

Postprint version : 1.0

Journal website : <https://www.sciencedirect.com/science/article/abs/pii/S0165178119305906?via%3Dihub>

Pubmed link : <https://www.ncbi.nlm.nih.gov/pubmed/31262536>

DOI : 10.1016/j.psychres.2019.05.044

This is a Nivel certified Post Print, more info at nivel.nl

The longitudinal effect of social recognition on PTSD symptomatology and vice versa: Evidence from a population-based study

Peter G. van der Velden^{a,*}, Marije Oudejans^b, Marcel Das^a, Mark W.G. Bosmans^c, Andreas Maercker^d

^a CentERdata and Tilburg University's Network on Health and Behavior (Nethlab), Tilburg, the Netherlands

^b CentERdata, Tilburg, the Netherlands

^c Netherlands Institute for Health Services Research (NIVEL), Utrecht, the Netherlands

^d Department of Psychology Psychopathology and Clinical Intervention, University of Zurich, Switzerland

ABSTRACT

A specific type of social support after potentially traumatic events is called “social recognition”. It is the acknowledgement or validation of event-related thoughts, behavior, and feelings by the individual or others. It consists of positive individual or societal reactions that recognize and acknowledge victims’ traumatic experiences and difficulties. Current studies suggest that social recognition protects against the development of PTSD symptomatology, but there is a lack of population-based studies assessing the longitudinal interplay between PTSD symptomatology and social recognition. For this purpose, we conducted a longitudinal study using the Dutch LISS panel, based on a random sample of the Dutch population. Structural equation modeling showed that among recently affected adults (0–2 months ago), those with relatively higher levels of social recognition had lower levels of PTSD symptomatology 6 months later. Victims with high levels of PTSD symptomatology at baseline received less social recognition 6 months later. On the intermediate term (affected 5–12 months ago), baseline social recognition was no longer predictive of PTSD symptoms 6 months later, in contrast to PTSD symptomatology predicting lack of social recognition. In sum, PTSD symptom levels eroded social recognition on the short and intermediate term, while the protective role of social recognition was limited to the short term.

1. Introduction

The lack or loss of social relationships and support that meet people's needs may put their (mental) health and wellbeing at risk (Greenberg et al., 2014; Hobfoll, 1989, 2002; Holt-Lunstad et al., 2010; Holt-Lunstad, 2018; Kawachi and Berkman, 2001; Kelly et al., 2017; Maercker and Müller, 2004; Shor and Roelfs, 2015). When people experience potentially traumatic events and/or crime, such as burglaries, accidents, serious threat, physical or sexual violence and disasters, a lack of social relationships and support may negatively affect their recovery. How people are treated by their social environment, especially when they are suffering from serious mental health problems following these events and/or are suffering from related stressors may therefore affect how they emotionally and cognitively process their traumatic experiences. A specific type of social support after potentially traumatic events is called "social recognition". It is the acknowledgement or validation of event-related thoughts, behavior, and feelings by the individual or others, and consists of positive individual or societal reactions that recognize and acknowledge victims' traumatic experiences and difficulties (Ahrens et al., 2007; French, 2003; Southwick et al., 2000; Maercker and Müller, 2004; Mueller et al., 2009). It differs from social support in that it includes the complete perceived societal context and not only the support from a person's close environment (Maercker and Müller, 2004).

To date, several empirical studies assessed the associations between social recognition and mental health problems, especially PTSD symptomatology, which vary in, for instance, study designs and type of potentially traumatic events. Below, we briefly discuss these studies and we start with the cross-sectional studies. Most studies used the Social Acknowledgement Questionnaire (SAQ; Maercker and Müller, 2004), that consist of three sub scales (social recognition, general disapproval, and family disapproval) and a total score scale (social acknowledgement).

1.1. Cross-sectional studies

Among a sample of Chechen refugees living in camps in Ingushetia, Maercker et al. (2009) found that, on a bivariate level, social recognition was not significantly correlated with PTSD symptomatology while PTSD symptomatology was significantly related to the total SAQ total score. A study among former World War II child soldiers showed that social recognition was significantly associated with intrusion, but not with avoidance, arousal, anxiety, depression, or somatization sixty years post-war (Forstmeier et al., 2009). Schumm et al. (2014) assessed the associations between family disapproval, social recognition, and PTSD among a mixed sample of US veterans seeking treatment. Social recognition was, according to the cross-sectional SEM analyses, associated with depression but not with PTSD symptom levels. General disapproval was associated with both mental health problems (they used a modified SAQ). Kuwert et al. (2014) conducted a comparative study among females that experienced conflict-related sexual violence at the end of WWII and matched females with non-sexual WWII trauma. Results showed that compared to victims of non-sexual trauma, victims of sexual violence had more mental health problems such as anxiety and hyperarousal, and lower scores on social recognition and family disapproval. The cross-sectional study by Lis-Turlejska et al. (2018) focused on a group of Polish WWII survivors and found that social recognition was correlated with depression symptoms but not with PTSD symptoms. General disapproval was moderately correlated with PTSD symptom clusters and depression.

Three studies focused on service providers. Among deployed German aid workers and workers who had completed their duty, levels of social recognition were not significantly associated with PTSD symptoms, in contrast to general disapproval, which was significantly associated with intrusion and arousal levels (Jones et al., 2006). Köhler et al. (2018) assessed the associations between PTSD symptom severity and social recognition, and the mediating role of disclosure among emergency service workers. Results suggest that PTSD symptoms indirectly influenced social recognition via reluctance to talk. Other studies included victims of (non-war) crime and other potentially traumatic

events. The study by Kern et al. (2019) among students confronted with assaultive and non-assaultive PTEs showed that social disapproval was modestly to strongly correlated with PTSD symptomatology. In a study among German and Chinese victims of crime, Mueller et al. (2009) found that social recognition and disapproval were not independent predictors of PTSD symptoms over and above other factors such as gender and trauma severity among the separate samples, while general disapproval was independently associated with PTSD symptomatology in the total sample. Wagner et al. (2012) assessed the association between social recognition and disapproval among family members who were present at an assisted suicide. Fourteen to twenty-four months post-event, social recognition and family disapproval subscales showed significant correlations with hyperarousal, but not with intrusion or avoidance. In the study by Krammer et al. (2016), social acknowledgement (total SAQ scores) was significantly associated with PTSD symptomatology, depression, and dissociation.

1.2. Longitudinal studies

In the longitudinal study by Maercker and Müller (2004) among former political prisoners in Eastern Germany, social recognition at baseline was moderately correlated with intrusions, avoidance, hyperarousal, and total PTSD symptomatology scores at follow-up. In addition, the SAQ total score (including general disapproval, family disapproval and social recognition) was a strong independent predictor of PTSD symptoms over and above social support at baseline. Mueller et al. (2008) study among victims of crime with baseline assessments 1.5 years post-event, found that general disapproval and family disapproval explained 4% of the variance of PTSD symptoms 6 months later over and above PTSD symptoms at baseline and other predictors, but not social recognition. The study by Thormar et al. (2016), which was conducted following a disaster, reported that volunteers who worked in the core of the disaster and were resilient, had higher social recognition scores than their colleagues with chronic PTSD symptomatology. The large three-wave study by Ullman and Relyea (2016) with one-year intervals among female assault victims using structural equation modeling (SEM), found that PTSD symptomatology at wave 1 predicted unsupportive acknowledgment at wave 2 and that unsupportive acknowledgment at wave 2 predicted maladaptive coping at wave 3, but not PTSD symptomatology at wave 3 (although they were significantly associated on a bi-variate level). The mean time between event and the first wave was 14 years. In the study among 80-year old former Swiss indentured child laborers, Maercker et al. (2016) found that social acknowledgment as a victim of childhood trauma was associated with an increase in depressive symptoms 20 months after the baseline assessment.

