Finding the golden lining

Assessment, self-help and treatment after trauma

van der Meer, C.A.I.

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
General discussion
The overall objective of this thesis was to broaden our knowledge of empowering trauma-exposed individuals by facilitating self-assessment and self-management of post-trauma outcomes, and providing a better understanding of clinical populations with posttraumatic stress disorder (PTSD) and PTSD treatment outcomes. This overall objective resulted in three specific aims. First, to develop and investigate tools that contribute to and facilitate the assessment of mental health factors and outcomes following trauma (Part I). Second, to examine easy-accessible self-help interventions to empower trauma-exposed individuals and help them self-manage trauma-related symptoms (Part II). Third, to deepen our understanding of the demographic and clinical characteristics of clinical PTSD populations, and gain insight into factors associated with PTSS (severity) and PTSD treatment outcomes (Part III).

In this final chapter, we will first summarize the main findings of this thesis, and subsequently integrate and discuss these with further literature. Also, we will elaborate on strengths, limitations and future directions, and end with an overall conclusion.

**Summary of main findings**

1. **Facilitating assessment of mental health factors and outcomes after trauma (Part I; chapters 2 & 3)**

   Posttraumatic stress and depressive symptoms are ranked as the most common negative mental health outcomes after experiencing traumatic events (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012; O’Donnell, Creamer, & Pattison, 2004; Shalev et al., 1998). It is of crucial importance to timely recognize and detect trauma-related symptoms, especially since early provision of appropriate interventions following trauma is associated with less PTSS development (Roberts, Kitchiner, Kenardy, & Bisson, 2009). In order to facilitate easy-accessible (self) assessment of trauma-related symptoms, we described the development, validation and reliability of a web-based app called SAM (Smart Assessment on your Mobile) to screen for PTSD and depressive symptoms in chapter 2. Results showed that SAM is able to accurately screen for PTSD and depression in treatment seeking police officers. SAM could be a valid and reliable (diagnostic) screening tool, particularly in the examined population, and could help detect individuals who need further diagnostics and care.

   When assessing mental health after potential traumatic events (PTEs), it is not only important to assess (negative) mental health outcomes, but also factors that may (positively) influence these outcomes (Bonanno, Brewin, Kaniasty, & Greca, 2010; Brewin, Andrews, & Valentine, 2000). Psychological resilience is one of these factors, considered important in determining
mental health outcomes following trauma (Windle, Bennett, & Noyes, 2011). In chapter 3, we described the development, psychometric properties and measurement invariance of a newly developed Dutch and English scale called the Resilience Evaluation Scale (RES) to measure psychological resilience, i.e. the extent to which individuals evaluate themselves as being resilient (Connor, 2006; Windle et al., 2011). Our study demonstrated that the final 9-item RES has sound psychometric properties and consists of two hypothesized underlying constructs (self-confidence and self-efficacy). Further, measurement invariance analysis showed that comparisons between these two language groups on the observed scores are meaningful. The RES may be freely used worldwide by Dutch or English-speaking individuals.

2. **Self-help interventions for self-management of trauma-related symptoms (Part I; chapters 4 & 5)**

When trauma-related symptoms are assessed and determined, (professional) care may be required. Apps may deliver low-intensity interventions to a wide range of people to self-manage these symptoms. In chapter 4, we provided an overview of international studies on the PTSD Coach; an app that was designed to self-manage trauma-related symptoms. The PTSD Coach was originally developed in the United States (U.S.) and adapted into six other international versions. By all means, the app is not a (full) solution to the unmet mental health needs post-trauma, but it may deliver (timely) interventions and psycho-education about trauma-related reactions. In chapter 5, we discussed the results of our randomized controlled trial (RCT) on the efficacy of the Dutch PTSD Coach (SUPPORT Coach) on reducing PTSS, negative trauma-related cognitions, and lack of social support and increasing psychological resilience in health care professionals with at least one posttraumatic stress symptom. Results showed that the majority (83%) of intervention condition participants used the app and found it easy to use. The perceived helpfulness was on average modest. Participants in the intervention condition showed a greater decline in negative trauma-related cognitions and larger increase in psychological resilience compared to participants in the control group who did not use the app. However, there was no effect on PTSS and lack of social support. The results suggest that SUPPORT Coach may provide easy-accessible and low-intensity self-help to empower trauma-exposed individuals and reduce negative trauma-related outcomes.

