Master's Thesis

Validation of the Dutch Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) after Losing a Loved One during the Plane Crash with Flight MH17

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Abstract

Introduction

The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5) is a self-report questionnaire measuring symptoms of a posttraumatic stress disorder (PTSD). So far, the Dutch PCL-5 has only been validated once and there is no validation of the PCL-5 targeting traumatically bereaved individuals. This study aimed to assess the psychometric properties of the Dutch translation of the PCL-5 for individuals that experienced a traumatic loss.

Methods

The analysis was performed with a sample of 139 individuals that lost a loved one during the MH17 plane crash in Ukraine in 2014. The data were examined for probable caseness, internal consistency, convergent validity, known-groups validity, and optimal clinical cut-off score.

Results

All items of the PCL-5 as well as its separate subscales demonstrated a good or excellent internal consistency (PCL-5: α = .93; subscales: $\alpha \geq .82$). Significant associations between PCL-5 scores, major depressive disorder (MDD), and prolonged grief disorder (PGD) suggest an acceptable convergent validity. Differences in PCL-5 sum scores were found in terms of gender and education. No differences were found depending on the time since loss (in months) and the form of kinship to the deceased. The optimal clinical cut-off for the PCL-5 was ≥24.

Discussion

Overall, this study demonstrated a good reliability and validity of the PCL-5 to measure PTSD symptomatology in people that lost a loved one in the plane crash. Still, more research is needed on the Dutch PCL-5 and the PCL-5 in general regarding the target group of traumatically bereaved individuals to get more insights into the reliability and validity of this

measurement. One suggestion for further research could be to examine the test-retest reliability.

Keywords: bereaved people, posttraumatic stress disorder checklist for DSM-5, psychometric properties, MH17 crash

Introduction

On 17 July 2014, the passenger plane Malaysia Airlines Flight MH17 crashed on its way from Amsterdam to Kuala Lumpur in Ukraine. This tragedy was especially shocking as the plane did not crash because of an accident, but it was shot down "from an area which was controlled by Russian-backed separatists" (Jong et al., 2016, p. 286). Within this plane crash, all 298 people on board lost their lives, 283 passengers and 15 crew members (Jong et al., 2016). This led not only to severe international political conflicts but also had the consequence that hundreds of people violently lost a loved person, a relative, or a friend (Yzermans et al, 2020). In general, homicidally bereaved individuals are significantly more likely to experience posttraumatic stress disorder (PTSD) symptoms than other bereaved people (van Denderen et al., 2016). A study of bereaved parents by Murphy et al. (2003) demonstrated that 27.7% of the mothers and 12.6% of the fathers had PTSD five years after the violent death of their child.

PTSD is a mental disorder that may develop after the experience of a traumatic event, like actual or threatened death (cluster A). According to the Diagnostic and Statistical Manual of Mental disorders–fifth edition (DSM-5) the individual does not necessarily have to be the person experiencing the traumatic situation himself or herself. It may also be that he or she witnesses how it happens to another person or learns that a close friend or family member experienced actual or threatened, violent or accidental death (North et al., 2016). PTSD consists of four symptomatic clusters 'intrusions' (cluster B), 'avoidance' (cluster C), 'negative alterations in cognitions and moods' (cluster D), and 'negative alterations in arousal' (cluster E) (North et al., 2016). To get a PTSD diagnosis one A, one B, two C, and two D cluster symptoms must be experienced (Blevins et al., 2015) and they must be present for at least one month (North et al., 2016). Previous research found strong positive correlations between PTSD symptom severity, symptoms of major depressive disorder

(MDD) and prolonged grief disorder (PGD) (Bovin et al., 2016; Maercker & Znoj, 2010; Maercker & Lalor, 2022).

Some groups in society seem to differ in their likelihood of developing PTSD. Murphy et al. (2003) found that women are more likely to experience PTSD symptoms than men. Additionally, people with a relatively lower education seem to be at a higher risk to experience PTSD symptoms than people with higher education (Cacciatore et al., 2016). Another factor that was found to influence the likelihood of developing PTSD symptoms is the type of kinship to the deceased. Parents and spouses are more likely to experience elevated PTSD levels compared to people with another form of relationship to the deceased (van Denderen et al., 2016). Finally, the more recent a traumatic event was, the higher is the probability of a person to experience PTSD symptoms (van Denderen et al., 2016).

