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The role of tonic immobility in the development of PTSD symptoms

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Abstract

Tonic immobility (TI) is a state of physical and verbal immobility to intense or painful stimulation. It is triggered by situations of fear and physical restriction or/and the incapacity to escape. The occurrence of tonic immobility tends to be a strong predictor of the severity of PTSD and treatment seems to be less effective. However, previous research on the effects of tonic immobility has included mostly retrospective studies. In this study a fear condition experiment was used to gain more knowledge of the relationship between TI and intrusions and the relationship between TI and extinction. The first hypothesis tested the relationship between TI and the number of intrusions. It was expected that participants who experience TI would have a higher intrusion frequency than those who experience less TI. The second hypotheses tested if the extend of TI affects the extinction of the UCS expectancy. It was expected that extinction takes longer when participants experience TI during the experiment. In contrast to earlier research, TI did not correlate with the number of intrusions. However, an effect from TI on the duration of extinction of the UCS expectancy was found in this study. Limitations of the present study and future directions are discussed. Future research needs to examine more closely the links between tonic immobility and PTSD.

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Contents

1. Introduction

During life, everyone is faced with different life events. These events can be beautiful, sad and sometimes traumatic. Some events can be so shocking that they have a huge impact on our capacity of regular and flexible adjustment. War conditions and rape are perhaps the most striking examples of traumatic events. A traumatic event is an event that is accompanied by an intense feeling of powerlessness and an acute disruption of daily life (Barrois, 1988). When people get confronted with the memory of the traumatic event, they are likely to experience helplessness and fear (Van der Kolk, Weisaeth, & Van Der Hart, 1996). People who experience this kind of events can develop post-traumatic stress disorder (PTSD).

PTSD is a public health problem and is associated with a high morbidity and mortality rate (Green et al., 2006). According to the American Psychiatric Association (2000) someone diagnosed with PTSD requires that a person "experienced, witnessed or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others" (Criterion A1) and "the person's response involved intense fear, helplessness or horror" (Criterion A2). People who have PTSD often show symptoms of intrusive thoughts about the event, hypervigilance, and react with huge distress when there are triggers, which remind them of the event (APA, 2000).

But what makes that one person can bear the huge influence of a traumatic event and does not develop a disorder and what makes the other person vulnerable for developing PTSD, for example? In other words, what are predictors for developing PTSD? This maybe can be explained by the way people react to traumatic events. Everyone reacts differently in a stressful situation. Gray (1987) descripted four different types of defending mechanisms when people get confronted with danger. The type of response depends on the severity of the danger. Those four types of responses are *alert*, also known as vigilant immobility (where you focus your attention on the potential danger), *flight, fight* and *tonic immobility*. Alert, flight and fight are responses that have been studied extensively in both humans and animals. However, tonic immobility has been studied a lot in animals but not much in humans.

In the present study we will focus on tonic immobility. Tonic immobility (TI) is a state of physical and verbal immobility, trembling, muscular rigidity and numbness or insensitivity to intense or painful stimulation. It is triggered by situations of fear and physical restriction or/and

the incapacity to escape (Marx, Forsyth, Gallup & Fusé, 2008). Of the people who are diagnosed with PTSD after urban violence (mostly non-sexual), 43% experienced tonic immobility during the traumatic event (Fiszman et al., 2008). In 2009, Rocha-Rego et al. found that the occurrence of tonic immobility was a strong predictor of the severity of PTSD and treatment is less effective. In the present study an experiment is done to investigate if tonic immobility is indeed associated with developing PTSD. It is important to keep in mind that tonic immobility is a different reaction than freezing. Volchan et al. (2011) say that freezing mostly occurs in the lowest threat stage of a defense cascade and that tonic immobility appears when survival is seriously threatened.

A few studies have done research on the appearance of TI and the association with PTSD. As named earlier, Fiszman et al. (2008) found that 43% of the victims of urban violence who have been diagnosed with PTSD reported TI on a self-report scale. A study from Heidt, Marx and Forsyth (2005) examined TI in victims of childhood sexual abuse. They found a positively correlation between TI and PTSD and found that TI is associated with greater posttraumatic symptomatology. In an experimental PTSD study from Hagenaars, Van Minnen, Holmes, Brewin and Hoogduin (2008) it is shown that (either voluntary or involuntary) immobility during an aversive film caused more intrusive memories than during a film where participants were free to move.

Most studies are examples of retrospective studies with questions about experiencing TI during events in the past. There are some experimental studies about this topic but these studies focus more on freezing than TI. However, Hagenaars and Putman (2011) have done an experimental study in which they showed an affective film to 43 participants. The participants had to complete a TI-task and they had to record their intrusive memories in a diary of the film in the subsequent week. The results of the study demonstrate that TI is related to intrusive memories. Intrusive memories can be defined as “content of consciousness that possess sensory qualities as opposed to those that are purely verbal or abstract” (Hackmann, 1998, p.301). Intrusive memories can be highly vivid and often go along with negative emotions, distress, and feelings of reliving the event (Newby & Moulds, 2011). TI could also have an effect on developing intrusive memories. Bradley, Codispoti, Cuthbert and Lang (2001) have investigated that immobility is associated with increased sensory uptake. This creates a more perceptual information-processing style, which contributes to developing intrusive memories.