Other evidence stems from intervention studies. In the web-based intervention study by Xu et al. (2016) among a relatively small group confronted with PTEs, changes in social recognition and changes in PTSD symptoms were strongly negatively correlated, and an improvement of social recognition mediated the reduction of PTSD symptoms during and after the intervention. In addition, Sommer and colleagues (2017) assessed changes in PTSD symptomatology following treatment and found that a decrease of PTSD symptoms was significantly associated with disapproval but not with social recognition.

1.3. Research questions

In summary, current research findings suggest that social recognition may protect victims against the development of PTSD symptomatology, but the number of longitudinal studies is limited and mostly started a long time after the event. Furthermore, results are mixed, with both positive and negative findings.

In addition, the results of longitudinal studies assessing the longitudinal interplay between, for instance, social support (Kaniasty and Norris, 2008) or coping self-efficacy (Bosmans and van der Velden, 2017) and PTSD symptomatology, have shown that reciprocal longitudinal associations may

change over time. In these studies, while support and event-related coping efficacy did protect against the development of PTSD symptomatology in the short term, in the intermediate term PTSD symptomatology eroded support and coping self-efficacy. It is therefore important to consider and assess possible reciprocal longitudinal associations between social recognition and PTSD symptomatology (Cf. Ullman and Relyea, 2016) in the short and intermediate term. Next, studies based on a representative sample of the general population are absent. And finally, to the best of our knowledge, to date no study assessed the longitudinal interplay between PTSD symptom severity (PTSS) and social recognition in the short and intermediate term while also taking pre-event loneliness and pre-event mental health problems into account, which may impact both PTSS and social recognition levels (cf. van der Velden et al., 2018b).

For this reason, we conducted a population-based study to assess the longitudinal interplay between PTSD symptomatology and social recognition (hereinafter also abbreviated as Recognition) in the short and intermediate term, while taking pre-event loneliness and mental health problems into account. The research questions were:

1. What are the longitudinal cross-lagged associations between PTSS and Recognition (PTSS → Recognition and Recognition → PTSS) in the short term (0–2 months after the PTE), taking into account pre-event loneliness and mental health problems?
2. The second research question is similar to the first research question but is aimed at the same associations in the intermediate term, i.e. a longer period after the PTE (5–12 months).
3. To what extent do the cross-lagged and autoregressive associations between PTSS and Recognition in the short term differ from the associations in the intermediate term, taking into account pre-event loneliness and mental health problems?

In our study, the time between baseline and follow-up PTSS and Recognition assessments was six months. We focused on adults victimized by 1.) burglary, theft or fraud, 2.) traffic or other accidents, and 3.) serious threat or physical (sexual) violence in the 12 months prior to the first survey on PTEs.

2. Methods

2.1. Procedures and participants

This study is part of the longitudinal Victims in Modern Society (VICTIMS) study of potentially traumatic events and/or crime, and support in the Netherlands. Data were collected in the Longitudinal Internet studies for the Social Sciences (LISS) panel, administered by CentERdata (Tilburg, The Netherlands; Scherpenzeel and Das 2011) and granted by the Netherlands Organization for Scientific Research (NWO). The LISS panel is based on a large representative random sample drawn from the Dutch population register by Statistics Netherlands ($N \sim 7500$). Panel members receive an incentive of 15 euros per hour for their participation. Respondents who do not have a computer and/or Internet access are provided with the necessary equipment.

Since 2007, this panel is used to conduct a number of annual core studies on such topics as social integration, health and values, as well as other studies (see English website www.lissdata.nl). We first extracted data on pre-PTE loneliness from the annual Social Integration and Leisure Core study conducted in October 2016 (with reminders in November: T1^a, $N^{\text{selected}}=6380$, response^{completers}=85.7%) and on pre-PTE mental health problems from the annual Health Core Study conducted in November 2016 (with reminders in December: T1^b, $N^{\text{selected}}=6336$, response^{completers}=84.7%).

In March 2018 (with reminders in April: T2), almost 7300 participants were administered a questionnaire on PTEs developed for this study. A total 5989 respondents completed the questionnaire ($N^{\text{selected}}=7292$, response^{completers}=82.1%), of whom 5879 were 18 years or older. Of

these adults, 737 had experienced the following three types of PTEs: 1) burglary, theft or fraud; 2) accidents (including traffic accidents, medical accidents/error, other accidents or disaster; or 3) serious threat or (sexual) violence in the past 12 months (see measures section below). About six months later, in October 2018 (with reminders in November: T3), a follow-up was conducted among this group of 737 victims, in which 635 participated (response^{completers} = 86.2%). The baseline PTE questionnaire was approved by a panel of internal and external reviewers at CentERdata, and the follow-up consisted of a small number of items from the baseline assessment. Importantly, previous research using the LISS panel revealed that the possible burden of participating in research on trauma was related to the perceived burden of other non-trauma studies (such as on values), and not PTSS and other PTE-related variables (van der Velden et al., 2013, Jaffe et al., 2015). All participants gave their informed consent.

2.2. Measures

2.2.1. Loneliness

Loneliness was assessed at T1^a using the six-item De Jong Gierveld Loneliness Scale (Jong Gierveld and Tilburg, 1999, 2006). Respondents rated items such as 'I often feel deserted' on three-point Likert scales (1=yes to 3=no). The total score was calculated after recoding the three negatively formulated items (Cronbach's Alpha's=0.83) without applying a prior dichotomization of the answer categories (van der Velden et al., 2018b).

2.2.2. Mental health problems

Mental health problems at T1^b were examined using the 5-item Mental Health Index or Inventory (MHI-5, Means-Christensen et al., 2005; Ware and Sherbourne, 1992). Respondents rated their mental health during the past month on six-point Likert scales, such as 'I felt very anxious' and 'I felt depressed and gloomy' (1=never to 6=continuously). After recoding the third and fifth item, the total scores were computed (Cronbach's Alpha=.86).