Murphy et al. (1999) found that persistent PTSD symptoms of bereaved parents led to several consequences, from decreased health and poor adjustment to poor job performance due to decreased productivity and more absence from work (Murphy et al., 1999). Additionally, decreased self-esteem and self-efficacy are consequences of PTSD. These consequences are of special importance, as in the long term they may lead to anxiety, depression, hopelessness, and even suicidal ideation (Murphy et al., 1999).

The number and severity of the consequences of having PTSD after losing a loved one underline the importance of having a reliable instrument to be able to confidently assess the PTSD symptomatology so that adequate treatment can be provided. The most common instrument to measure PTSD levels is the posttraumatic stress disorder checklist (PCL), which was originally based on the diagnostic categories of the Diagnostic and Statistical Manual of Mental disorders–fourth edition (DSM-IV) (Van Praag et al., 2020). The updated version of the PCL is the PCL-5 questionnaire which includes some changes in accordance with the DSM-5 and was translated into multiple languages (Van Praag et al., 2020). The PCL-5 is a

questionnaire of 20 items including the 4 symptomatic clusters of PTSD as defined in the DSM-5 (Blevins et al., 2015). The sum scores of all items are calculated so that a symptom severity score between 0 and 80 can be obtained (Blevins et al., 2015). Current research, based on non-bereaved trauma samples, suggests a cut-off score of 31-33 to be indicative of a PTSD diagnosis (Bovin et al., 2016; Ashbaugh et al., 2016; van der Meer et al., 2017). However, so far this cut-off has not been validated for individuals that experienced a traumatic loss of a loved one.

The psychometric properties of the Dutch translation of the PCL-5 have not been widely evaluated yet (Van Praag et al., 2020). However, the English version of the PCL-5 indicates a strong positive correlation to the *Clinician-Administered PTSD scale* (CAPS) (Morrison et al., 2021). The CAPS is a structured clinical interview that is described to be the current gold standard for PTSD diagnostics (Morrison et al., 2021). Surveys could be more beneficial than interviews because they are less expensive and easier to administer when using them for larger populations (Aalto et al., 2012). Additionally, they are more time-efficient and less prone to bias than interview diagnostics like the CAPS (Phellas et al., 2011). Thus, it is important to validate the Dutch PCL-5 in traumatically bereaved people because it may provide clinicians and researchers with an additional efficient way to assess PTSD levels in this target group.

The PCL-5 is widely used and shows good reliability and validity in various trauma samples and in different languages (Bovin et al., 2016; Blevins et al., 2015; Krüger-Gottschalk et al., 2017; Ashbaugh et al., 2016). However, there is little evidence for the psychometric properties of the Dutch translation of the PCL-5. So far, the study by Van Praag et al. (2020) is the only one testing the validity of the Dutch PCL-5. In this study, a sample of people with a traumatic brain injury was examined. The results showed that for this target group the PCL-5 has an “excellent internal consistency and reliability and high criterion

validity" (Van Praag et al., 2020, p. 8). Additionally, Van Praag et al. (2020) underlined a close similarity of their results with those of studies in other countries testing the psychometric properties of the PCL-5 such as Ashbaugh et al. (2016).

So far, according to the researcher's knowledge, there are no scientific studies of the PCL-5's validity and reliability focusing on the target group of traumatically bereaved individuals or bereaved people in general. A study by Blevins et al. (2015) includes 40 individuals who experienced an accidental or sudden violent loss of a loved one in an American sample and reported excellent reliability and validity. However, since also other causes of trauma were included (n = 278), these results do not completely represent this target group (Blevins et al., 2015). The PCL-5 should be further evaluated with the target group of people who have violently lost a loved one, to ensure that PTSD levels of this group can be measured in a valid and reliable manner (Van Praag et al., 2020).

The fact that the Dutch PCL-5 has only been validated once and there is no research on the PCL-5 targeting traumatically bereaved individuals, implies that further research is needed in this field. This is the case to ensure that the questionnaire is a credible instrument to reliably measure PTSD symptoms in Dutch-speaking traumatically bereaved people. Having a reliable measurement instrument is of relevance for clinical purposes, as it may support the clinician in giving a correct diagnosis, which is needed to give the client adequate treatment. Also, valid measurements are necessary for research purposes as they enable the evaluation of the consequences of a certain event, ensure comparability with research results of other countries and allow the generalizability of research results.