It would be interesting to further investigate if TI and intrusions are related because both are associated with the development of PTSD (Bovin et al., 2008). In addition, it is important to know if TI affects extinction of learned behavior. When people experience a traumatic event, certain triggers or reminders (neutral or conditional stimulus, CS) may cause severe reactions (conditioned response, CR), such as reliving experiences or panic attacks (VanElzakker, Dahlgren, David, Dubois & Shin, 2014). This is the case in people with PTSD, because it is caused by learned fear (Rothbaum & David, 2003). Extinction is the reduction in CR that occurs when the CS no longer predicts the unconditioned stimulus (UCS) (Milad et al., 2008). Previous studies found that people with PTSD show a deficit in extinction learning and this maybe cause the failure to recover after a traumatic event (Rauch, Shin & Phelps, 2006; Milad, Rauch, Pitman & Quirk, 2006). Because TI often occurs in people with PTSD, this fear response could contribute to a deficit in extinction (Fiszman et al., 2008). When people have experienced TI during the traumatic event, the connections between CS and CR could be stronger and possibly cause deficit of extinction. Thereby, the learned fear last longer and could increase the risk of developing PTSD, or maintaining it. As far as we know, no previous research has investigated the effect of TI on extinction of learned behavior.

Considering the lack of evidence on the association between TI, intrusive memories and extinction, it is important to gain more insight into the role of these peritraumatic responses on the development of PTSD. If we would know which people experience TI during a traumatic event and that the influence of TI could increase the risk of PTSD, interventions can be adapted. It could be helpful for those people to start with EMDR or exposure therapy earlier and with more intensity, perhaps even immediately after the traumatic event, before they experience PTSD symptoms.

In the present study an experimental fear conditioning design is set up to investigate the relation of freezing with symptoms that are related to PTSD. Participants are taught that an aversion picture and an electric shock can follow a neutral stimulus. Later in the experiment this conditioning will be extinguished. During the experiment, intrusions will be tracked and the extent of TI and the expectation of the shock and aversive images will be examined. To gain more insight in the relation between TI immobility, intrusive memories and extinction, two research questions will be addressed. The first is *whether TI, measured during the acquisition phase, is related to the number of reported intrusions*. Based on previous literature, participants

who experience more TI during the experiment are expected to experience a higher intrusion frequency than those who experience less TI. The second question is *whether TI during acquisition affects the extinction of the learned conditioning*. Based on previous research it is expected that extinction takes longer when participants experience TI during the experiment.

2. Method

2.1 Participants

There were a total of 52 participants, 11 males (mean age = 25.5, SD = 6.12) and 41 females (mean age = 22.2, SD = 3.2) originating from the Dutch population, recruited through the social media Facebook and through flyers that were spread out at the campus of Utrecht University. Exclusion criteria were the presence of a psychological disorder, substance abuse and the use of prescription drugs that may have a negative impact on the response ability. For this study ethical permission was granted from Utrecht University and all participants signed an informed consent form before taking part in the study. When participants had completed the entire experiment they received three trial person hours (PPU's) or € 12.50.

2.2. Materials

2.2.1. Questionnaire Demographics

To control if a participant could take part in the experiment a demographic questionnaire was conducted. This questionnaire consisted of eight questions. Two sample items are: "I am currently in treatment for mental illness" and the education level of the participant.

2.2.2. Tonic Immobility Scale (TIS)

In this experiment a Dutch version of the Tonic Immobility Scale (TIS) (Fusé, Forsyth, Marx, Gallup & Weaver, 2007) was used to evaluate the presence and severity of TI symptoms during traumatic events in the past of the participant. The TIS is a self-report measure scale with 10 items on a 7-points Likert scale (range 0-6). On this scale, the participants should indicate in which degree they have experienced a certain response during a traumatic event in their lives. Higher scores in response to the items indicated greater TI behavior. A sample item was: 'Please indicate to what extent you could not shout or scream during the event'. The answer could range from 0, which stood for 'could easily scream' to 6 'couldn't scream at all'. Items of

the TIS can be divided into two factors: tonic immobility (TI) and fear. The items 1, 2, 4, 5, 6, 8 and 9 represented the TI factor and items 3, 7 and 10 displayed the fear factor. In this study only the items from the TI factor will be used. The Crohnbach's alpha for the TIS is .86 (Kunst, Winkel & Bogaers, 2011). The TIS was tested during the experiment but is not relevant for the hypotheses in this study.