2.2.3. Potentially traumatic events

At T2, a list of 21 potentially traumatic events and/or crime (hereinafter abbreviated as PTEs) was administered to examine experiences with PTEs in 12 months preceding T2. PTEs such as child abuse and WWII experiences were excluded because our focus was on adults and events in the past 12 months. This 21-item list, based on previous research (Bronner et al., 2009; de Vries and Olff, 2009; Hentschel et al., 2016; van der Velden et al., 2013), included events such as serious threat without physical violence, events involving physical violence and the unexpected death of a significant other (based on Criterion A1 events in DSM-IV, cf. ICD-11). Respondents had to rate each event (1=yes, 2=no) to ensure that respondents read all 21 items. Participants were offered the opportunity to describe PTEs in the past twelve months that were not listed. They were recoded in existing or new categories of PTEs. Respondents who had experienced a serious disease, the expected or unexpected death of a significant other or colleague, besides burglary, theft, fraud, traffic or other accident, serious threat, or physical (sexual) violence, were automatically asked to bear the burglary, theft, and fraud, (traffic) accident, threat or physical (sexual) violence in mind when answering the PTSD- and Recognition-related questions (see below). If respondents experienced two or more different PTEs of the PTEs burglary, theft, fraud, traffic or other accident, serious threat and physical (sexual) violence, they were asked to bear the most stressful PTE in mind when answering the PTSD- and Recognition-related questions. Control analyses showed that respondents who reported two or more PTEs did not rate the burglary, theft, fraud, traffic or other accident, serious threat or physical (sexual) violence as more stressful than respondents who reported one event (i.e. burglary, theft, fraud, traffic or other accident, threat or physical (sexual) violence). Affected participants were also asked

when the PTE 2.2.4. Posttraumatic stress symptoms had taken place (1=one week ago to 8=7–12 months ago).

2.2.4. Posttraumatic stress symptoms

At T2 and T3, PTSD symptom severity (PTSS) during the past months were assessed using the 8-items version of the PCL-5 (Price et al., 2016; van der Velden et al., 2018a; Weathers, 2008). The PCL-5 assessed symptoms across the four symptom clusters of PTSD according to DSM-5 (APA, 2013). Since we did not assess PTSD clinically, we ignored the 1-month criterion of PTSD. Items have 5-point Likert scales (1=not at all to 5=extremely; Cronbach's Alpha=0.92).

2.2.5. Disclosure

Acknowledgment can only be provided if others are informed or are aware of the event the participant experienced. We therefore first assessed at T2 whether the participants had communicated with others about the event (displayed on screen) using a list of 20 persons and organizations (varying from family and friends to Victim Support Netherlands). If a participant indicated that he/she had not revealed the PTE, we asked if other people knew or were aware that they were affected. When affected participants reported “no, nobody (except possible perpetrator)” or “I don't know”, the questionnaire about Recognition was not administered.

2.2.6. Social recognition

To assess event-related social recognition at T2 and T3, the 5-item Recognition scale of the Social Acknowledgment Questionnaire (SAQ, Maercker and Müller, 2004; van der Velden and de Bruijne, 2018) was administered. The items have five-point answer categories (1=totally disagree to 5=totally agree). The scale consists of items such as “There is not enough sympathy for what happened to me” and “Most people cannot understand what I went through” (Cronbach's Alpha=0.86).

[Table 1]

2.3. Statistical analyses

For the present study we first distinguished two groups of victims: those affected 0–2 months before T2 (short term subgroup; $N=247$) and those affected by a PTE 5–12 months before T2 (intermediate term subgroup, $N=346$). The distribution of the three types of PTEs differed between the short term and intermediate term subgroup ($\chi^2=20,379$, $df=2$, $p<0.001$) as well as the total number in both groups. To enable comparison of short-term and intermediate term effects, we therefore selected victims at random in both subgroups to obtain exactly equal distributions of PTEs and equal numbers of respondents in both groups, resulting two subgroups of 229 respondents (see Table 1). We used the following procedure: first, we cross-tabulated the group by type of event, resulting in a 2x3 table. To obtain equal numbers, we chose the cell with the lowest number for each type of event. That number was used to randomly select the same number of respondents in the other (larger) subgroup. Differences in demographics and other study variables were assessed using chi-square statistics and paired t-tests.

The longitudinal associations between Recognition and PTSS were assessed using structural equation modeling (SEM, with IBM SPSS AMOS version 25). Full Information Maximum Likelihood (FIML) estimation was used to deal with any missing values on the study variables, especially on pre-trauma mental health and loneliness. This method includes the estimation of means and intercepts, and generates variances and covariances for all variables in the model. For these estimations, and for the estimation of the models, AMOS uses all available data.

The full models are presented in Figs. 1 and 2. We first tested several competing causal models (labelled as A1 to D1) for the short term subgroup to answer research question 1. Competing model

A1 was the unconstrained model and we compared this model with the following constrained models. In competing model B1 the cross-lagged path from PTSS to Recognition and from Recognition to PTSS was constrained to be equal. In competing models C1 and D1, the paths from Recognition to PTSS and from PTSS to Recognition were constrained to be equal to 0. Identical analyses were conducted for the intermediate term subgroup (models A2 to D2) to answer research question 2.

To answer research question 3, we compared the cross-lagged and autoregressive paths of the short term subgroup and intermediate term subgroup using both subgroups simultaneously. Model A3 is the unconstrained model of the total study subgroup ($N=2 \times 229=458$), and the competing models were compared with this unconstrained model. In the competing models B3, B4 and B5, the cross-lagged paths from PTSS to Recognition, from Recognition to PTSS, and both cross-lagged paths of both subgroups were constrained to be equal. So, in case model B3 does not worsen the model fit significantly (compared to the unconstrained model), the cross-lagged paths from PTSS to Recognition are not found to be different in the short and intermediate term. The same applies for B4 with the cross-lagged path from Recognition to PTSS, and B5 with both cross-lagged paths in the short and intermediate term. In the competing models E3, E4 and E5, the autoregressive paths for PTSS, the autoregressive paths for Recognition, and both autoregressive paths respectively of both subgroups were constrained to be equal. Finally, in competing model F all cross-lagged and autoregressive paths of both subgroups were constrained to be equal. The overall model fit was evaluated using chi-square statistics, the comparative fit index (CFI), the normed fit index (NFI), Akaike Information Criterion (AIC) and the root mean square error of approximation (RMSEA). CFIs and NFIs higher than 0.95 and RMSEAs lower than 0.06 indicate good model fit (Hu and Bentler, 1999).

[Figure 1]

3. Results

3.1. Participants

Table 1 provides an overview of the demographics, the three types of potentially traumatic events, pre-event loneliness and mental health problems, and posttraumatic stress symptoms and Recognition of both subgroups. Results showed that both subgroups, after we randomly selected victims to obtain equal distributions of type of events, did not differ significantly and were highly comparable. The intercorrelations of study variables are presented in Table 2. In both subsamples, study variables are significantly and modestly to strongly correlated.

[Table 2]

3.2. Cross-lagged models PTE short term subgroup

The structural model for the short term subgroup is graphically presented in Fig. 1, and the (standardized) coefficients are the coefficients for the unconstrained model (model A1). The model fit of the unconstrained (A1) and competing models are presented in the upper part of Table 3. This shows that, according to the criteria described above, the model fit for the unconstrained model was excellent ($\chi^2(4)=6700, p=0.153$). In addition, the results of the constrained competing model B1 show that both cross-lagged paths ($\beta^{PTSS \rightarrow REC}=0.35, p<0.001$; $\beta^{REC \rightarrow PTSS}=0.25, p<0.001$) can be considered equal and not equal to zero (models C1 and D1).