Due to the lack of research on the Dutch translation of the PCL-5, this present study aimed to investigate its psychometric properties for individuals who lost a significant other through a plane crash. Based on previous research, the PCL-5 was expected to be a reliable measurement instrument for PTSD symptoms of individuals that lost a loved one in the

MH17 crash (Van Praag et al., 2020). Therefore, items of the PCL-5 were expected to show a good internal consistency (Cronbach's alpha > .80) (J. A. Gliem & R. R. Gliem, 2003). Moreover, it was expected that the PCL-5 strongly correlates with measurements of MDD and PGD in traumatically bereaved individuals ($r > .5$), as these concepts overlap with PTSD indicating an acceptable convergence validity (Bovin et al., 2016; Maercker & Lalor, 2022). It was anticipated that the PCL-5 is capable to distinguish differences in severity levels of PTSD symptoms based on background variables in traumatically bereaved individuals. PTSD levels were expected to be higher for women than men (Murphy et al., 2003) and relatively lower educated people, compared to those having higher education (Cacciatore et al., 2016). Also, PCL-5 scores were expected to be relatively higher for more recently bereaved individuals, compared to those who are less recently bereaved (van Denderen et al., 2016). The type of relationship with the deceased person was also expected to influence the severity of PTSD symptoms, parents and spouses were expected to score relatively higher on the PCL-5 than other relatives of a victim (van Denderen et al., 2016). An additional aim of the study was to determine the optimal cut-off of the PCL-5 to distinguish people meeting the criteria for PTSD and those not meeting them within the target group of traumatically bereaved people.

Methods

Design

To test the validity and reliability of the PCL-5, data from the first assessment of a longitudinal study by Lenferink et al. (2017) was used. Thus, a cross-sectional design was chosen. Lenferink et al. (2017) investigated the relationship between the loss of an important other during the MH17 plane crash in 2014 and the presence of psychopathological symptoms. One of the measured psychopathologies in the study was PTSD using the PCL-5 which made the dataset suitable for this study.

Participants

Lenferink et al. (2017) used different recruitment methods for their data collection. One method was contacting a support organization for the bereaved after the plane crash, all 149 members of this organization called “MH17 disaster foundation” got an invitation letter. Additionally, an announcement was included on a webpage showing information about the tragedy that was accessible to about 450 people who lost a loved one due to the crash. The governmental organization “Victim support the Netherlands”, which is giving legal and practical advice to bereaved individuals contacted 166 spokespersons by letter or telephone. Finally, potential participants were approached through “presentations at support organizations and through media attention” (Lenferink et al., 2017, p.3) and those who chose to participate in the study were asked to invite others to do so as well (Lenferink et al., 2017). In total 167 participants completed the survey. Twenty-eight participants had to be excluded because they did not complete the PCL-5. So, 139 people were included in this study. The data collection took place between May 2015 and January 2016, approximately one year after the plane crash (Lenferink et al., 2017).

Procedure

The ethics committee of psychology at the University of Groningen ethically approved this study. The participants completed an online survey or, if preferred, a paper-pencil-version of the survey was sent to them by mail together with a stamped return envelope (Lenferink et al., 2017). The survey included questionnaires measuring different mental processes and demographics of the individuals, as well as the nature of their relation to the person dying during the MH17 crash (Lenferink et al., 2017). All participants gave their informed consent.

Measurement

Among others, the study by Lenferink et al. (2017) included questionnaires to measure PTSD, PGD, and MDD, also questions regarding demographic data and the relation to the bereaved person were included. The relevant questionnaires for the present study are described in the following.

PTSD Checklist for DSM-5

The PCL-5 is a 20-item self-report questionnaire used to measure PTSD symptoms. The questions included in the PCL-5 reflect the diagnostic criteria and symptom clusters of PTSD as described in the DSM-5. A 5-point Likert scale was used with the response options *'not at all' (0), 'a little bit' (1), 'moderately' (2), 'quite a bit' (3),* and *'extremely' (4)* (Weathers et al., 2013). Questions 1-5 measure the criteria of *intrusions*, 6 and 7 measure *avoidance*, questions 8-14 ask for symptoms of *negative alterations in cognitions and mood*, and the last 6 questions measure the *alterations in affect and reactivity* (Wortmann et al., 2016). An example question of the PCL-5 is "in the past month, how much were you bothered by repeated, disturbing dreams of the stressful experience?" (Weathers et al., 2013). The wording of the questions was adapted to the target group thus "the stressful experience" was connected to losing one's loved one due to the plane crash (Lenferink et al., 2020).