3. **Understanding clinical populations and PTSD treatment outcomes (Part III; chapters 6, 7 & 8)**

In case of severe levels of PTSS (e.g. full-blown PTSD) formal PTSD treatment may be required. So far, little is known about the characteristics of clinical PTSD populations and how those characteristics are associated with treatment outcomes. Focusing on clinical populations
with PTSD, in chapter 6 we described the association between gender and age with PTSS and potentially traumatic events (PTEs) in a large sample of treatment seeking police officers with PTSS. Police officers experienced on average 19.5 different types of PTEs; those who experienced a greater variety of PTEs had more PTSS. Further, women reported more often direct life threatening or private events as their index trauma than men, and had on average more PTSS than their male colleagues. Moving from treatment seeking to treatment receiving police officers, results on pre- and post-treatment assessments in police officers receiving trauma-focused cognitive behavioral therapy (TF-CBT) showed that those who experienced a larger variety in injury/maltreatment or private events, had more baseline PTSS as well as larger PTSS reduction during treatment (chapter 7). Additionally, a greater variety of losses of loved ones (work or private) was related to less PTSS symptom reduction. Although treatment effect size in general was large, almost 18% of police officers had substantial concentration problems post-treatment, which were associated with baseline PTSS and a greater variety of losses of loved ones. Shifting from psychopathology to positive outcomes after PTSD treatment, in chapter 8, we studied change in posttraumatic growth (PTG) and its relationship with PTSS improvement over the course of two trauma-focused psychotherapies, i.e. TF-CBT and eye movement desensitization reprocessing (EMDR), in a sample of Dutch PTSD outpatients. The results showed that after both psychotherapies, PTG increased, and a greater increase in PTG was positively related to a greater decline in PTSS during treatment. Baseline PTG had no predictive effect on change in PTSS during both treatments. There were no differences in post-treatment PTG between treatments. However, an increase in relating to others (one aspect of PTG) was stronger related to PTSS decrease in TF-CGT compared to EMDR.

**Integration and discussion of findings**

**Importance of screening after PTEs**

Since the experience of a traumatic event by definition precede the development of PTSS, the symptoms have an identifiable onset that offers unique possibilities regarding (timely) assessment of post-trauma mental health (chapter 2-6). However, there are many barriers in (timely) recognizing trauma-related symptoms and eventually seeking help (chapter 1, 2 and 4). Through apps, self-assessment tools may become available for a wide range of trauma-exposed people and might facilitate the post-trauma assessment process (chapter 2, 4 and 5). In general, the app marketplace is littered with apps that claim to reliably screen for various mental health problems, like anxiety, bipolar, and obsessive-compulsive disorders. However, the large majority of these apps lack scientific evidence (Van Ameringen, Turna, Khalesi, Pullia, & Patterson, 2017). Up to now, SAM is one of the few mobile screeners...
that has been examined on its validity to assess trauma-related symptoms, and is a valid (diagnostic) screener to indicate PTSD and depression (chapter 2). Mobile screeners as SAM may be valuable for anyone who experienced a PTE, but could particularly serve high-risk professions where employees are regularly exposed to PTEs. Interestingly, our study in treatment seeking police officers showed that a substantial group (13%) did not report a single specific index trauma (i.e. one traumatic event that had the most negative impact on their lives), but an accumulation of events (chapter 6). These results underscore the importance of screening and ongoing monitoring of trauma-related symptoms in high-risk jobs, especially since repeated exposure to PTEs may lead to sensitization to subsequent PTEs and PTSS, and potentially to (delayed) PTSD over time (Smid, Kleber, Rademaker, van Zuiden, & Vermetten, 2013). Also, the large majority (70%) of our police officers indicated confrontational events (e.g. witnessing severe human suffering) as their index trauma instead of life-threatening events (e.g. being assaulted) (chapter 6). This might be because they possibly experienced confrontational events more often than life-threatening events, but it might also be explained by the nature of confrontational events, which frequently evoke feelings of helplessness and sorrow (Carlier & Gersons, 1992; Carlier, Lamberts, & Gersons, 1997). Hence, it is not only relevant to assess and monitor the mental health of someone who was closely involved or had an active role in a stressful event (e.g. a police officer who arrives at a traffic accident and performs cardiopulmonary resuscitation on a young child who is severely injured), but also the ones who were passive bystanders and might be forgotten (e.g. police officers who witness severe accidents while guiding traffic and putting up roadblocks).

