Young people's trauma-related cognitions before and after cognitive processing therapy for post-traumatic stress disorder

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Objectives. Cognitive processing therapy (CPT) is a psychotherapy for post-traumatic stress disorder (PTSD) with a broad evidence base. Change in trauma-related cognitions is considered its primary working mechanism. When trying to integrate a traumatic event into existing cognitive schemas, the adaptive mechanism is changing the schema (accommodation). However, PTSD patients frequently either change their schemas too much (over-accommodation), or cognitively distort the event (assimilation). We aimed to test the hypothesized connections between the three types of cognition and symptom load.

Design. This study adds to the literature using 'impact statements', essays on their trauma-related thoughts written by patients at the beginning and end of CPT, to investigate cognitive change and its relationship to symptomatic outcome.

Methods. We analysed statements written by 31 adolescents and young adults who received developmentally adapted CPT (a longer treatment where CPT is the core component) in a randomized controlled trial.

Results. As expected, post-CPT statements contained more accommodated and fewer over-accommodated and assimilated clauses than pre-CPT statements. Correlations between cognition frequencies and concurrent symptom load were as expected for assimilation, and, in part, over-accommodation and accommodation. Decreased PTSD and depressive symptoms were correlated with increased accommodated thoughts. For over-accommodation and assimilation, however, expected correlations could not be shown.

Conclusions. Our results support the notion that cognitive change is an important mechanism of change in CPT in a sample of younger, non-English-speaking clients.

Practitioner points

- Knowledge about the working mechanisms of psychotherapies (in addition to knowledge about their efficacy) is important for psychoeducation, motivating clients, and clinical decision-making.

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- In accordance with the theory behind cognitive processing therapy, young clients' cognitions changed over the course of therapy in the predicted ways.
- For some types of cognition, the change was related to PTSD and/or depressive symptoms, supporting the notion that cognitive change is an important working mechanism of cognitive processing therapy.

Background

There are several effective psychological treatments for post-traumatic stress disorder (PTSD; e.g., Bisson *et al.*, 2007; Watts *et al.*, 2013). Most clinical guidelines for adults (American Psychiatric Association, 2010; Centre for Posttraumatic Mental Health, 2007; National Institute for Health & Care Excellence, 2005) and meta-analyses of child and adolescent samples (Gutermann *et al.*, 2016; Gutermann, Schwartzkopff, & Steil, 2017; Morina, Koerssen, & Pollet, 2016) rank forms of cognitive behavioural therapy (CBT) among the most efficacious treatments. However, while it is clear that these treatments work for most patients, there is less evidence concerning their working mechanisms.

Cognitive processing therapy (CPT; Resick, Monson, & Chard, 2007, 2016) is one of the CBTs for PTSD with the strongest empirical support. It focuses on helping patients to challenge and change negative trauma-related cognitions. The original protocol (CPT-A) includes a written exposure component. However, since the treatment has been shown to be equally effective without the exposure component (Resick *et al.*, 2008), the cognitive-only form (CPT) has been increasingly used. Extremely negative, rigid, and unbalanced cognitions about the traumatic event, oneself, the world, and other people are important PTSD symptoms. In its current fifth version, the Diagnostic and Statistical Manual of Mental Disorders (2013) lists 'negative alterations in cognition and mood' as a fourth symptom cluster besides intrusions, avoidance, and hyperarousal.