PCL-5 sum scores were calculated. In total, a symptom severity score between 0 and 80 could be obtained, with higher sum scores indicating higher levels of PTSD symptoms. Additionally, every item was dichotomized with a score of ≥ 2 indicating that a symptom was endorsed and interpreted using the DSM-5 scoring rule, meaning that at least one B, one C, two D, and two E cluster symptoms were indicative of a PTSD diagnosis (Blevins et al., 2015). To the researcher's knowledge, there is only one study analysing the psychometric properties of the Dutch translation of the PCL-5. Van Praag et al. (2020) reported an excellent Cronbach's alpha of .93 and high criterion validity.

Traumatic Grief Inventory

The traumatic grief inventory (TGI) is an 18-item questionnaire measuring symptoms of PGD and persistent complex bereavement disorder (PCBD) (Boelen & Smid, 2017). Participants were asked to answer the questions on a 5-point Likert scale with the answer possibilities *'never' (1), 'rarely' (2), 'sometimes' (3), 'frequently' (4),* and *'always' (5).* To get an overall score, the sum scores of the participants' answers were calculated, the range of the possible scores was between 18 and 60. An example question of the TGI is "I avoided places, objects or thoughts reminding me of his/her death" (Boelen & Smid, 2017). For participants that experienced multiple losses the instruction was to complete the TGI while thinking of the loss they think about the most and/or the one they feel is the most stressful for them. If participants felt like they could not choose one loss it was also possible to complete the TGI more than once, for every loss they experienced due to the plane crash. In this case, only the TGI with the highest sum score was included in the analysis (Lenferink et al., 2017). The instructions were adapted to the target group from "the death of your loved one" to "the death of your loved one(s) due to the Ukrainian Plane Crash" (Lenferink et al., 2020). In the present study, a Cronbach's alpha of .91 was measured.

Quick Inventory of Depressive Symptomatology

MDD symptoms were measured using the Quick Inventory of Depressive Symptomatology (QIDS). It consists of 16 items that ask the respondent to indicate how frequently a certain symptom is experienced by choosing between four options (0-4) (Rush et al., 2003). The instruction of the questionnaire is "Please circle the one response to each item that best describes you for the past seven days". An example of a symptom that the QIDS asks for is *Concentration/Decision making* with the answer options *"there is no change in my usual capacity to concentrate or make decisions" (0), "I occasionally feel indecisive or find that my attention wanders" (1), "most of the time, I struggle to focus my attention or to make*

decisions" (2), and *"I cannot concentrate well enough to read or cannot make even minor decisions" (3)* (Rush et al., 2003).

The original scoring rule for the QIDS was used in the present study. For the scoring, the 16 items were converted into the nine symptoms of MDD as defined in the DSM-5, namely *sad mood*, *concentration/decision making*, *self-criticism*, *suicidal ideation*, *interest*, *energy/fatigue*, *sleep disturbance*, *decrease/increase in weight/appetite*, and *psychomotor agitation/retardation* (Rush et al., 2003). For the item *suicidal ideation,* the last answer category was not included due to ethical reasons (Lenferink et al., 2020). Using the participants' answers to these nine symptoms sum scores were calculated ranging from 0 to 29, with a higher sum score indicating more depressive symptoms (Rush et al., 2003). The measured Cronbach's alpha, considering all answered items was .80.

Data Analysis

The database Statistical Packages for the Social Sciences 26 (SPSS) was used for the data analysis (IBM Corp., 2019). A descriptive analysis was performed to describe the sample characteristics in terms of gender, age, birth country, education level, and kinship with the deceased. Additionally, the mean, standard deviation, minimum and maximum scores of the PCL-5, QIDS, and TGI were calculated.

Rate of PTSD Cases

The percentage of participants that met the diagnostic criteria for PTSD was calculated using the diagnostic scoring rule as defined in the DSM-5 (Blevins et al., 2015).

Reliability

The internal consistencies of all items of the PCL-5 and its subscales were investigated using Cronbach's alpha. An alpha of $\alpha > .80$ was indicative of a good reliability and $\alpha > .90$ indicated an excellent reliability (J. A. Gliem & R. R. Gliem, 2003).