**Are self-help apps after trauma really promising and needed?**

Besides facilitating the post-trauma assessment process, apps may provide low-intensity and easy-accessible self-help care. Although we are at the beginning of exploring the possibilities in this regard (Van Ameringen et al., 2017) our RCT indicates that SUPPORT Coach may deliver self-help to diminish negative trauma-related cognitions and strengthen psychological resilience in people affected by trauma (chapter 5). Of notice, PTSS significantly declined in both conditions over the course of two months, with the intervention condition showing 50% and the control condition 30% decline in PTSS two months after baseline (chapter 5). Although our study lacks a prospective design, and the endured PTE could have occurred at any given time point, we might speculate that the decline in PTSS reflects natural recovery over time. This raises the question whether and when to intervene if individuals have limited PTSS levels. Regarding the question whether to intervene, we note that PTSS may cause significant distress and negative consequences. Even if ‘only’ one PTSD symptom is present, for example when someone avoids places and persons associated to the event or are no longer able to function professionally at an adequate level. Furthermore, since
PTSS may worsen over time and could progress into delayed PTSD, which may particularly hold for employees in high-risk professions (Robertson & Perry, 2010; Smid et al., 2013; Smid, Mooren, van der Mast, Gersons, & Kleber, 2009), prevention may be preferred over treatment. Also, individuals with limited levels of PTSS usually do not need professional care (yet), and may be able and prefer to tackle trauma-related symptoms on their own (Kuhn et al., 2018). Freely available apps as SUPPORT Coach could be easily used without guidance (i.e. stand-alone) and may contribute to the empowerment of trauma-exposed individuals and self-management of negative post-trauma outcomes (chapter 4 and 5). Additionally, some stand-alone self-help apps designed to alleviate depressive symptoms have already shown promising results in individuals with moderate depression on depressive symptoms and work absence (Birney, Gunn, Russell, & Ary, 2016; Rathbone, Clarry, & Prescott, 2017), as well as on anxiety, stress, and social functioning (Proudfoot et al., 2013).

The question about when to intervene after trauma has been primarily focused on prevention of PTSS and providing early interventions. For years, there is an ongoing debate about when, how and to whom these early interventions should be delivered (Ehlers & Clark, 2003; Kears, Ressler, Zatzick, & Rothbaum, 2012). Previous research has shown that TF-CBT and prolonged exposure delivered within the first weeks after a PTE in people who experience distress may reduce acute stress and might prevent PTSS (Kearns et al., 2012). On the contrary, single-session psychological debriefing and self-help booklets (the latter including psychoeducation and advise on coping strategies) delivered as early interventions do not seem to be effective in reducing trauma-related outcomes as PTSS and depression, and might even interfere with natural recovery (Kearns et al., 2012). The finding that SUPPORT Coach has beneficial effects on reducing negative trauma-related cognitions and increasing psychological resilience is promising with regard to potential (preventive) effects on PTSS. Clearly, future research is needed to examine the potential preventive effects of SUPPORT Coach in a prospective design, including determining the optimal timing of delivering this intervention after PTEs (chapter 5).

**Technology versus people**

Importantly, mobile screeners and self-help apps cannot replace face-to-face care, but they could be used as part and enhancement of a post-trauma stepped care model. Obviously, mobile screeners are not able to formally diagnose psychiatric conditions, but they could help detect trauma-exposed individuals who need further diagnostics or care, which could both aid end-users as well as clinicians (chapter 2). They might provide (carefully articulated) feedback on mental health status, contact details of professional care, and may be linked to self-help apps for self-management of trauma-related symptoms (chapter 2) (Olff, 2015).
Similar to mobile screeners, self-help apps cannot replace humans, but may fulfill various roles in a stepped care model. These apps could be used as stand-alone tools by individuals with limited trauma-related symptoms to enhance self-management of these symptoms, and to stimulate treatment seeking behavior (chapter 4 and 5) (Possemato, Kuhn, Johnson, Hoffman, & Brooks, 2016). Through apps, low-intensity and easy-accessible care may be offered to people with little access to face-to-face care due to barriers in distance, finances or time, or because of a lack of qualified mental health professionals (Kantor, Knefel, & Lueger-Schuster, 2017; Kazdin & Rabbitt, 2013; Kuhn et al., 2017). Interestingly, a pilot study in U.S. veterans with probable PTSD who were not seeking or receiving (PTSD) treatment found that participants who used PTSD Coach during 8 weeks showed significant PTSS improvements. Also, those who received more guidance (i.e. four sessions with a clinician on how to use PTSD Coach) showed better PTSS improvement and more often sought specialized PTSD treatment compared to those who received less guidance (i.e. one session with a clinician who provided general app usage instructions) (Possemato et al., 2016). Although the sample of this U.S. study is small, and a control group is lacking, the results could imply that (clinician supported) PTSD Coach usage could increase self-management of PTSS, enhance the referral process, and stimulate help seeking behavior (chapter 4).