In contrast to other cognitive therapies, CPT posits that there are different ways in which dysfunctional cognitions develop. A traumatic event is usually discrepant with a person's cognitive schemas. In order to integrate the discrepant information, the schema has to change to allow the new information to fit. This mechanism, known as 'accommodation', results in altered but still balanced and realistic beliefs ('I now know that bad things can happen to me, but I am still able to feel safe'). However, PTSD patients often change their schemas too much and this leads to extremely negative and rigid beliefs. This mechanism is called 'over-accommodation'. It often manifests in generalized negative beliefs related to the present or future, such as 'I am not safe anywhere' or 'I will never be happy again'. The other dysfunctional mechanism is 'assimilation'. Here, the necessary change in the cognitive schema does not occur. Instead, the person cognitively distorts the traumatic event in order to integrate it into his or her existing belief system. Assimilation often results in self-blame with pronounced feelings of shame and guilt, other blame with anger reactions or mental undoing (ruminative thoughts about what the person could have done to prevent the trauma or about why the trauma should not have happened). Assimilated thoughts usually pertain to the past ('I shouldn't have. . .', 'Things like that must not happen'). Most PTSD patients have both assimilated and over-accommodated cognitions. At the start of CPT, patients are asked to write an essay about why the traumatic event happened and how their thinking has changed since it happened. This 'impact statement' serves as a starting point for identifying dysfunctional cognitions, known as 'stuck points'. Botsford *et al.* (2018) conducted a qualitative analysis and were able to show that the content of stuck points was related to the type and severity of the

traumatic event. At the end of therapy, patients write another impact statement to serve as a comparison to the first one. These statements are valuable therapeutic tools, but they also provide qualitative insight into a patient's accommodated, over-accommodated, and assimilated beliefs. To our knowledge, there are three studies to date that use impact statements to analyse the three cognitive mechanisms. They all used the coding manual developed by Sobel, Resick, and Rabalais (2009) to code clauses in four categories: the three cognitive mechanisms and an 'information' category for clauses that did not fit in any of the other categories. Statements were divided into clauses, which were coded separately, because a sentence can contain more than one type of thought.

Sobel *et al.* (2009) examined statements from 37 women who were suffering from PTSD after experiencing sexual violence and had received CPT-A. The authors reported a significant increase in accommodated as well as significant decreases in over-accommodated and assimilated clauses between the first and second impact statements. At pre-treatment, there was a negative correlation between self-reported PTSD symptoms and the percentage of accommodated clauses, whereas at post-treatment both self- and clinician-reported PTSD symptoms correlated negatively with the percentage of accommodated clauses and positively with the percentage of over-accommodated clauses (there were no assimilated clauses post-treatment). Change in self-reported PTSD symptoms correlated negatively with change in accommodation percentages and positively with change in over-accommodation percentages. Correlations for clinician-rated PTSD symptoms were not significant, but were in the expected directions. For assimilation, the correlation was not significant, possibly because rates of assimilated beliefs were low even in the pre-treatment statements. The authors speculate that this was caused by the instructions for the impact statement, which led patients to focus on their beliefs after the trauma, but not on the reasons why the event happened.

Iverson, King, Cunningham, and Resick (2015) analysed impact statements from 50 female rape victims suffering from PTSD who had received the same instructions as in the Sobel *et al.* (2009) study and were treated with CPT-A. In addition to the usual time points at the beginning and end of therapy, they also included statements written five to ten years after the end of treatment. There were no significant correlations between cognitions and symptoms of PTSD and depression at pre-treatment. At post-treatment, significant moderate to large correlations emerged for accommodation (negative) and over-accommodation (positive) with both PTSD and depressive symptoms. Change in PTSD and depressive symptoms correlated with changes in accommodation (negatively) and over-accommodation (positively). As in the study by Sobel *et al.* (2009), there was no significant correlation with changes in assimilated thoughts. The long-term results were very similar to the short-term ones and also underlined the importance of cognitive change for symptomatic improvement of PTSD in CPT-A.

Dondanville *et al.* (2016) analysed impact statements from 63 service members who were predominantly male and had experienced military trauma. This sample received CPT, partly in an individual and partly in a group setting. This time, the instructions for the impact statements included asking patients for their thoughts on the cause of the event in order to elicit assimilated statements. Again, the types of beliefs changed in the expected ways (accommodation increased, assimilation and over-accommodation decreased). In addition, a significant negative correlation between change in cognition and change in PTSD and depressive symptoms emerged for accommodation and a positive correlation for over-accommodation, but none for assimilation. Treatment responders showed greater changes in accommodated and over-accommodated cognitions than non-responders, while there was no significant difference in assimilation. Consequently,

despite the changed instructions and a larger proportion of assimilation in the pre-treatment statements compared with the previous studies, there was no connection between symptom change and change in assimilated clauses, possibly because assimilation was still not very frequent.