[Figure 2]

[Table 3]

3.3. Cross-lagged models PTE intermediate term subgroup

Fig. 2 shows the same structural model for the intermediate term subgroup, and the lower part of Table 3 contains the model fit of all models (A2 to D2). Again, the model fit of the unconstrained model (model A2) is excellent ($\chi^2(4)=3.625, p=0.459$). The competing model B2 shows that the model fit does not worsen significantly if both cross-lagged paths were constrained to be equal ($\beta^{PTSS>REC}=0.22, p<0.001$; $\beta^{REC>PTSS}=0.09, p=0.127$). However, competing model C2 shows that the model fit worsens if the cross-lagged path PTSS to Recognition was constrained to be equal to zero. This was not the case for model D2 where the cross-lagged path Recognition to PTSS was constrained to be zero.

3.4. Comparisons paths of short term and intermediate term subgroups

The model fit and model comparison between both subgroups are presented in Table 4. The results of competing model B3 shows that constraining the cross-lagged path PTSS to Recognition to be equal among both subgroups did not worsen the model fit indicating that the strength of this path among the short term subsample ($\beta^{PTSS>REC}=0.35$) can be considered equal to the strength of this path among the intermediate term subsample ($\beta^{PTSS>REC}=0.22$). In contrast, the constrained model B4 did worsen the fit ($p=0.030$) indicating that the path Recognition to PTSS was indeed stronger in the short term (short term $\beta^{REC>PTSS}=0.25$ versus intermediate term $\beta^{REC>PTSS}=0.09$). The results of competing model B5 indicate that, as could be expected, the combined cross-lagged paths differed between the short term and intermediate term subgroup. With respect to the autoregressive paths, the results of competing models E3, E4 and E5 show that the autoregressive paths for PTSS and Recognition can be considered equal between both subgroups: constraining the path did not worsen the model fit. Finally, the results of competing model F show that the combined autoregressive and cross-lagged paths differed between both sub-samples, confirming that the causal models are different between the two subgroups. In summary, the cross-lagged association between Recognition at T2 and PTSS at T3 was no longer significant in the intermediate term, in contrast to the association between PTSS at T2 and Recognition at T3 in the intermediate term.

4. Discussion

To the best of our knowledge, this is the first population-based study examining the longitudinal interplay between PTSD symptomatology and social recognition among adults who were affected by potentially traumatic events recently (short term; in the past 0–2 months) and longer ago (intermediate term; in the past 5–12 months). In this study we focused on victims of 1.) burglary, theft and fraud, 2.) (traffic) accidents, and 3.) serious threat and physical (sexual) violence.

The results of the structural equation modeling (SEM) show a clear pattern. In the short term, victims with relatively higher levels of event related social recognition had lower levels of PTSD symptomatology 6 months later than those with lower levels of social recognition. This finding is in line with previous studies suggesting that social recognition may serve as a protector against mental health problems (Forstmeier et al., 2009; Kuwert et al., 2014; Thormar et al., 2016; Xu et al., 2016). However, the SEM analysis showed a clear negative reciprocal relationship as well: those with high levels of PTSD symptomatology received less social recognition 6 months later than victims with low PTSD symptom levels. This finding is in line with other research that points to the presence of social selection, i.e. that PTSD symptomatology may erode social support and in this case social recognition (Clapp and Beck, 2008; Ehlers and Clark, 2000; Köhler et al., 2018; Nickerson et al., 2017; Platt et al., 2016; Ullman and Relyea, 2016; van der Velden et al., 2018b). A similar eroding effect of PTSD

symptomatology has been found with respect to coping self-efficacy (Bosmans and van der Velden, 2017). The constrained models showed that the longitudinal bidirectional relationships in the short term were equal in strength (see model B1).

[Table 4]

The patterns in the intermediate term differ from the short term patterns. Victims with higher levels of social recognition are no longer less at risk for higher PTSD symptom levels 6 months after baseline than those with lower levels of social recognition. In other words: in the intermediate term, social recognition no longer protects against PTSD symptomatology 6 months after baseline while high PTSD symptom levels are still related to lower social recognition levels 6 months later. The constrained models demonstrate that the cross-lagged relationships are no longer bidirectional (see model B2). Comparisons of the short and intermediate term models confirm these differences. Comparisons of the longitudinal paths furthermore showed that the strengths of the autoregressive paths for PTSS may be considered equal and provided the best fit (see model E3). Altogether, these findings (again) demonstrate the eroding effects of PTSS on social recognition.

As expected, pre-event mental health problems and loneliness were predictive of PTSD symptom levels and/or social recognition. In the short term, PTSS was strongly related to pre-existing mental health but not with pre-event loneliness. In the intermediate term, both effects appear equally strong. Findings suggest that loneliness becomes more detrimental over time as PTSS persists. This is in line with previous research indicating that post-event loneliness is dependent on PTSS levels (van der Velden et al., 2018b). The fact that pre-event mental health problems were predictive of social recognition, especially in the short term, may signify that these were already eroding social support, resulting in less available social recognition even shortly after the potentially traumatic event.

4.1. Strengths and limitations

Our 4-wave study is based on a large representative national sample of the Dutch adult population with high response rates (above 82%) at each survey. The LISS panel enabled us to take into account existing mental health problems and loneliness levels that were not collected retrospectively, i.e. were not based on memories that are sensitive to recall bias. The model fit of the final structural equation models was excellent. We used validated questionnaires but did not conduct clinical interviews to assess PTSD symptomatology, which would have further strengthened our study. Although we were able to make a distinction between the short and intermediate term cross-lagged relationships between PTSD symptomatology and social recognition, the PTSD symptomatology and social recognition assessments were limited to two assessments. In addition, the time interval between the two assessments was 6 months and we were not able to examine the crosslagged relationships in a shorter time-interval. Furthermore, we have no information about possible experiences of potentially traumatic events between the two PTSD symptomatology and social recognition assessments. We therefore could not examine if or how these possible events influenced the cross-lagged relationships between our study variables. Finally, feelings of shame may hinder the victim in disclosing the specific event to their social environment or may limit disclosure to a limited number of persons in the social environment. This may impact social recognition or the relationship between social recognition and PTSD symptoms. Due to the sample size and absence of data about possible event-related feelings of shame, we could not examine to what extent the longitudinal interplay between PTSD symptoms and social recognition differs between shame-related and non-shame related potentially traumatic events (cf. Maercker and Horn, 2013; Taylor, 2015).

5. Conclusions

According to the results of the present study, social recognition during the first months after potentially traumatic events enhances the psychological recovery of victims, i.e. is related to lower PTSD symptom levels at later stages. However, the positive effects of social recognition on PTSD symptom levels 6 months later disappear in the intermediate term, suggesting that it is critical to offer social recognition during the first months (at least). The relevance of early social recognition in contrast to social recognition long after the event was previously demonstrated by Maercker et al. (2016), where social acknowledgment as a WWII victim many years after the war was associated with an increase in depressive symptoms 20 months after the baseline assessment. We found no indications that social recognition in the intermediate term played a direct positive role in the further development of PTSD symptom levels, although social recognition or validation of thoughts and feelings may in itself be important for victims (cf. Ahrens et al., 2009; Trotter and Allen, 2009).