2.2.3. Fear conditioning stimuli

The fear condition stimuli consisted of two parts: The UCS and the CS. An aversive image (angry dog or bloody hand), both selected from International Affective Picture System (IAPS) (Lang, bradley & Cuthbert, 1997), and an electric stimulation were used as UCS (Lang, Bradley & Cuthbert, 1997). The electric stimulation came from a basic, two-pole, resistively regulated, battery powered aversive electric stimulator (E12-22), designed for finger stimulation. The electric shock with duration of 200ms was giving through two electrodes that were placed on the middle and pointer finger of the non-dominant hand from the participant. The voltage of the shock began at 0.2 mA and could be increased to a maximum of 4.0 mA. The participant had to indicate a voltage of the shock when it was very uncomfortable but painless. The CS consisted of two neutral objects, a yellow cube and a blue cylinder. One of the neutral objects was CS+ and the other object was CS-, depending on the condition. The object that served as CS+ would be followed by the UCS.

2.2.4. Subjective tonic immobility, UCS expectancy and subjective anxiety

Through the computer task three different factors were measured: *Subjective tonic immobility, UCS expectancy* and *subjective anxiety*. The subjective tonic immobility and subjective anxiety were measured by asking participants in which degree they felt immobile or paralyzed on a 100mm visual analog scale (VAS). To measure UCS expectancy a similar VAS scale was used. The participants had to indicate how much they expected to receive an electrical stimulation after presentation of the CS. Both UCS expectancy and subjective tonic immobility were measured during each trial, during presentation of the CS. The subjective anxiety was tested during the experiment but is not relevant for the hypotheses in this study.

2.2.5. Intrusion diary

After the computer task, the participants were assigned to keep a diary for one day. In this pen-and-paper diary they had to track how many intrusions they had experienced and if these intrusions were an image (B), thought (G), physical sensation (S), or a combination (for example, SB, BG). They had to describe the content of the intrusion and the situation the participant was in when he or she experienced an intrusion. Finally, they were asked to indicate in which degree they felt tense after the start of the intrusion and to what extent the intrusion occurred spontaneously. It was important that the participants understood that an intrusion is a spontaneously memory from the objects, images or shocks they experienced.

2.2.6. Intrusion Provocation Task

On the second day of the experiment, participants had to complete another condition task and immediately after that, participants had to do an Intrusion Provocation Task (IPT) (Lang, Moulds & Holmes, 2009). Participants were required to close their eyes for two minutes and think freely. Every time an intrusion occurred, they had to press the space bar. After finishing the IPT, they received a questionnaire which consisted of two questions; "Where were *most* of the intrusions about?" and if they had intrusions about every single aspect (object, image or electric shock). The intrusion provocation task was taken during the experiment but is not relevant for the hypotheses in this study.

2.2.7. State Trait Anxiety Inventory (STAI-T)

A Dutch version of the State Trait Anxiety Inventory (STAI) was used to measure a reliable and sensitive measure of anxiety (Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983; Marteau & Bekker, 1992). The STAI consists of two questionnaires of 40 items in total with a 4-point scale. The scale ranged from 'totally not' to 'very much'. The first questionnaire with 20 items measures state anxiety (feelings *moment*) and the second, also 20 items, measures trait anxiety (*general* feelings). A few sample items were: 'I feel tense', 'I'm confused' and 'I feel secure'. The reliability coefficient for the 20-item STAI was: $\alpha = .91$ (Marteau & Bekker, 1992). The reliable and sensitive measure anxiety was tested during the experiment but is not relevant for the hypotheses in this study.

2.3. Procedure

The experiment took place on two consecutive days.

Day one

Participants could sign up for the experiment by sending an email. Then they were scheduled for two consecutive days. Before the experiment began, participants had to fill in a questionnaire to screen for exclusion criteria. If there were no exclusion criteria, the participants could participate in the experiment. Before they began, they received general information about the experiment, research and the procedure. The participants were explicitly told that the experiment contained electrical stimulation and aversive images. After that, they had to sign the informed consent. When the experiment started, they first completed the TIS. Thereafter participants received electrical stimulation on two fingers of the non-dominant hand. This determined the height of the stimulation strength (mA) that would be used throughout the experiment. Then they had to indicate to what extent the stimulation was considered unpleasant on a scale of 0 to 10. Subsequently, the conditioning task started. The experiment consisted of two different conditions. The participants were randomly assigned into condition A or B. Within the conditions, CS+ and CS- varied. The first part was the habituation phase. This component consisted of 6 trials (3 CS+, 3 CS-). The next phase was acquisition. This phase consisted of 16 trials (8 CS+, 8 CS-). These trials were shown in random order. A trial lasted 8 seconds. Between 3-7 seconds, participants had to indicate to what extent they expected the UCS (UCS expectancy) and subjective freezing. At 7-8 seconds they were shown an aversive picture, always followed by an electric stimulation at 7.995 seconds. Of all trials, 75% were followed by the UCS. After each trial, an inter-trial interval followed. This endured for 15-25 seconds. After 3 seconds, the participant was asked again to indicate the subjective freezing and subjective anxiety. After the acquisition phase was finished, the electrodes were removed. Finally, the participants received an explanation of the intrusion diary, which they should take home and fill in until they returned for the second part of the experiment. Before leaving the room, the participants were always asked to check whether the appointment was well noted for the next day.