While the studies to date show similar results for different types of trauma and for all female and predominantly male samples, as far as we know the method of impact statement coding has not been applied to adolescents and to statements written in a language other than English. Our aim in this study was to replicate previous findings with a sample of German adolescents and young adults suffering from PTSD after childhood sexual and/or physical abuse who received developmentally adapted CPT (D-CPT; Matulis, Resick, Rosner, & Steil, 2014).

We formulated the following hypotheses. (1) We expected the proportions of cognitive mechanisms in our impact statements to be comparable to those found in other samples. (2) Consistent with the literature and the theory, we expected that impact statements written at the end of the CPT phase of treatment would contain more accommodated and fewer over-accommodated and assimilated clauses than those written at the beginning of this phase. (3) We also expected the severity of PTSD and depressive symptoms to correlate negatively with accommodated thoughts and positively with over-accommodated and assimilated ones at both pre-treatment and post-treatment. (4) We further expected symptomatic change in PTSD and depression from pre-treatment to post-treatment to correlate negatively with change in accommodation and positively with change in over-accommodation. For change in assimilation, we expected that like all studies to date, we would be unable to confirm the theoretical expectation of a positive correlation with symptomatic change because of the low expected numbers of assimilated clauses. Even though we had no hypothesis regarding informational clauses, we decided to include them as exploratory analyses.

Method

Participants

We report on a sample of 31 patients enrolled in a randomized study on D-CPT (Rosner *et al.*, 2019). Most of the patients in our sample ($n = 22$) received the therapy after randomization, others were randomized into the control group and received D-CPT after the waiting period ($n = 7$). Two patients were pilot cases treated with the same protocol and by the same therapists. We included all patients treated in the context of the study from whom two impact statements were available, making this a convenience sample. Therapies took place in three study centres in different German cities and the relevant ethics committees approved the study protocol. The flow of participants through the trial as well as the main outcomes has been described by Rosner *et al.* (2019). Participants were predominantly female (90 %) and between 14 and 21 years of age at study entry ($M = 17.5$, $SD = 2.5$). The majority were in school (59 %), at university (19 %), or in vocational training schemes (9 %). They had all experienced physical and/or sexual abuse according to the Clinician Administered PTSD Scale, Child and Adolescent Version (CAPS-CA; Nader *et al.*, 1996). They all had current PTSD according to DSM-IV (American Psychiatric Association, 1994) or subthreshold PTSD. The latter required only two instead of three symptoms of avoidance, but did not otherwise differ from PTSD criteria.

Measures

Trauma history, PTSD diagnostic status, and PTSD severity were established using the German translation (Steil & Füchsel, 2006) of the CAPS-CA. This is a structured clinical interview for diagnosing PTSD according to DSM-IV, which also gives a severity score. We report averaged item scores.

We assessed self-rated PTSD severity using the German translation (Ruf, Schauer, & Elbert, 2010) of the University of California at Los Angeles Posttraumatic Stress Disorder Reaction Index (PTSD-RI; Steinberg, Brymer, Decker, & Pynoos, 2004). We used the severity score where items corresponding to DSM-IV criteria B-D are rated on a Likert-type scale between 0 (never) and 4 (usually). The sum score is an indicator of PTSD severity, with scores of 38 and above being considered clinically relevant.

Comorbid depression was measured using the German translation (Hautzinger, Keller, & Kühner, 2006) of the Beck Depression Inventory-II (BDI-II Beck, Steer, & Brown, 1996). This widely used inventory consists of 21 items that are rated on a four-point Likert-type scale. Although it was created for adults, its psychometric properties have also been established with adolescents (Besier, Goldbeck, & Keller, 2008).