Convergent validity

The Shapiro-Wilk test of normality indicated that $p < .05$, meaning that the data from the PCL-5 was not normally distributed. Therefore, non-parametric tests were chosen for the analysis. The convergent validity of the PCL-5 was analysed by checking for Spearman's rho correlations with two instruments that measure related constructs, namely MDD and PGD, the QIDS and the TGI. A *p*-value of < .05 indicated a statistically significant correlation.

Known-Groups Validity

Non-parametric tests were chosen to examine the known-groups validity. The Mann-Whitney u was performed to test the known-groups validity of the PCL-5 based on the demographic background variables *educational level* (0 = other, 1 = university/college degree) and *gender* (0 = male, 1 = female) as well as the kind of *kinship* with the deceased (0 = other, 1 = spouse/child deceased). The known-groups validity of the PCL-5 and the continuous variable *time since loss (in months)* was analysed using Spearman's rho. The statistical significance level was set at $p < .05$.

Optimal Clinical Cut-Off for Probable Cases

To determine the optimal clinical cut-off score of the PCL-5 to detect a probable PTSD of traumatically bereaved individuals a Receiver Operating Characteristic (ROC) analysis was performed. During the ROC analysis, for each possible cut-off score, the true-positive rate (i.e., sensitivity) is plotted against the false-positive rate (i.e., 1-specificity) in a ROC curve. To calculate the accuracy of the respective cut-off score to differentiate between cases and non-cases a Youden's Index (i.e., sensitivity – (1–specificity)) was calculated. A score above .90 was considered excellent, between .80 and .90 good, and a score between .70 and .80 would indicate a fair accuracy. Scores below .70 were considered to be poor (Ferraris, 2019).

Results

Characteristics of the Participants

In total more females than males participated in the study, the mean age was 53.3 and 7 different birth countries were represented. Most of the participants were born in the Netherlands (92.1%). In total 67.6% of the participants lost more than one loved person. According to the diagnostic scoring rule of the DSM-5, 17.3% of the participants in this sample met the criteria for PTSD (Table 1).

Reliability

The Cronbach's alpha for the 20 items of the PCL-5 was .93, indicating excellent reliability. Considering the subscales an alpha of .83 was measured for *intrusions*, .86 for *avoidance*, .82 for *negative alterations in cognitions and mood*, and .83 for the subscale *alterations in arousal and reactivity*. This implies a good internal consistency of all subscales.

Table 1

Demographics of participating bereaved sample (n=139).

Characteristic	n	Percentage	Mean	SD	Min	Max
Gender						
Male	58	41.7				
Female	81	58.3				
Age			53.30	15.66	20	88
Education						
College/ University	95	68.3				
Other	44	31.7				
Kinship						
Parent	11	7.9				
Child	42	30.2				
Sibling	35	25.2				
Spouse	2	1.4				
Other	48	34.5				
Number of losses			2.29	1.21	1	6
Time since loss (in months)			10.84	1.85	9	17
Birth Country						
Netherlands	128	92.1				
Belgium	4	2.9				
Indonesia	2	1.4				
Other	5	3.6				

PTSD criteria met		
Yes	24	17.3
No	115	82.7

Convergent Validity

Table 2 displays the mean, standard deviations, range, and Spearman's rho between the PCL-5 and the PGD and MDD measurements. The Spearman's rho implied a significant strong positive correlation between the sum scores of the PCL-5 and PGD. Additionally, a statistically significant strong positive correlation was found between PCL-5 scores and MDD.

Table 2

Mean, SD, Min, Max, and Spearman's rho of the PCL-5, PGD, and MDD (N = 139).

Scale	Mean	SD	Min	Max	PGD	MDD
PCL-5	19.17	14.06	0	77	.82**	.74**
PGD	46.97	11.76	24	88		.64**
MDD	7.86	4.89	0	25		

Note. ** $p < .001$

Known-Groups Validity

People with a relatively lower education scored significantly higher on the PCL-5 after losing a loved one due to the MH17 crash than those with a college or university degree. Also, women had significantly higher sum scores compared to men. Scores did not differ depending on the kind of kinship between the deceased and the bereaved. Additionally, the time that has passed since the crash did not correlate with PCL-5 levels (Table 3).

Table 3

Sociodemographic and loss-related correlates of PCL-5 scores (N = 139).