Day Two

On the second day of the experiment, participants were asked to return to the same room as the day before. When the participants placed the electrodes back on their fingers, the extinction phase was started. This time, the participant was presented 24 trials in random order, in which the CS+ (12 trials) and the CS- (12 trials) were shown without the UCS. Participants had to indicate the UCS expectancy and subjective freezing during each trial as well as on the first day. During the last three trials, participants were presented with the UCS. The final stage in this experiment was the reinstatement phase. 12 trials were shown in random order. This phase included 6 CS+ and 6 CS- trials. After this phase the fear condition experiment was finished. Subsequently, participants had to fill in the intrusion provocation task (IPT) and the STAI-T. Finally, the participants had to hand in the intrusion diaries and the intrusions described were discussed in detail together with the experimenter.

2.4. Analyses

The present study was a fear condition paradigm with a repeated-measures within-subjects design. The collected data was processed and analyzed with IBM SPSS Statistics 24. A repeated-measured ANOVA has been performed to prove if the paradigm worked. The first hypothesis regarding the relationship between TI during the acquisition stage and the number of intrusions is tested with a two-tailed Pearson correlation. The independent variable is the TI rate during the acquisition phase, measured at the 8 trials of CS+ presentation. The dependent variable is the number of intrusions indicted in the intrusion diary.

To answer the second question, does the extent of TI during acquisition affect the extinction of the UCS expectancy of CS+, a repeated measures ANOVA has been performed with TI (high TI and low TI, distinguished by median split) as the between-subjects factor and time (12 trials measuring UCS expectancy) as within subjects factor. All tests were two tailed with significance level set at 0.05.

3. Results

The data were checked for outliers on all measures. One participant was an outlier on TI during acquisition, scoring more than three standard deviations above the mean. The score of this outlier was changed into a score that was one unit higher than the next most extreme score in the distribution (Tabachnick & Fidell, 1996). Table 1 shows the mean and standard deviation of TI, intrusions and UCS expectancy.

Table 1

Mean and standard deviation of TI, Intrusions and UCS expectancy

	Tonic Immobility*	Intrusions	UCS Expectancy **
M	1,31	1,58	2,03
SD	1,85	1,66	1,86

* *Subjective tonic immobility during presentation of the CS+ in the 8 trials of acquisition.*

** *UCS expectancy during the extinction phase.*

3.1. Fear conditioning paradigm test

Mauchly's test of Sphericity indicated that the assumption of sphericity had been violated, χ^2 (27) = 144.03, $p < .01$, and therefore, a Greenhouse-Geisser correction was used.

Results show that UCS Expectancy significantly differed between CS+ and CS-, F (4.16, 237.37) = 35, $p < .01$, partial $\eta^2 = .12$. Figure 1 shows the marginal means for UCS expectancy.

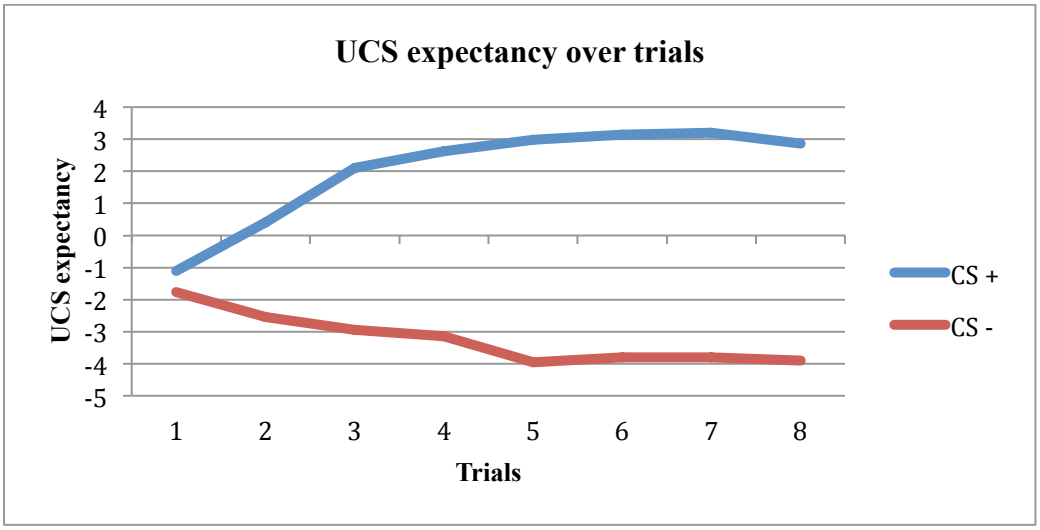

Figure 1. UCS expectancy divided in CS+ and CS-.

3.2. Hypothesis 1: Correlation between TI during acquisition and the number of intrusions

The Shapiro-Wilk test was not significant ($W < 0.05$). When a large sample is used $N \geq 30$, it is less important to meet the normality assumption (Mordkoff, 2011). Because the assumptions of linearity and homoscedasticity were violated, a Spearman's rho correlation was chosen to perform an analysis. It was expected that participants who reported more TI during acquisition would experience more intrusions. Spearman's rho indicated the absence of a correlation between TI during acquisition and the number of intrusions, $r_s = -.033$, $p = .817$, two-tailed, $N = 52$.