Treatment

CPT is the core component of D-CPT, but the treatment contains other elements tailored to the young target group. In the beginning, there is a 5-session commitment phase with a focus on improving treatment motivation, strengthening therapeutic alliance, and establishing the formal framework of therapy. Then, there are six sessions derived from dialectical behaviour therapy (Bohus *et al.*, 2013) which involve teaching patients emotion regulation skills. This is followed by the 15-session CPT phase, which can be delivered in an intensive format (3-4 sessions per week). The CPT phase is very similar to the German CPT for adults (König, Resick, Karl, & Rosner, 2012), but uses simplified information sheets and worksheets as well as examples adapted to the age of the target group. The final four sessions are devoted to issues such as career choice, vocational training, and preventing revictimization in future relationships. These issues are important as adolescents who have experienced interpersonal trauma have a high risk of dropping out of school and having abusive relationships (e.g., Barnes, Noll, Putnam, & Trickett, 2009; Lipschitz, Rasmusson, Anyan, Cromwell, & Southwick, 2000).

It is important to note that in the case of the analyses presented in this paper, the addition of several phases means that patients wrote their first impact statements when they were in about session 12 of D-CPT, and their second impact statement in session 25 of the 30 session D-CPT treatment. There was, therefore, a gap of several weeks between the symptomatic assessments and the writing, especially of the pre-CPT statements.

Coding and inter-rater reliability

A student research assistant, otherwise unconnected to the study, divided the impact statements into clauses and deleted information on whether statements were pre- or post-CPT wherever this was possible without altering the meaning. Two raters (second and third authors BK and AZ) then coded the statements. Both had completed course work on CPT, had a bachelor's degree in psychology, and were preparing their master's thesis at the time. They used the coding manual developed by Sobel *et al.* (2009) which our group had translated into German and tested in a different sample of PTSD patients in an unpublished study. We followed the steps set out by Lombard, Snyder Duch, and Bracken

(2002) to establish inter-rater reliability as follows: In a training phase, both raters coded impact statements from a different sample in order to familiarize themselves with the manual, refine instructions where necessary, and discuss differences between their ratings. We calculated both the percentage of agreement between raters and Cohen's κ. It takes random agreement into account and can assume values between −1 and 1, with κ ≥.61 being considered acceptable. However, for trustworthy conclusions a κ ≥.80 should be reached (Altman, 1995). When raters achieved a κ = .719, the training phase was terminated. Then, one rater (AZ) coded all the impact statements included in these analyses and the other rater (BK) coded a randomly selected subsample of 12 impact statements to establish inter-rater reliability. The two raters achieved 87.8% agreement, and a very good Cohen's κ = .823.

Statistical analysis

We calculated the proportions of the four types of clauses in relation to the total number of clauses in each statement. To achieve comparability to the previously reported results, we additionally calculated the proportions of accommodated, over-accommodated, and assimilated clauses in relation to the theoretically relevant clauses only (i.e., excluding the information category). Like previous studies, we compared percentages of clauses from each category between statements at the beginning and end of CPT using repeated measures MANOVA. We analysed the relationship between proportions of cognitions and symptom severity concurrently (i.e., pre-treatment symptom severity and pre-CPT cognitions as well as post-treatment symptom severity and post-CPT cognitions) to ascertain whether symptom scores were indeed related to cognition types in the expected ways. We also calculated pre- to post-treatment difference scores for measurements of PTSD, depression symptom severity, and cognition percentages, and correlated them to see whether more changes in cognitions were connected to greater symptomatic improvement. As the data were not normally distributed, we used Spearman's *Rho*.