Another important issue is the eroding effect of higher PTSD symptoms levels on social recognition in the short and intermediate term. This eroding pattern was also observed in other studies showing that PTSD symptomatology has a negative effect on social support (cf. Kaniasty and Norris, 2008), loneliness (cf. van der Velden and Bruijine, 2018), coping self-efficacy (Bosmans and van der Velden, 2017), and physical health (cf. van den Berg et al., 2008; Hori and Kim, 2019). It is unclear whether and if so which factors play a mediating role in these relationships. With respect to social recognition, it may be that victims with PTSD symptomatology are more inclined to withdraw from the social environment, contributing to a lack of social recognition. Future studies on possible mediating factors are warranted.

Nevertheless, our results may be viewed as a signal that the eroding effects of PTSD symptomatology on social recognition are part of a broader problem, i.e. that PTSD symptomatology may erode important resources such as social support and relations, social recognition, coping self-efficacy and health (cf. Hobfoll, 1989, 2002). Possible interventions to reduce the eroding effect should therefore not be limited to and aimed at only one resource such as social recognition. This raises the practical and important question how this can be achieved. What can or must the social environment, victims and professionals do, from this perspective? Offering treatment to victims who continue to suffer from PTSD symptomatology for months is an important measure but, given the fact that many PTSD patients fail to recover (Bradley et al., 2005) or are reluctant to seek help, presumably not enough. A possible starting point could be creating a broader awareness among victims, their social environment, and professionals such as general practitioners and victim support organizations of the eroding effects of PTSD symptomatology.

Declaration of Competing Interest

None.

Acknowledgment

This study is part of the longitudinal Victims in Modern Society (VICTIMS) study, granted by the VictimSupport Foundation (Fonds Slachtofferhulp), The Netherlands.

References

- Ahrens, C.E., Campbell, R., Ternier-Thames, K.N., Wasco, S.M., Sefl, T., 2007. Deciding whom to tell: expectations and outcomes of rape survivors' first disclosures. *Psychol. Women Q.* 31, 38–49. <https://doi.org/10.1111/j.1471-6402.2007.00329.x>.

- Ahrens, C.E., Cabral, G., Abeling, S., 2009. Healing or hurtful: sexual assault survivors' interpretations of social reactions from support providers. *Psychol. Women Q.* 33, 81–94. <https://doi.org/10.1111/j.1471-6402.2008.01476.x>.
- American Psychiatric Association, 2013. *Diagnostic and Statistical Manual of Mental Disorders*, (Fifth edition). American Psychiatric Association, Washington, DC.
- Berg, B.v.d., Grievink, L., van der Velden, P.G., Yzermans, C.J., Stellato, R.K., Leuret, E., Brunekreef, B., 2008. Risk factors for physical symptoms after a disaster: a longitudinal study. *Psychol. Med.* 38, 499–510. <https://doi.org/10.1017/S003329170700133X>.
- Bosmans, M.W.G., van der Velden, P.G., 2017. Cross-lagged associations between posttraumatic stress symptoms and coping self-efficacy in long-term recovery: a fourwave comparative study. *Soc. Sci. Med.* 193, 33–40. <https://doi.org/10.1016/j.socscimed.2017.09.040>.
- Bradley, R., Greene, J., Russ, E., Dutra, L., Westen, D., 2005. A multidimensional metaanalysis of psychotherapy for PTSD. *Am. J. Psychiatry* 162, 214–227. <https://doi.org/10.1176/appi.ajp.162.2.214>.
- Bronner, M.B., Peek, N., De Vries, M., Bronner, A.E., Last, B.F., Grootenhuis, M.A., 2009. A community-based survey of posttraumatic stress disorder in the Netherlands. *J. Trauma. Stress.* 22, 74–78. <https://doi.org/10.1002/jts.20379>.
- Clapp, J.D., Beck, J.G., 2008. Understanding the relationship between PTSD and social support: the role of negative network orientation. *Behav. Res. Ther.* 47, 237–244. <https://doi.org/10.1016/j.brat.2008.12.006>.
- de Vries, G.J., Olf, M., 2009. The lifetime prevalence of traumatic events and posttraumatic stress disorder in the Netherlands. *J. Trauma. Stress* 22, 259–267. <https://doi.org/10.1002/jts.20429>
- Ehlers, A., Clark, D.M., 2000. A cognitive model of posttraumatic stress disorder. *Behav. Res. Ther.* 38, 319–345. <https://doi.org/10.1016/S0005-79679900123-0>.
- Forstmeier, S., Kuwert, P., Spitzer, C., Freyberger, H.J., Maercker, A., 2009. Posttraumatic growth, social acknowledgment as survivors, and sense of coherence in former German child soldiers of World War II. *Am. J. Geriatr. Psychiatry* 17, 1030–1039. <https://doi.org/10.1097/JGP.0b013e3181ab8b36>.
- French, S.L., 2003. Reflections on healing: framing strategies utilized by acquaintance rape survivors. *J. Appl. Communicat. Res.* 31, 209–319. <https://doi.org/10.1080/1369681032000132573>.
- Greenberg, S., Rosenblum, K.L., McInnis, M.G., Muzik, M., 2014. The role of social relationships in bipolar disorder: a review. *Psychiatry Res* 219, 248–254. <https://doi.org/10.1016/j.psychres.2014.05.047>.
- Hobfoll, S.E., 1989. Conservation of resources a new attempt at conceptualizing stress. *Am. Psychol.* 44, 513–524 <https://doi.org/10.1037/0003-066x443513>.
- Hobfoll, S.E., 2002. Social and psychological resources and adaptation. *Rev. Gen. Psychol.* 6, 307–324 <https://doi.org/10.1037/1089-268064307>.
- Holt-Lunstad, J., 2018. Why social relationships are important for physical health: a systems approach to understanding and modifying risk and protection. *Ann. Rev. Psychol.* 69, 437–458. <https://doi.org/10.1146/annurev-psych-122216-011902>.
- Holt-Lunstad, J., Smith, T.B., Layton, J.B., 2010. Social relationships and mortality risk: a meta-analytic review. *PLoS Med* 7, e1000316 <https://doi.org/10.1371/journal.pmed.1000316>.
- Hori, H., Kim, Y., 2019. Inflammation and posttraumatic stress disorder. *Psychiatry Clin. Neurosci.* <https://doi.org/10.1111/pcn.12820>.
- Hu, L.-t., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Model* 6, 1e55. <https://doi.org/10.1080/10705519909540118>.
- Jaffe, A.E., DiLillo, D., Hoffman, L., Haikalis, M., Dykstra, R.E., 2015. Does it hurt to ask? A meta-analysis of participant reactions to trauma research. *Clinic. Psychol. Rev* 40, 40–56. <https://doi.org/10.1016/j.cpr.2015.05.004>.