3.3. Hypothesis 2: The extend of TI during the acquisition phase affects the extinction of the UCS expectancy

Mauchly's Test of Sphericitty indicated that the assumption of sphericity had been violated, $\chi^2(65) = 433{,}61$, $p = < 0{,}01$, and therefore, a Greenhouse-Geisser correction was used.

There was a significant effect from time on the extinction of the UCS expectancy, F (1, 50) = 93.44, p = .000, partial $\eta^2 = {,}65$ with mean UCS expectancy for the last measure moment (trial 12) ($M = -3.88$, $SD = 1.99$) being significantly lower than for the first measure moment (trial 1) ($M = 2.69$, $SD = 2.60$). A significant main effect for TI was not found F (1, 50) = .478, $p = .492$, partial $\eta^2 = .009$. However a significant interaction between time and TI was found, F (11, 550) = 3.776, $p = .007$, partial $\eta^2 = .070$.

Examination of the means indicated that there was a large change in UCS expectancy of participants in both high TI at the beginning of extinction ($M = 1.95$; $SD = .482$) to the end of extinction ($M = -3.35$; $SD = .373$), as in low TI at the beginning of extinction ($M = 3.49$; $SD = .501$) to the end ($M = -4.43$; $SD = .387$). Figure 2 shows the effects of TI on the extinction of UCS expectancy.

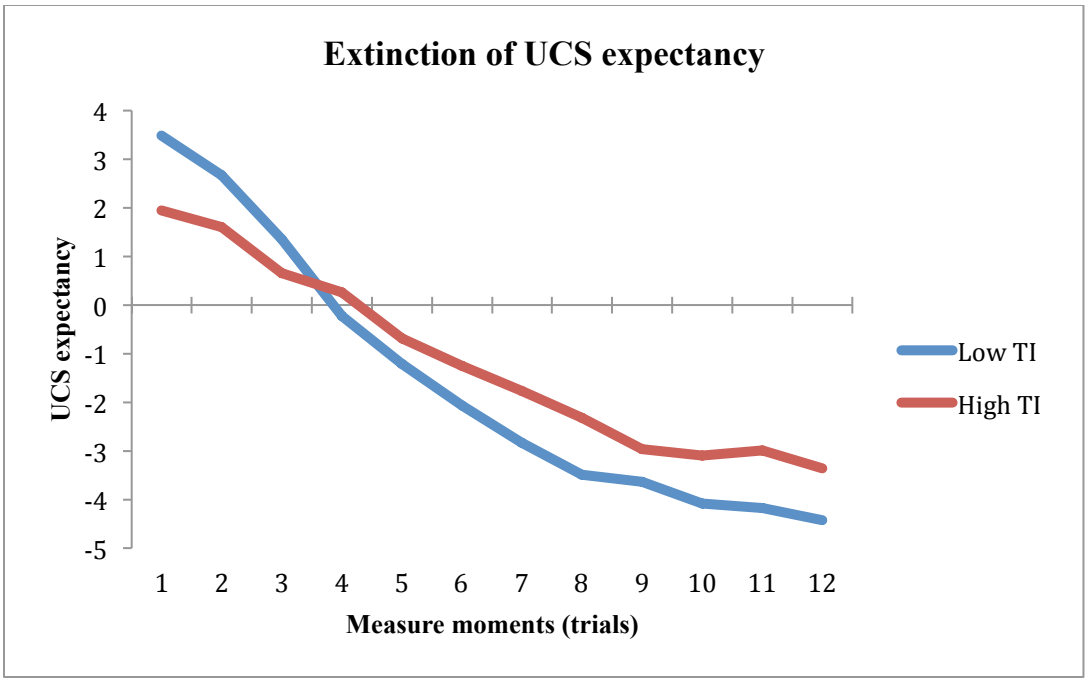

Figure 2. Extinction of UCS expectancy divided in low TI and high TI group.

4. Discussion

PTSD is, as mentioned earlier, a public health problem and is associated with a high morbidity and mortality rate (Green et al., 2006). Therefore, it is important to learn more about possible risk factors for developing PTSD. A potential risk factor for developing PTSD is tonic immobility during the traumatic event (Rocha-Rego et al., 2009; Fiszman et al., 2008). This research contributes to increased knowledge about TI in humans and the influence of TI on intrusive memories and extinction of unconsciously learned behavior.