Results

Table 1 indicates the percentages of cognition types in relation to relevant clauses (i.e., excluding information) and the total number of clauses. The proportions found in our sample correspond quite well with those found in previous studies, especially those reported by Sobel *et al.* (2009). The lengths of the statements (expressed as number of clauses) in the four studies, however, differ considerably. For the three studies on adult patients, there may be a gender effect with the predominantly male sample studied by Dondanville *et al.* (2016) writing the shortest statements. This does not, however, explain the major difference between the two all-female samples from the other studies. In this study, even though our sample was predominantly female, statements were closest in length to those from the Dondanville *et al.* (2016) study. In fact, at post-CPT statements from our sample were the shortest.

Statements written before CPT contained significantly more clauses than those at post-CPT, $t(30) = 3.169$, $p = .004$. As hypothesized, accommodation increased from the first to the second statement, while over-accommodation and assimilation decreased (see Table 2). At both time points, roughly half of the clauses were informational.

At pre-CPT, correlation patterns of PTSD and depression symptoms were largely as expected, namely positive for over-accommodation and assimilation, though not all

Table 1. Proportions of cognitive mechanisms (excluding information) and total number of clauses in the impact statements in previous studies and in our sample

	Sobel *et al.* (2009)	Iverson *et al.* (2015)	Dondanville *et al.* (2016)	Current sample
	M (SD)[a]	*M (SD)*	*M (SD)*	*M (SD)*
Sample characteristics				
Per cent female	100	100	6.3	90.3
Age	32.0 (9.9)	31.6 (9.7)	33.6 (6.9)	17.6 (2.5)
Pre-CPT				
Accommodation	0.17	0.08 (0.1)	0.13 (0.2)	0.13 (0.2)
Over-accommodation	0.75	0.80 (0.2)	0.63 (0.2)	0.69 (0.3)
Assimilation	0.08	0.12 (0.1)	0.24 (0.2)	0.15 (0.2)
Total number of clauses	86.76 (67.3)	36.0 (23.1)	19.59 (9.1)	24.00 (14.0)
Post-CPT				
Accommodation	0.78	0.75 (0.3)	0.63 (0.3)	0.72 (0.8)
Over-accommodation	0.22	0.14 (0.2)	0.31 (0.3)	0.25 (0.3)
Assimilation	0	0.05 (0.1)	0.06 (0.1)	0.03 (0.1)
Total number of clauses	57.35 (36.1)	41.4 (24.2)	18.67 (10.1)	15.52 (6.8)

Note. CPT = cognitive processing therapy.
[a]As we calculated the percentages from the data published, we cannot give standard deviations.

Table 2. Univariate results for repeated measures MANOVA for the impact of time on the proportion of cognition types

	Pre-CPT *M (SD)*	Post-CPT *M (SD)*	Comparison	
			$F(1, 30)$	p
Accommodation	0.05 (0.08)	0.38 (0.23)	83.423	<.001
Over-accommodation	0.39 (0.23)	0.12 (0.16)	55.243	<.001
Assimilation	0.09 (0.10)	0.02 (0.05)	13.966	<.001
Information	0.47 (0.23)	0.49 (0.14)	0.215	.646

Note. CPT = cognitive processing therapy; MANOVA = multivariate analysis of variance.

reached statistical significance (Table 3). For accommodation, however, the expected negative correlation did not emerge. Interestingly, informational clauses showed significant negative correlations with symptoms. Post-CPT, there were significant correlations with PTSD symptoms for accommodation (negative) and assimilation (positive) but not for over-accommodation. BDI scores showed the expected correlation patterns for all three cognition types. It is interesting that, at this time point, information clauses now correlated positively with symptom measures, even though this was significant only for the PTSD-RI.

The expected significant correlations between pre–post-change scores of cognitions and symptom measures respectively only appeared for accommodation clauses: A greater increase in accommodated clauses was associated with a greater decrease in symptoms of PTSD and depression. Interestingly, at this time point there was a positive correlation between PTSD-RI and information change scores indicating that a larger decrease in symptoms was associated with a larger decrease in information clauses (see lower section of Table 3). This effect was not observed for the CAPS or BDI, however.