- Jones, B., Müller, J., Maercker, A., 2006. Trauma and posttraumatic reactions in German development aid workers: prevalences and relationship to social acknowledgement. *Int. J. Soc. Psychiatry* 52, 91–100. <https://doi.org/10.1177/0020764006061248>.
- Jong Gierveld, J.d., Tilburg, T.G.v., 1999. *Manual of the Loneliness Scale*, Department of Social Research Methodology ISBN 90-9012523-X. VU University, Amsterdam.
- Jong Gierveld, J.d., Tilburg, T.G.v., 2006. A 6-item scale for overall, emotional, and social loneliness confirmatory tests on survey data. *Res. Aging* 28, 582–598. <https://doi.org/10.1177/0164027506289723>.
- Kaniasty, K., Norris, F.H., 2008. Longitudinal linkages between perceived social support and posttraumatic stress symptoms: sequential roles of social causation and social selection. *J. Traum. Stress* 21, 274–281. <https://doi.org/10.1002/jts.20334>.
- Kawachi, I., Berkman, L.F., 2001. Social ties and mental health. *J. Urban Health* 78, 458–467. <https://doi.org/10.1093/jurban/78.3.458>.
- Kelly, M.E., Duff, H., Kelly, S., McHugh Power, J.E., Brennan, S., Lawlor, B.A., Loughrey, D.G., 2017. The impact of social activities, social networks, social support and social relationships on the cognitive functioning of healthy older adults: a systematic review. *Syst. Rev.* 6, 259. <https://doi.org/10.1186/s13643-017-0632-2>.
- Kern, S.M., Stacy, S.E., Kozina, R.M., Ripley, A.J., Clapp, J.D., 2019. Exploring the relation between posttraumatic stress disorder and interpersonal outcomes: the role of social acknowledgment and trauma type. *J. Clin. Psychol.* 75, 132–145. <https://doi.org/10.1002/jclp.22693>.
- Köhler, M., Schäfer, H., Goebel, S., Pedersen, A., 2018. The role of disclosure attitudes in the relationship between posttraumatic stress disorder symptom severity and perceived social support among emergency service workers. *Psychiatry Res* 270, 602–610. <https://doi.org/10.1016/j.psychres.2018.10.049>.
- Krammer, S., Kleim, B., Simmen-Janevska, K., Maercker, A., 2016. Childhood trauma and complex posttraumatic stress disorder symptoms in older adults: a study of direct effects and social-interpersonal factors as potential mediators. *J. Trauma Diss.* 17, 593–607. <https://doi.org/10.1080/15299732.2014.991861>.
- Kuwert, P., Glaesmer, H., Eichhorn, S., Grundke, E., Pietrzak, R.H., Freyberger, H.J., Klauer, T., 2014. Long-term effects of conflict-related sexual violence compared with non-sexual war trauma in female World War II survivors: a matched pairs study. *Arch. Sex. Behav.* 43, 1059–1064. <https://doi.org/10.1007/s10508-014-0272-8>.
- Lis-Turlejska, M., Szumiał, S., Drapała, I., 2018. Posttraumatic stress symptoms among Polish World War II survivors: the role of social acknowledgement. *Eur. J. Psychotraumatol.* 26 (91), 1423831. <https://doi.org/10.1080/20008198.2018.1423831>.
- Maercker, A., Horn, A.B., 2013. A socio-interpersonal perspective on PTSD: the case for environments and interpersonal processes. *Clinic. Psychol. Psychother.* 20, 465–481. <https://doi.org/10.1002/cpp.1805>.
- Maercker, A., Müller, J., 2004. Social acknowledgment as a victim or survivor: a scale to measure a recovery factor of PTSD. *J. Trauma. Stress* 17, 345–351. <https://doi.org/10.1023/B:JOTS.0000038484.15488.3d>.
- Maercker, A., Hilpert, P., Burri, A., 2016. Childhood trauma and resilience in old age: applying a context model of resilience to a sample of former indentured child laborers. *Aging Ment. Health* 20, 616–626. <https://doi.org/10.1080/13607863.2015.1033677>.
- Maercker, A., Povilonyte, M., Lianova, R., Pöhlmann, P., 2009. Is acknowledgment of trauma a protective factor? The sample case of refugees from Chechnya. *Eur. Psychol.* 143, 249–254. <https://doi.org/10.1027/1016-9040.14.3.249>.
- Means-Christensen, A.J., Arnau, R.C., Tonidandel, A.M., Bramson, R., Meagher, M.W., 2005. An efficient method of identifying major depression and panic disorder in primary care. *J. Behav. Med.* 28, 565–572. <https://doi.org/10.1007/s10865-005-9023-6>.

- Mueller, J., Moergeli, H., Maercker, A., 2008. Disclosure and social acknowledgement as predictors of recovery from posttraumatic stress: a longitudinal study in crime victims. *Can. J. Psychiatry* 53, 160–168. <https://doi.org/10.1177/070674370805300306>.
- Mueller, J., Orth, U., Wang, J., Maercker, A., 2009. Disclosure attitudes and social acknowledgement as predictors of posttraumatic stress disorder symptom severity in Chinese and German crime victims. *Can. J. Psychiatry* 54, 547–556. <https://doi.org/10.1177/070674370905400807>.
- Nickerson, A., Creamer, M., Forbes, D., McFarlane, A.C., O'Donnell, M.L., Silove, D., Steel, Z., Felmingham, K., Hadzi-Pavlovic, D., Bryant, R.A., 2017. The longitudinal relationship between post-traumatic stress disorder and perceived social support in survivors of traumatic injury. *Psychol. Med.* 47, 115–126. <https://doi.org/10.1017/S0033291716002361>.
- Platt, J.M., Lowe, S.R., Galea, S., Norris, F.H., Koenen, K.C., 2016. A Longitudinal study of the bidirectional relationship between social support and posttraumatic stress following a natural disaster. *J. Trauma. Stress* 29, 205–213. <https://doi.org/10.1002/jts.22092>.
- Price, M., Szafranski, D.D., van Stolk-Cooke, K., Gros, D.F., 2016. Investigation of abbreviated 4 and 8 item versions of the PTSD Checklist 5. *Psychiatry Res* 239, 124–130. <https://doi.org/10.1016/j.psychres.2016.03.014>.
- Scherpenzeel, A., Das, M., 2011. 'True' longitudinal and probability-based internet panels: evidence from The Netherlands. In: Das, M., Ester, P., Kaczmirek, L. (Eds.), *Social and Behavioral Research and Internet: Advances in Applied Methods and New Research Strategies*. Taylor Francis, Boca Raton, pp. 77–104.
- Schumm, J.A., Koucky, E.M., Bartel, A., 2014. Associations between perceived social reactions to trauma-related experiences with PTSD and depression among veterans seeking PTSD treatment. *J. Trauma. Stress* 27, 50–57. <https://doi.org/10.1002/jts.21879>.
- Shor, E., Roelfs, D., 2015. Social contact frequency and all-cause mortality: a meta analysis and meta-regression. *Soc. Sci. Med.* 128, 76–86. <https://doi.org/10.1016/j.socscimed.2015.01.010>.
- Sommer, J., Hinsberger, M., Holtzhausen, L., Kaminer, D., Seedat, S., Elbert, T., Augsburger, M., Maercker, A., Weierstall, R., 2017. Associations between societal disapproval and changes in symptoms of PTSD and appetitive aggression following treatment among high-risk South African males. *J. Psychotraumatol* 8 (1), 1369831. <https://doi.org/10.1080/20008198.2017.1369831>.
- Southwick, S.M., Morgan, C.A., Rosenberg, R., 2000. Social sharing of Gulf War experiences: association with trauma-related psychological symptoms. *J. Nerv. Ment. Dis.* 188, 695–700.
- Taylor, T.F., 2015. The influence of shame on posttrauma disorders: have we failed to see the obvious? *Eur. J. Psychotraumatol.* 22 (6), 28847. <https://doi.org/10.3402/ejpt.v6.28847> eCollection 2015.
- Thormar, S.B., Sijbrandij, M., Gersons, B.P., Van de Schoot, R., Juen, B., Karlsson, T., Olff, M., 2016. PTSD Symptom trajectories in disaster volunteers: the role of self-efficacy, social acknowledgement, and tasks carried out. *J. Trauma. Stress* 29, 17–25. <https://doi.org/10.1002/jts.22073>.
- Trotter, J.L., Allen, N.E., 2009. The good, the bad, and the ugly: domestic violence survivors' experiences with their informal social networks. *Am. J. Com. Psychol.* 43, 221–231. <https://doi.org/10.1007/s10464-009-9232-1>.
- Ullman, S.E., Relyea, M., 2016. Social support, coping, and posttraumatic stress symptoms in female sexual assault survivors: a longitudinal analysis. *J. Trauma. Stress* 29, 500–506. <https://doi.org/10.1002/jts.22143>.
- van der Velden, P.G., Bosmans, M.W.G., Scherpenzeel, A.C., 2013. The burden of research on trauma for respondents: a prospective and comparative study on respondents evaluations and predictors. *PLoS One* 8(10), e77266. <https://doi.org/10.1371/journal.pone.0077266>.
- van der Velden, P.G., Buijine, M. de, 2018. Dutch version of the social acknowledgment questionnaire SAQ. CentERdata: Tilburg.