To find out more about the influence of TI, this study examined whether there is a relationship between TI and the number of intrusions. It was expected that participants who reported TI would experience more intrusions. No relationship was found between TI and the number of intrusions, thereby this hypothesis was rejected. The hypothesis about the influence of TI on the number of intrusions was based on previous studies (Hagenaars & Putman, 2011; Heidt et al., 2005), which showed that people who experienced TI reported more intrusions and that TI influenced the mechanism of the onset of intrusions. This research shows that this might not always be the case. It is possible that the response to experimental induced TI differs from TI that occurs when a situation take place in which escaping is impossible. In the current study,

aversive images were used of a bleeding hand and an aggressive dog. In the study of Hagenaars and Putman (2011) a film with four traumatic scenes of real-life footage of the horrible aftermath of road traffic accidents was used to model a traumatic experience. The pictures used in this study may not be shocking enough and therefore could not give a realistic perspective of the effect of TI on the number of intrusions. Another possible explanation of this study could be that the time in which participants could note the intrusions was too short. In Hagenaars and Putman's (2011) research, the intrusions were reported for one week. Speculatively, the effect of TI on the number of intrusions could become visible over time. Within 24 hours after the experiment, the intrusions for both groups (high TI and low TI) are maybe more equal than when time passes by.

The second hypotheses in this study concerned whether the extent of TI during the acquisition phase affect the extinction of the UCS expectancy. Confirming our hypothesis, high TI was associated with slower extinction of the UCS expectancy in comparison with low TI. This finding is striking because it could be that the experienced TI in people with PTSD causes the failure to recover after a traumatic event (Rauch et al., 2006; Milad et al., 2006). However, in this study the high TI and low TI group originate due median split. A problem with categorizing a continuous predictor is loss of power (Aiken & West, 1991). For future studies, it would be interesting to further investigate this effect in a larger sample size with high TI versus low TI, to learn more about the influence of this fear response.

This study has some limitations that should be mentioned. Firstly, through a self-report measure, the level of TI was obtained. In this way of obtaining results, the risk of socially desirable answers is high (Fisher, 1993). In a subsequent study, instruments could be used that measure TI's physical responses, for example heart rate and postural movements. This will probably allow researchers to show a better difference between high TI and low TI.

Secondly, there was no control over the participants while making the computer task. As a result, participants could respond messy or rushed. To get a good idea of the respondents' reaction, they had a time limit when indicating the experienced TI. However, a time limit also has a negative side. Time pressure reduces efficiency by reducing motivation (Dreu, 2003).

Furthermore, the sample included only students with an age range from 19 to 27 and all high educated. Because there is less variation in this sample, the results may have limited generalizability. More variance in age and education will be required in a follow-up study.

In conclusion, this study attempted to gain more knowledge into the role of TI in developing PTSD symptoms, especially intrusion, by means of a fear condition experiment. Also, for the first time as far as we know, it was examined whether there is a relationship between TI and extinction. The main findings of this study were that, contrary to our expectation and previous research, there was no relationship between TI and the number of intrusions. However, an effect from TI on the duration of extinction has been found. Further research needs to examine more closely the links between tonic immobility and PTSD. Through this knowledge, treatment and prevention interventions for PTSD can be improved.

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Attachements

Attachment 1. Syntax

```
DATASET ACTIVATE DataSet1.

*Descriptives Tonic Immobility during acquisition
DESCRIPTIVES VARIABLES=FAcquisition_CSPiti_12345678
  /SAVE
  /STATISTICS=MEAN STDDEV MIN MAX

*Descriptives US Ecpectancy
DATASET ACTIVATE DataSet1.
DESCRIPTIVES VARIABLES=FAcquisition_CSPiti_12345678
  /STATISTICS=MEAN STDDEV MIN MAX.

*Detecting outlier
EXAMINE VARIABLES=FAcquisition_CSPiti_12345678
  /PLOT BOXPLOT HISTOGRAM
  /COMPARE GROUPS
  /PERCENTILES(5,10,25,50,75,90,95) HAVERAGE
  /STATISTICS EXTREME
  /MISSING LISTWISE
  /NOTOTAL.

*Change outlier by winsorize. Copy/past variabele FAcquisition_CSPiti_12345678 and change
into FAcquisition_CSPiti_123456789_W and change outlier into 7 (one score above the next
most extreme score)

* Prove of of paradigm
DATASET ACTIVATE DataSet1.
GLM USAcqCSP1 USAcqCSP2 USAcqCSP3 USAcqCSP4 USAcqCSP5 USAcqCSP6
USAcqCSP7 USAcqCSP8 USAcqCSM1
    USAcqCSM2 USAcqCSM3 USAcqCSM4 USAcqCSM5 USAcqCSM6 USAcqCSM7
USAcqCSM8
  /WSFACTOR=CS 2 Polynomial UCS 8 Polynomial
  /METHOD=SSTYPE(3)
  /PLOT=PROFILE(UCS*CS)
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=CS UCS CS*UCS.

*Checking normality hypothese 1
DATASET ACTIVATE DataSet1.
EXAMINE VARIABLES=FAcquisition_CSPiti_12345678_W IntrusionDiary_imageUS_adj
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS NONE
  /CINTERVAL 95
```

```
  /MISSING LISTWISE
  /NOTOTAL.

*Checking linearity & homoscedasticity hypothesis 1
DATASET ACTIVATE DataSet1.
EXAMINE VARIABLES=FAcquisition_CSPiti_12345678_W IntrusionDiary_imageUS_adj
  /PLOT HISTOGRAM NPPLOT
  /STATISTICS NONE
  /CINTERVAL 95
  /MISSING LISTWISE
  /NOTOTAL.

*Checking correlation for hypothesis 1 with Spearman's Rho.
NONPAR CORR
  /VARIABLES=FAcquisition_CSPiti_12345678_W IntrusionDiary_imageUS_adj
  /PRINT=BOTH TWOTAIL NOSIG
  /MISSING=PAIRWISE.

*Split TI respons in TI low and TI high through median-split so I can use them as between-
subject factor in the rmAnova.
DATASET ACTIVATE DataSet1.
FREQUENCIES VARIABLES=FAcquisition_CSPiti_12345678_W
  /STATISTICS=MEDIAN
  /ORDER=ANALYSIS.

RECODE FAcquisition_CSPiti_12345678 (Lowest thru 0.58=1) (ELSE=2) INTO
FacquisitionCSPitiCat.
VARIABLE LABELS  FacquisitionCSPitiCat 'FacquisitionCSPitiCat'.
EXECUTE.

*Analyse rmAnova. Within subject factors (USexpectancy) are different measerement moments
where UCS expectancy is measured. Between-subjec factors are two groups (low and high TI)
GLM USExtCSP1 USExtCSP2 USExtCSP3 USExtCSP4 USExtCSP5 USExtCSP6
USExtCSP7 USExtCSP8 USExtCSP9
    USExtCSP10 USExtCSP11 USExtCSP12 BY FacquisitionCSPitiCat
  /WSFACTOR=Measuremoments 12 Polynomial
  /METHOD=SSTYPE(3)
  /PLOT=PROFILE(Measuremoments*FacquisitionCSPitiCat)
  /EMMEANS=TABLES(Measuremoments) COMPARE ADJ(BONFERRONI)
  /PRINT=DESCRIPTIVE ETASQ HOMOGENEITY
  /CRITERIA=ALPHA(.05)
  /WSDESIGN=Measuremoments
  /DESIGN=FacquisitionCSPitiCat.
```