Table 3. Correlations (Spearman's *rho*) between percentages of cognition types and symptom severity for each measurement and between change scores

	CAPS	PTSD-RI	BDI
	r (*p*)	*r* (*p*)	*r* (*p*)
Pre-CPT/Pre-treatment	(*n* = 31)	(*n* = 31)	(*n* = 31)
Accommodation	.003 (.985)	−.278 (.131)	−.192 (.301)
Over-accommodation	.216 (.244)	.422 (.018)*	.365 (.044)*
Assimilation	.516 (.003)**	.371 (.040)*	.269 (.144)
Information	−.472 (.007)**	−.414 (.021)*	−.485 (.006)**
Post-CPT/Post-treatment	(*n* = 30)	(*n* = 30)	(*n* = 31)
Accommodation	−.424 (.020)*	−.438 (.016)*	−.383 (.034)*
Over-accommodation	.320 (.085)	.307 (.099)	.378 (.036)*
Assimilation	.561 (.001)**	.584 (.001)**	.576 (.001)**
Information	.323 (.082)	.408 (.025)*	.215 (.245)
Pre–post-change scores	(*n* = 30)	(*n* = 30)	(*n* = 31)
Accommodation	−.379 (.039)*	−.461 (.010)*	−.526 (.002)**
Over-accommodation	.101 (.594)	−.092 (.629)	.323 (.076)
Assimilation	.248 (.185)	.042 (.825)	.129 (.491)
Information	.159 (.401)	.500 (.005)**	.145 (.437)

Note. BDI-II = Beck depression inventory-II; CPT = cognitive processing therapy; CAPS-CA = Clinician administered PTSD scale – Child and adolescent version; PTSD-RI = University of California at Los Angeles posttraumatic stress disorder reaction index.
*$p < .05$; **$p < .01$.

Table 4. Correlations between cognitions and symptoms using PTSD-RI at 9 weeks as pre-CPT measurement

Mechanism	Pre-CPT/week 9 (*n* = 27)	Pre–post-change scores (*n* = 26)
Accommodation	−.369 (.058)	−.416 (.035)*
Over-accommodation	.411 (.033)*	−.111 (.591)
Assimilation	.459 (.016)*	.238 (.241)
Information	−.323 (.101)	.357 (.074)

Note. PTSD-RI = University of California at Los Angeles posttraumatic stress disorder reaction index.
*$p < .05$.

As the pre-treatment assessment took place several weeks before the start of the CPT treatment phase, there was a significant time lag between the symptomatic assessment and the impact statements. To determine whether correlations were influenced by this time lag, we used PTSD-RI process data from week 9 (or, if the data were missing from that week, week 8 or week 10) when these data were available (*n* = 27). Week 9 was the week prior to the scheduled start of the CPT phase. The results are listed in Table 4 and are very similar to the ones that include pre-treatment PTSD-RI data.

Discussion

We were able to reliably code impact statements written by adolescents and young adults treated with D-CPT into the categories accommodation, over-accommodation,

assimilation and information. The proportions of these categories were comparable to those found in previous studies, supporting hypothesis 1. Consistent with hypothesis 2, accommodated clauses became significantly more frequent from pre- to post-CPT statements, while the occurrence of over-accommodated and assimilated ones decreased. This supports the notion that CPT helps change patients' cognitions and that this mechanism works for young patients. The results also suggest that our translation of the coding manual is valid.