	Mean	SD	Test statistic
Education			U = 1425.50*
University/ College	16.37	11.61	
Other	25.23	16.88	
Gender			U = 1637.50*
Female	21.47	13.40	
Male	15.97	14.44	
Kinship			U = 2073.00
Child/ Spouse	19.11	13.68	
Other	19.20	14.30	
Time since loss			$r_s(139) = -.05$

Note. * $p < .01$

Optimal Clinical Cut-Off for Probable Cases

Considering the DSM-5 diagnostic rules the optimal cut-off for the PCL-5 for traumatically bereaved individuals is ≥ 24 (AUC = .92 (95% CI: .87-.97)). When this score is used 92% of the PTSD cases are correctly identified and 19% are incorrectly identified. This results in a fair Youden's Index (J = .73). The Sensitivity, 1-Specificity, and Youden's Index based on different cut-off scores are displayed in Table 4.

Table 4

Determining the optimal cut-off for the PCL-5 using the scoring rule of the DSM-5 (n=139)

PCL-5 score	Sensitivity	1-Specificity	Youden's Index
≤17	≥.96	≥.37	≤.58
18	.96	.30	.65
19	.92	.28	.64
21	.92	.27	.65
22	.92	.25	.67
23	.92	.22	.70
24	**.92**	**.19**	**.73**
25	.88	.19	.68
26	.88	.18	.69
27	.79	.17	.63
28	.75	.12	.63
29	.63	.10	.52
≥32	≤.58	≤.10	≤.49

Note. In bold the optimal cut-off score

Discussion

The aim of the present study was to investigate the psychometric properties of the Dutch translation of the PCL-5 for measuring PTSD symptoms in traumatically bereaved people. Data were derived from the first assessment of a longitudinal study by Lenferink et al. (2017) measuring multiple psychopathologies in people who have lost a loved one in the MH17 plane crash in 2014. Currently, there is only one study that researches the psychometric properties of the Dutch PCL-5. This study focuses on individuals that experienced traumatic brain injury (Van Praag et al., 2020). To the researcher's knowledge,

there is no research on the reliability and validity of the PCL-5 with traumatically bereaved individuals being the target group yet, however, there seems to be an increased risk for this group to experience PTSD symptoms underlining the relevance of this research (van Denderen et al., 2016).

First, the internal consistency of the PCL-5 was analysed. As expected, a good reliability was found for both: items of the complete questionnaire and all subscales of the Dutch PCL-5. This finding is in line with previous research on the PCL-5 and indicated that the items of the PCL-5 and its subscales reliably measure the same construct (Van Praag et al., 2020; Bovin et al., 2016).

Strong positive correlations between PCL-5 scores and levels of MDD and PGD indicated an acceptable convergence validity. Based on existing studies, confirming that there are differences as well as an overlap between PTSD, MDD, and PGD, this result was expected (Bovin et al., 2016; Maercker & Lalor, 2022). Due to the strong correlations, it can be assumed that the PCL-5 indeed measures a similar and yet distinguishable concept to MDD and PGD.

The known-groups validity could partly be demonstrated. On the one hand, as predicted, women indicated significantly higher PCL-5 scores than men, as well as people with relatively lower education compared to those with a university or college degree. Thus, it can be concluded that the PCL-5 was able to identify differences between those groups. On the other hand, there was no statistically significant difference between PCL-5 scores of individuals based on the time since the plane crash and the form of kinship between the bereaved person and the deceased. It is likely, that this is because the period since the plane crash was relatively similar for all participants (minimum of 9 and maximum of 17 months). A possible explanation for the lack of difference between kinship forms and PCL-5 scores may be that more than half of the respondents lost multiple loved ones, so one person might

have lost three siblings and another respondent might have lost their spouse. This may influence the development of PTSD symptoms and consequently, also the comparability between these groups might be impaired. Only two respondents indicated that they lost their spouse, thus this group is underrepresented. A reason for that may be that many passengers were on the plane with their spouses.

By calculating the probable caseness it was found that, according to the diagnostic scoring rule of the DSM-5, about one out of six respondents fulfilled the criteria for a PTSD diagnosis. Using these results an optimal cut-off of ≥ 24 was found to be appropriate to determine a probable PTSD diagnosis in this traumatically bereaved sample, meaning that individuals that have a score of 24 or higher would be classified as having PTSD. The Youden's index is fair meaning that this cut-off has an acceptable sensitivity and specificity. Compared to other studies that suggested a cut-off score of 31-33 to be characteristic of a PTSD diagnosis (Bovin et al., 2016; Ashbaugh et al., 2016), for the target group of traumatically bereaved individuals, a lower one seems to be appropriate.