Attachment 2: Informed Consent

Beste deelnemer,

Alvast hartelijk bedankt voor het meedoen aan ons onderzoek!

Wij zijn Eva, Iliana en Omer en wij nemen dit onderzoek af in opdracht van Universiteit Utrecht. In dit onderzoek wordt geheugen onderzocht.

Het onderzoek bestaat uit twee delen, het eerste deel zal vandaag plaatsvinden en het tweede deel morgen. Het onderzoek vandaag duurt ongeveer 45 minuten en bestaat uit het invullen van vragenlijsten en een computertaak. Het tweede gedeelte zal ongeveer 30 minuten duren.

Tijdens de computertaak krijg je ongevaarlijke en pijnloze stroomschokjes. Ook krijg je onaangename plaatjes te zien. Na de computertaak krijg je de opdracht mee om thuis een dagboek in te vullen en morgen weer in te leveren.

Als je het gehele onderzoek hebt afgerond ontvang je 3 proefpersoonuren of €12,50.

Je deelname is geheel vrijwillig. Je kunt op ieder moment stoppen met het onderzoek zonder dat je daar een reden voor hoeft op te geven. Ook als je nu toestemming geeft voor deelname, heb je ten alle tijden het recht om je nog terug te trekken. Je hebt altijd het recht om aanvullende vragen te stellen als iets onduidelijk is.

Alle informatie die in dit onderzoek wordt verzameld wordt anoniem verwerkt en zullen dus niet naar jou te herleiden zijn. Uit deze gegevens trekken wij enkel conclusies op groepsniveau, er zullen dus geen uitspraken worden gedaan over jouw individuele gegevens.

Indien je na afloop van die onderzoek nog vragen of opmerkingen hebt naar aanleiding van je deelname, of geïnteresseerd bent in (een samenvatting van) de resultaten, kun je ons bereiken via e-mail: uu.geheugen@gmail.com.

Met vriendelijke groet,
Eva, Iliana, Omer

Toestemmingsformulier

Participant

Ik verklaar hierbij dat ik voldoende geïnformeerd ben over dit onderzoek en dat mijn deelname geheel vrijwillig is.

Ik ben geïnformeerd over het feit dat ik ongevaarlijke en pijnloze stroomschokjes krijg en onaangename plaatjes zal zien en geef hier toestemming voor.

Naam: _____

Handtekening:

_____ Datum: ___ / ___ / ___

Onderzoeker
Ik verklaar hierbij dat ik deze participant voldoende heb geïnformeerd over het genoemde onderzoek.

Naam onderzoeker: _____

Handtekening:

_____ Datum: ___ / ___ / ___

Attachment 3: Questionnaire Demographics

Vragenlijst demografie

In de volgende vragenlijst zullen een aantal vragen over u worden gesteld. Bij de open vragen vult u zelf het antwoord in op de stippellijn. Omcirkel bij elke stelling het antwoord dat voor u van toepassing is.

Leeftijd: ……..