- van der Velden, P.G., Kleber, R.J., Komproe, I., 2018a. Dutch 8-item version PCL-5. CentERdata: Tilburg/ Utrecht University: Utrecht.
- van der Velden, P.G., Pijnappel, B., van der Meulen, E., 2018b. Potentially traumatic events have negative and positive effects on loneliness, depending on PTSD-symptoms levels. Evidence from a population-based prospective comparative study. *Soc. Psychiatry Psychiatr. Epidemiol.* 53, 195–206. <https://doi.org/10.1007/s00127-017-1476-8>.
- Wagner, B., Keller, V., Knaevelsrud, C., Maercker, A., 2012. Social acknowledgement as a predictor of post-traumatic stress and complicated grief after witnessing assisted suicide. *Int. J. Soc. Psychiatry* 58, 381–385. <https://doi.org/10.1177/0020764011400791>.
- Ware, J.E., Sherbourne, C.D., 1992. The MOS 36-item short-form health survey, SF-36: conceptual framework and item selection. *Med. Care* 30, 473–483.
- Weathers, F.W., 2008. Posttraumatic stress disorder checklist. In: Reyes, G., Elhai, J.D., J.D (Eds.), *Encyclopedia of Psychological Trauma*. Wiley, Hoboken, NJ, pp. 491–494.
- Xu, W., Wang, J., Wang, Z., Li, Y., Yu, W., Xie, Q., He, L., Maercker, A., 2016. Web-based intervention improves social acknowledgement and disclosure of trauma, leading to a reduction in posttraumatic stress disorder symptoms. *J. Health Psychol.* 21, 2695–2708. <https://doi.org/10.1177/1359105315583371>.

Tables and figures

Table 1. Characteristics of PTE short term and PTE intermediate term subgroups.

	Short term group (N = 229)		Interm.term Group (N = 229)		χ^2	Df	P
	n	(%)	n	(%)			
Sex							
Men	114	(49.8)	113	(49.3)	0.009	1	0.926
Women	115	(50.2)	116	(50.7)			
Employed							
Yes	97	(42.4)	104	(45.4)	0.434	1	0.510
No	132	(57.6)	125	(54.6)			
Living together (married)							
Yes	131	(57.2)	134	(58.5)	0.081	1	0.776
No	98	(42.8)	95	(41.5)			
Education level							
Primary educ./preparatory intermediate vocational educ.	40	(17.5)	30	(13.1)	3.655	5	0.455
Higher general secondary/pre-university educ.	17	(7.4)	13	(5.7)			
Intermediate professional educ.	50	(21.8)	61	(26.6)			
Higher professional educ.	76	(33.2)	72	(31.4)			
University	46	(20.1)	53	(23.1)			
Background							
Dutch origin	165	(72.1)	160	(69.9)	2.221	3	0.528
West European	22	(9.6)	31	(13.5)			
Non-Western	27	(11.8)	27	(11.8)			
Unknown	15	(6.6)	11	(4.8)			
Age							
18–34	67	(29.3)	67	(29.3)	0.372	3	0.946
35–49	50	(21.8)	49	(41.4)			
50–64	64	(27.9)	69	(30.1)			
65 and older	48	(21.0)	44	(19.2)			
PTE							
Burglary, theft and fraud (ref.)	80	(34.9)	80	(34.9)	0.000	2	1.000
Accident	75	(32.8)	75	(32.8)			
Threat and physical (sexual) violence	74	(32.3)	74	(32.3)			
	M	(SD)	M	(SD)	t	Df	P
Loneliness scores T1 ^a	15.7	(2.85)	15.1	(3.16)	1.73	301	0.084
Mental health problems scores T1 ^b	11.9	(4.43)	12.6	(4.87)	-1.25	303	0.212
PTSS scores T2	13.1	(6.39)	14.3	(7.63)	-1.856	441.9	0.064
PTSS scores T3	13.0	(6.82)	13.2	(6.64)	-0.200	368	0.839
Social recognition scores T2	10.0	(4.34)	10.7	(4.84)	-1.557	428.3	0.120
Social recognition scores T3	11.0	(4.70)	10.8	(4.89)	0.253	368	0.800

Educ. = Education. PTSS = PTSD symptom severity. Interm. term group = intermediate term group affected by potentially traumatic event 5–12 months ago (i.e. before baseline PTSS and Recognition assessment). Time between baseline and follow-up PTSS and Recognition assessments was 6 months.

Figure 1. Structural model for PTE short-term subgroup (N=229)

The (standardized) coefficients presented in the figure are the coefficients for the unconstrained model. Thick black lines mark significant associations ($p < 0.05$) and thin gray lines mark nonsignificant associations. PTSS=PTSD symptom severity. Short-term subgroup=affected by potentially traumatic event 0–2 months ago (i.e. before baseline PTSS and Recognition assessment). Time between baseline and follow-up PTSS and Recognition assessments was 6 months. Time between event and baseline was 0–2 months.