It may be that this specific group feels more connected to each other than other groups of traumatically bereaved people as they lost their loved ones in the same tragedy and a wide range of support systems is provided to them. This relation to others may facilitate dealing with the trauma and reduces the overall number of symptoms they experience which could lead to the lower optimal cut-off (Catherall, 1986). Since other studies also used a ROC analysis to determine a suitable cut-off (Ashbaugh et al., 2016; van der Meer et al., 2017), this analysis is likely not the reason for this difference. However, they selected other forms of analysis than the Youden's Index to select the best possible cut-off, which may influence the results (Ashbaugh et al., 2016; van der Meer et al., 2017). Also, these studies included other diagnostic measurements like the gold standard CAPS and did not categorize the participants based on the PCL-5 which might have affected the outcome as well (Bovin et al., 2016; van

der Meer et al., 2017). A study by Ibrahim et al. (2018) also did not include the CAPS as the gold standard for the PTSD classification and found a similarly low optimal cut-off of 23. So, not using the gold standard for analysis might affect the results of the ROC analysis and lead to lower optimal cut-off values.

Strengths and Limitations

A strength of this study was its relatively large sample size considering that 298 people lost their lives in the plane crash which gave an adequate impression of the characteristics of the target group. Additionally, the sample included a good variability for the variables age and gender which increases the generalizability of results. The target group of this study was highly specific which can be seen as another major strength of this study. A rather homogeneous group of bereaved people was studied who were all exposed to the same type of loss, under the same circumstances and assessed at a similar point in time. The possible influences of all these variables were therefore ruled out.

Still, some limitations need to be considered. First, two respondents lost their spouses due to the plane crash, therefore this group of bereaved who is likely to suffer more than others was underrepresented (van Denderen et al., 2016). Thus, no clear conclusion can be formulated for this group. Additionally, although this is also a strength of this study, there was little variance in the time since the participants lost their loved ones in the plane crash, the range of 8 months is likely too short to measure the effect of time on PTSD levels. Another limitation of the study is that the ROC analysis was based on the caseness and non-caseness as predicted by the PCL-5, having an additional assessment for PTSD, like the CAPS to increase certainty would improve the accuracy of this analysis.

Implications

To determine the psychometric properties of the Dutch PCL-5 further research should be conducted, as not all aspects of validity were tested in this study. It is advisable to conduct

further research, for example on the factor structure of the Dutch PCL-5, as well as its ability to predict long-term PTSD symptomatology. Also, this target group was highly specific which may reduce the generalizability of the results. Thus, it is advisable to perform further research with other traumatically bereaved samples. Additionally, there is no research on the validity of the PCL-5 for traumatically bereaved individuals in other languages. Therefore, further research may be conducted on the PCL-5 in other languages with this target group to ensure the generalizability of the results.

Validating the Dutch PCL-5 in traumatically bereaved individuals is valuable for further research with this target group. One reason is, that it provides researchers with a time-efficient way of collecting information about the severity of PTSD symptomatology of the respondents as defined in the DSM-5. Additionally, it is of advantage for the clinical psychological practice, as having a reliable and valid measurement as an addition to therapeutic interviews can facilitate the diagnostic process. Currently, in clinical practice in the Netherlands, only the CAPS is used as a diagnostic measurement. Having the PCL-5 as an additional measurement would enable clinicians to test a possible diagnosis in a time-efficient way that is less likely to be influenced by bias than interviews.

Conclusion

To conclude, this study demonstrated that the PCL-5 has acceptable psychometric properties to measure PTSD symptoms in traumatically bereaved individuals. The results supported the findings of previous research reporting a good internal consistency and convergence validity. Additionally, the known-groups validity was supported for those groups that have a rather large variability. By using data from individuals that lost a loved person during the MH17 crash it can be said that a lower cut-off score of the PCL-5 may be advisable compared to other target groups to predict the caseness of PTSD. Overall, the PCL-5 seems to

be a promising measurement in both research and clinical contexts for the specific target group of traumatically bereaved individuals.

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