Geslacht: man / vrouw

Opleidingsniveau: ……
(hoogst afgeronde opleiding)

1. Ik ben op dit moment in behandeling voor een psychische aandoening (bijvoorbeeld een depressieve stemmingsstoornis en/of angststoornis).

ja / nee

2. In heb in de afgelopen 24 uur drugs gebruikt.

ja / nee

3. Ik heb in de afgelopen 24 uur excessief alcohol gebruikt.

ja / nee

4. Op dit moment ben ik onder invloed van middelen of medicijnen die mijn reactievermogen beïnvloeden.

ja / nee

5. Ik ben verslaafd aan roken.
ja / nee

Attachment 4: Intrusion Diary

Vertrouwelijk

Instructies voor het dagboek intrusies.

(Probeer dit dagboek niet te verliezen: het is van groot belang voor het experiment. Dankjewel!)

Proefpersoonnummer: .....
Datum sessie 1: .....
Datum sessie 2: .....

* Als je gedurende de komende 24 uur spontane intrusies krijgt over de plaatjes die je zojuist gezien hebt, schrijf deze dan in dit dagboek. Met "intrusies" worden intrusieve herinneringen bedoeld, dus herinneringen aan de objecten, plaatjes of schokjes die je vandaag hebt gezien/ervaren. Intrusies komen plotseling in je op, dus het gaat niet om de momenten waarop je met opzet aan de film denkt of erover doordenkt. Intrusies kunnen komen in de vorm van beelden, gedachten of lichamelijke sensatie (gevoel).

*Het invullen kun je het beste doen door iedere dag wat tijd te reserveren om het dagboek in te vullen. Geef het totale aantal intrusies in iedere tijdsperiode aan (kolom 1) en voor iedere intrusie specifiek of het vooral een beeld, vooral een gedachte of vooral een lichamelijke sensatie was of een combinatie (kolom 2). Indien een combinatie, noteer dan welke elementen er in de intrusie zaten. Beschrijf de inhoud van de intrusie in kolom 3. Beschrijf de situatie op het moment van de intrusie of vlak ervoor in kolom 4. Vul de kolommen "spanning" en "automatisme" (kolom 5 en 6) in door een cijfer van 0 tot 10 te geven aan uw ervaring.

* Gebruik 1 blad van het dagboek per dag. Als je de intrusies die je in 1 tijdsperiode hebt gehad niet kwijt kunt in de ruimte die daarvoor gegeven is, kun je op de achterkant of een ander blad verder schrijven. Ook als de ruimte te klein is om de inhoud van de intrusies te beschrijven, kun je de achterkant van het blad of een ander blad gebruiken.

* Als je soms geen details kunt beschrijven, noteer dan in ieder geval dat je een intrusie hebt gehad op dat tijdstip.

* ALS JE GEEN INTRUSIES HEBT GEHAD, NOTEER DAN EEN 0 VOOR DIE TIJDSPERIODE.

* Neem het dagboek mee bij je volgende afspraak.

Intrusie dagboek (probeer dit dagboek niet te verliezen, het is van groot belang voor het experiment. **DANK JE!**)

Proefpersoonnummer: ..... Dag 1: dag van de week: .....

Datum: .....

Moment van de dag	**TOTAAL AANTAL intrusies**	**B G S BGS**[1]	**Beschrijf de <u>inhoud</u> van de intrusie**	**Beschrijf de <u>situatie</u> op het moment van de intrusie of vlak ervoor**	**Spanning nav de intrusie?** **0=helemaal niet 10=extreem**	**In hoeverre kwam het spontaan in je op?** **0=helemaal niet 10=extreem**
OCHTEND (zet een 0 als je geen intrusies gehad hebt)						
MIDDAG (zet een 0 als je geen intrusies gehad hebt)						
AVOND (zet een 0 als je geen intrusies gehad hebt)						
NACHT (zet een 0 als je geen intrusies gehad hebt)						

[1]Was de intrusie een beeld (B), een gedachte (G), een lichamelijke sensatie (S) of een combinatie (bv BG of BS of SG)?

Intrusie dagboek (probeer dit dagboek niet te verliezen, het is van groot belang voor het experiment. **DANK JE!**)

Proefpersoonnummer: ..... Dag 2: dag van de week: .....
Datum: .....

Moment van de dag	**TOTAAL AANTAL intrusies**	**B G S BGS[1]**	**Beschrijf de <u>inhoud</u> van de intrusie**	**Beschrijf de <u>situatie</u> op het moment van de intrusie of vlak ervoor**	**Spanning nav de intrusie?** **0=helemaal niet 10=extreem**	**In hoeverre kwam het spontaan in je op?** **0=helemaal niet 10=extreem**
OCHTEND (zet een 0 als je geen intrusies gehad hebt)						
MIDDAG (zet een 0 als je geen intrusies gehad hebt)						
AVOND (zet een 0 als je geen intrusies gehad hebt)						
NACHT (zet een 0 als je geen intrusies gehad hebt)						

[1]Was de intrusie een beeld (B), een gedachte (G), een lichamelijke sensatie (S) of een combinatie (bv BG of BS of SG)?