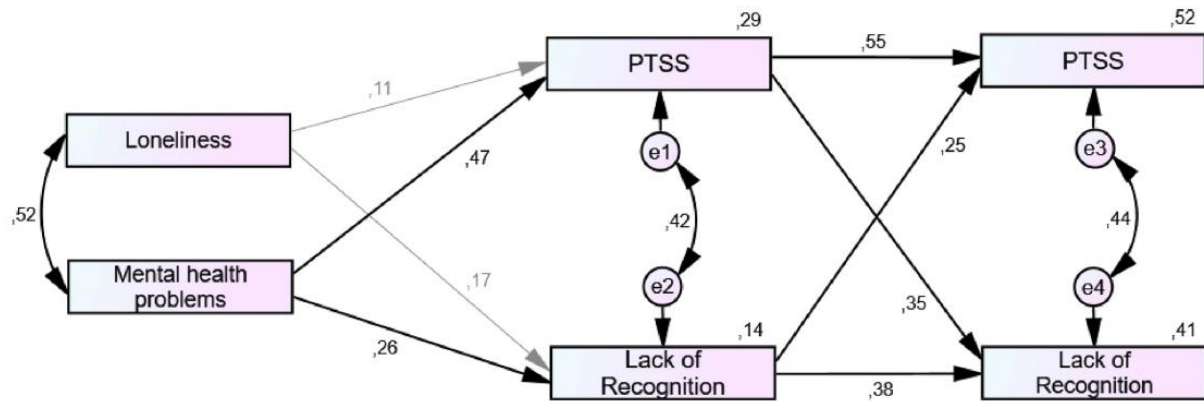


Table 2 Intercorrelation study variables.

	1	2	3	4	5	6
1 Loneliness T1 ^a	1	0.518***	0.405***	0.322***	0.226**	0.223*
2 Mental Health Problems T1 ^b	0.520***	1	0.411***	0.395***	0.264**	0.333***
3 PTSS T2	0.350***	0.546***	1	0.808***	0.677***	0.613***
4 PTSS T3	0.338***	0.468***	0.674***	1	0.582***	0.661***
5 Recognition T2	0.334***	0.391***	0.514***	0.512***	1	0.720***
6 Recognition T3	0.295**	0.444***	0.534***	0.675***	0.533***	1

Under diagonal: intercorrelations short term. Above diagonal: intercorrelations intermediate term. PTSS = PTSD symptom severity.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

Figure 1 Structural model for intermediate term subgroup (N=229)

The (standardized) coefficients presented in the figure are the coefficients for the unconstrained model. Thick black lines mark significant associations ($p < 0.05$) and thin gray lines mark nonsignificant associations. PTSS=PTSD symptom severity. Intermediate term subgroup=affected by potentially traumatic event 5–12 months ago (i.e. before baseline PTSS and Recognition assessment). Time between baseline and follow-up PTSS and Recognition assessments was 6 months. Time between event and baseline was 5–12 months.

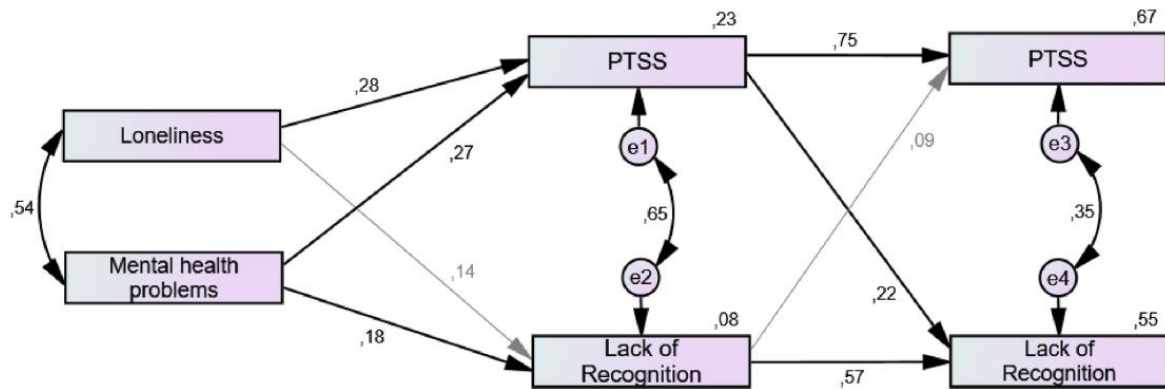


Table 3 Model fit and model comparisons for the PTE short-term and PTE intermediate term subgroups.

Model	χ^2 total	Df	P	$\Delta \chi^2$	Df	P	CFI	NFI	AIC	RMSEA	(CI RMSEA)
Short-term											
Model A1 (unconstrained)	6.700	4	0.153	–	–	–	0.993	0.984	52.700	0.054	(0.000–0.124)
Model B1 (REC→PTSS and PTSS→REC are equal)	8.019	5	0.155	1.319	1	0.251	0.993	0.981	52.019	0.051	(0.000–0.114)
Model C1 (PTSS→REC equal 0)	30.500	5	0.000	23.800	1	0.000	0.937	0.929	74.500	0.150	(0.150–0.101)
Model D1 (REC→PTSS equal 0)	21.768	5	0.001	15.067	1	0.000	0.959	0.949	65.768	0.121	(0.072–0.176)
Intermediate term											
Model A2 (unconstrained)	3.625	4	0.459	–	–	–	1.000	0.994	49.625	0.000	(0.000–0.096)
Model B2 (REC→PTSS and PTSS→REC are equal)	3.665	5	0.599	0.040	1	0.841	1.000	0.994	47.665	0.000	(0.000–0.078)
Model C2 (PTSS→REC equal 0)	14.011	5	0.016	10.386	1	0.001	0.984	0.977	58.011	0.089	(0.035–0.146)
Model D2 (REC→PTSS equal 0)	5.985	5	0.308	2.360	1	0.124	0.998	0.990	49.985	0.029	(0.000–0.100)

AUTO = autoregressive path. REC = Social recognition. PTSS = PTSD symptom severity. CFI = comparative fit index. NFI = normed fit index. AIC = Akaike Information Criterion. RMSEA = root mean square error.

Table 4 Model fit and model comparisons between the PTE short-term and PTE intermediate term subgroups.

Model	χ^2 total	Df	P	$\Delta \chi^2$	Df	P	CFI	NFI	AIC	RMSEA	(CI RMSEA)
Model A3 (unconstrained)	10.325	8	0.243	–	–	–	0.998	0.990	102.325	0.025	(0.000–0.064)
Model B3 (PTSS→REC equal)	13.375	9	0.146	3.05	1	0.081	0.996	0.987	103.375	0.033	(0.000–0.067)
Model B4 (REC→PTSS equal)	15.049	9	0.090	4.724	1	0.030	0.994	0.985	105.049	0.038	(0.000–0.071)
Model B5 (B3 and B4 combined)	20.488	10	0.025	10.163	2	0.006	0.989	0.980	108.488	0.048	(0.016–0.078)
Model E3 (AUTO PTSS equal)	10.798	9	0.290	0.473	1	0.491	0.998	0.989	100.798	0.021	(0.000–0.059)
Model E4 (AUTO REC equal)	12.845	9	0.170	2.52	1	0.112	0.996	0.987	102.845	0.031	(0.000–0.065)
Model E5 (AUTO REC and AUTO PTSS equal)	14.038	10	0.171	3.713	2	0.156	0.996	0.986	102.038	0.030	(0.000–0.063)
Model F (B5 and E5 combined)	23.388	12	0.025	12.870	4	0.011	0.988	0.984	107.388	0.046	(0.000–0.073)

AUTO = autoregressive path. REC = Social recognition. PTSS = PTSD symptom severity. CFI = comparative fit index. NFI = normed fit index. AIC = Akaike Information Criterion. RMSEA = root mean square error.