatic dissociation and PTS, because all instrument omit symptoms of peritraumatic somatoform dissociation (such as anesthesia and loss of motor control that are common manifestations of dissociation; Janet, 1907; Nijenhuis, 2004; Van der Hart, Van Dijke, Van Son, & Steele, 2000). All coded instruments focus exclusively on psychoform dissociation (mental symptoms such as amnesia) and on alterations in consciousness that may not necessarily be dissociative in nature (Steele, Dorahy, Van der Hart, & Nijenhuis, 2008; Van der Hart, Nijenhuis, Steele, & Brown, 2004; Van der Hart, Nijenhuis, & Steele, 2006). Further study is needed to determine what would be truly dissociative responses and thus eligible predictors for PTSD later in life. We suggest that future studies should incorporate measures of peritraumatic somatoform dissociation, such as the Somatoform Dissociation Questionnaire-Peritraumatic (SDQ-P; Nijenhuis, Van Engen, Kusters, & Van der Hart, 2001) in order to enhance theory building on the relationship between peritraumatic dissociation and the subsequent development of PTS(D).

Appendix A. Papers on PERITRAUMATIC DISSOCIATION-PTS(D) rejected for failure to fit inclusion criteria

1. Fullerton et al. (2001)
   Only information on acute PTSD (after 1 month)
2. Bryant et al. (2003)
   Reported statistical outcomes not sufficient to compute an ES
3. Roemer et al. (1998)
   No measurement of peritraumatic dissociation reported
4. Kleber et al. (1998)
   Review article, no empirical study
5. Tucker et al. (2000)
   No measure of peritraumatic dissociation reported
6. Nijenhuis et al. (2001)
   No measure for PISD reported
7. O'Toole et al. (1996–1998, 5 articles)
   Reported statistical outcomes not sufficient to compute an ES
8. Duke et al.
   Review, not an independent empirical study
9. Resnick (1997)
   Review, not an independent empirical study
10. Shalev, Freedman, Peri, Brandes, and Sahar (1997)
    Part of other study, better documented somewhere else
11. Favaro et al. (2006)
    No peritraumatic dissociation, but dissociation in general as a psychological symptom

12. Ginzburg, Koopman et al. (2006)
    Insufficient information on the relation between peritraumatic dissociation and PTSD
13. Ginzburg, Solomon et al. (2006)
    Insufficient information on the relation between peritraumatic dissociation and PTSD
14. McCaslin et al. (2006>)
    Insufficient information on the relation between peritraumatic dissociation and PTSD
15. Fikretoglu et al. (2006a)
    No PTSD measure is reported
16. Fikretoglu et al. (2006b)
    No PTSD measure is reported
17. Marmar et al. (1996)
    Insufficient information on the relation between peritraumatic dissociation and PTSD
18. Classen et al. (2002)
    No peritraumatic dissociation, but dissociation in general as a psychological symptom
19. Sim et al. (2005)
    No peritraumatic dissociation, but dissociation in general as a psychological symptom
20. Birmes et al. (2004)
    Only acute PTSD is measured, within 1 month after trauma
21. Ben-Ezra et al. (2006)
    Only acute PTSD is measured, within 1 month after trauma

Appendix B. Coding schedule

Study-level coding form [variable names in brackets]

Bibliographic reference:

Independent variables
1. Study ID number [STUDYID] (also in narrative review)
1B. Study condition number [STUDYCON]
2. Type of publication [PUBTYPE]
   1 book chapter
   2 peer reviewed article
   3 thesis or doctoral
   4 technical report
   5 conference paper
   6 other (specify):

3. Publication year (complete; 9999 if unknown)? [PUBYEAR]

Sample descriptors

4. Mean age [MEANAGE]
5. Predominant sex [SEX]
   1 <5% males
   2 5–44% male
   3 45–55% male
   4 56–95% male
   5 >95% male
   9 not recorded

6. Number of participants [NUMBER]
   6a Number of participants in condition 1 (if test between groups is provided)
   6b Number of participants in condition 2 (if test between groups is provided)

7. Type of study [STUDTYPE]
   1 retrospective
   2 longitudinal really prospective (start measurement at moment of trauma)
   3 longitudinal or multiple waves (start measurement retrospective)

7B. Number of longitudinal waves [WAVE]

8. Type of sample [SAMPTYPE]
   1 general community
   2 problematic

9. Professional [PROFTYPE]
   1 victims are first responders (fire-brigade, ambulance, nurses etc)
   2 victims are not first responders
10. Type of trauma [TRAUMA]
   1 Combat
   2 Road accidents/emergency service work
   3 Disasters
   4 Violence
   5 Injury inducing events
   6 Childbirth
   7 Terrorist attack
   8 (Childhood) abuse
   9 Cancer diagnosis
   10 Various events

11. Which instrument is used to measure dissociation [DISINSTR)
   1 PDEQ (Peritraumatic Dissociative Experiences Questionnaire)
   2 SDQ-P (Somatoform Dissociation Questionnaire)
   3 TI SAV (Trauma Interview for Sexual Abuse Victims)
   4 DAPS (Detailed Assessment of Posttraumatic Stress)
   5 DEQ-M (Modified Dissociative Experiences Questionnaire)
   6 ASDI (Acute Stress Disorder Interview)
   7 SAS-RQ (Stanford Acute Stress Reaction Questionnaire)
   8 different

12. Which instrument is used to measure PTSD [PTSDINSTR]
   1 SCID (Structured Clinical Interview for DSM-IV Disorders)
   2 PTSD-D (posttraumatic stress disorder)
   3 MISS (Mississippi Scale of Combat Severity)
   4 MMPI-K (Keane's PTSD from the Minnesota Multiphasic Personality Inventory)
   5 PCL-M (PTSD Checklist Military Version)
   6 IES-R (Impact of Event Scale-Revised)
   7 SRRS (Social Readjustment Rating Scale)
   8 PSS-SR (PTSD Symptom Scale Self-Report)
   9 PI (Penn Inventory)
   10 PDS (Posttraumatic Stress Diagnostic Scale)
   11 CV
   12 CAPS (Clinician Administered PTSD Scale)
   13 different

13. Which disorder is measured? [SYMPTOMS]
   1 PTSD according to DSM-IV
   2 general stress symptoms
   3 mixed: number of symptoms of general stress

14. How long after trauma is PTD observed? [TIMEPTD]
   1 within a day
   2 >1 day to 1 week
   3 >1 week to 1 month
   4 within 3 month
   5 within a year
   6 over a year has passed

15. How long after trauma PTSD is observed? [TIMPTSD]
   1 <6 month (acute)
   2 6 month to 3 years (intermediate)
   3 >3 years (chronic)

16. Has study already controlled for mediating variables? [MEDIAT]
    0 NO
    1 YES

17. Non-response and attrition [NONRESP]
    Percentage of the original sample compared to sample that is reported. (response number)
18. Country where study is conducted [LAND]
    1 USA
    2 Netherlands
    3 France
    4 UK
    5 Germany
    6 Others

Dependent variables

19. Effect measure correlation [EFFECT]
20. Standardized correlation [STANDEFF]
21. Variance of effect [EFFVAR]
22. Standard error of effect [EFFSE]
23. Other effects sized Chi [CHISQR]
24. Other effects sized *T*-TEST [TTEST]
25. Other effects sized *F*-VALUE [FTEST]

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