Hypothesis 3 was supported only in part. We will discuss our results in the context of previous research. Two of three previous studies report on concurrent correlations between proportions of cognitions and symptoms. For pre-CPT, Iverson *et al.* (2015) reported no significant correlations, while Sobel *et al.* (2009) were able to show a significant negative correlation between self-reported PTSD symptoms and the percentage of accommodation clauses only. It is interesting that in our sample, correlations emerged with all cognition types *except* accommodation. At post-CPT, in both previous studies, accommodated and over-accommodated clauses, but not assimilated ones, showed significant correlations with symptom severity. We were able to replicate the finding for accommodation, but the correlations for over-accommodation fell short of statistical significance. However, there were significant positive correlations between all three measures and assimilated clauses, which had not been found previously. It is not clear why this is the case, as the rates of assimilation in our sample did not differ from previous findings.

Even though the statistical methods differed between the three previous studies, they were all able to show significant correlations between changes in symptoms and changes in cognitions for accommodation (negative) and over-accommodation (positive), but not for assimilation, this is, therefore, the result we expected (hypothesis 4). However, we were able to replicate the finding for accommodation only. For over-accommodation, correlations for PTSD measures were low and, for PTSD-RI, not even in the expected direction. There was only partial support, therefore, for hypothesis 4.

Overall, our findings in a sample of young people treated with an adapted form of CPT fit quite well with the results from adult samples. One possible reason for the minor differences in findings is the age of our sample. Adolescents may find it harder than adults to give a complete and comprehensible written account of their thoughts, especially on a subject as emotionally laden as interpersonal trauma. In addition, as they had experienced trauma at a young age and the abuse had often gone on for a long time, it is possible that they were less able to express themselves in writing than typical even for their age group. As many of them were still in school, it is possible that they viewed the impact statement as an assignment to complete (possibly, in some cases, with minimum effort) rather than a chance to explore their own thinking in preparation for therapy. Both coders reported several instances where the meaning of a sentence was not clear because there were words missing or the sentence was grammatically incorrect. (They coded these instances as informational.) Last, and probably most importantly, D-CPT differs from CPT or CPT-A as it has two additional treatment modules comprising 11 sessions on commitment and training in emotion regulation preceding the CPT component and another four sessions following it. The therapeutic work during these phases probably also impacts symptoms. It may, therefore, weaken the statistical relationship between the cognitive change during the CPT phase and overall symptomatic change.

The finding that the frequency of informational clauses showed such strong and consistent correlations with symptom severity (negative before and positive after the CPT phase) also requires elucidation. It is possible that before CPT, patients who were less

avoidant gave more information. After CPT, when participants had explicitly discussed and challenged their thinking, it is possible that the more successful patients did better at determining which thoughts were relevant to the task and, therefore, wrote fewer informational clauses.

This study has some major limitations. Probably, the most important one is the small sample size. As in previous studies, it was not possible to mask whether a statement had been written before or after CPT in all cases without significantly altering the content. This may have influenced coding decisions. The study is correlational and has no control group, which precludes drawing conclusions about causality. The structure of D-CPT meant that a substantial amount of therapy took place between the symptomatic assessments and the writing of the impact statements. This is another limitation even though it does not appear to have influenced results.

Despite the limitations, this study adds important information to the literature. We were able to reliably code impact statements written in German by adolescents and young adults into the cognition categories. Percentages for all three types of cognitions changed in the expected directions, demonstrating that participants' cognitions changed in accordance with the theory behind CPT. Even more important are the correlations between change in accommodated thoughts on one hand and change in PTSD and depressive symptoms on the other. These suggest that cognitive change is indeed a mechanism of change for CPT. Knowledge about the working mechanisms of therapies is important not only for psychoeducation and motivation of patients, but also for clinical decision-making. For example, if a patient does not show improvement in CPT, it could be helpful to look for remaining over-accommodated and/or assimilated thoughts and challenge them. Given that our results were most consistent for the accommodated category, it might also be important to help patients formulate balanced thoughts. In future research, it would be interesting to include a control group (for instance elicit impact statements from patients receiving a different PTSD treatment or in a waiting condition) to be able to make causal deductions and to compare treatments with different hypothesized working mechanisms.

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Data availability statement

Data are available on request due to privacy/ethical restrictions.

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