Furthermore, a self-help app as SUPPORT Coach may be implemented as a supportive tool next to colleague peer support, i.e. systems wherein high-risk professionals like health care providers or police officers are trained to support their colleagues after work-related PTEs (Seys et al., 2013). When severe levels of PTSS are present, and formal psychotherapy is indicated, self-help apps may be used during (waitlist) periods before and as a supportive (homework) tool during treatment (Kuhn et al., 2017; Miner et al., 2016; Possemato et al., 2016). Regarding the latter, attention should be paid to studying the beneficial effects of SUPPORT Coach as an add-on to psychotherapy in terms of therapy adherence and motivation, increasing psychological resilience and posttraumatic growth, reducing PTSS, and potentially diminishing residual symptoms. In addition, self-help apps could be used after treatment as well, to potentially prevent and monitor symptom recurrence (chapter 4 and 5). Future research is needed to shed insight into these hypotheses and possibilities, and explore the potential effects of (clinician) guidance.

A broader perspective on PTSD treatment outcomes

Insight in clinical PTSD populations and factors associated with negative and positive treatment outcomes may contribute to better treatment results. Our study in the largest group of police officers receiving TF-CBT (i.e. brief eclectic psychotherapy for PTSD; BEPP) studied so far showed that this treatment was highly effective (effect size $d = 3.6$, chapter 7), which is in line with previous RCTs on the effectiveness of BEPP in police officers (Gersons, Carlier, Lamberts, & van der Kolk, 2000) and in a community sample with PTSD (Nijdam,
Gersons, Reitsma, de Jongh, & Olff, 2012). Intriguingly, the aforementioned RCT in police officers with PTSD (wherein BEPP was compared to a waitlist condition) found that 50% and 35% of the police officers in the waitlist condition did not meet the criteria for full-blown PTSD diagnosis anymore after four and after seven months, respectively (compared to 91% and 96% respectively in the BEPP condition) (Gersons et al., 2000). Since our current study lacks a control condition, the large effect size could have been influenced by spontaneous recovery.

Importantly, treatment effectiveness should not be merely based on evaluating the absence or presence of a diagnosis post-treatment or on assessing symptom change over time, but also on measuring residual symptoms and potential positive (treatment) outcomes (chapter 7 and 8). In fact, although BEPP seemed highly effective in our police officers (chapter 7), up to 18% of them still suffered from substantial concentration problems after treatment, which was associated with greater baseline PTSS, and a greater variety of losses of loved ones. Previous studies have found that the presence of certain PTSS post-treatment (e.g. hyperarousal, numbing and avoidance) were related to significant impairments in (psychosocial) functioning (Lunney & Schnurr, 2007; Monson et al., 2012; Shnaider et al., 2014). Alarmingly, a recent review that included the results of 51 RCTs on residual PTSD symptoms after various evidence-based PTSD interventions reported that none of the included RCTs reported residual PTSD symptoms at individual symptom level post-treatment, and only approximately one-third reported residual symptoms on a cluster level (Larsen et al., 2019). Since we were the first to report on residual (individual) PTSD symptoms in police officers, and specifically examined the association between these symptoms with trauma type, baseline PTSS, and sociodemographic and treatment characteristics, comparisons with other studies cannot be made. Nevertheless, in line with our results (chapter 7), it seems that in general a higher level of baseline PTSD symptoms is associated with more residual symptoms, and hyperarousal symptoms tend to be the most persistent residual problems after various evidence-based interventions (Larsen et al., 2019).

**Are there any positive sides to trauma?**

In general, most people are resilient and do not suffer from long-lasting psychological problems after trauma, and some may even experience posttraumatic growth (Zoellner & Maercker, 2006). Our RCT in outpatients with PTSD demonstrated that posttraumatic growth significantly increased over the course of two trauma-focused psychotherapies, i.e. BEPP and EMDR, and was positively related to PTSS decline post-treatment (chapter 8). The fact that the increase in posttraumatic growth was similar across therapies may be explained by the commonalities in BEPP and EMDR that both focus on reflecting on personal beliefs and experiences, cognitive restructuring, disclosing personal history, and a supportive
relationship with the therapist (Roepke, 2015; Schnyder et al., 2015). Moreover, posttraumatic growth may be established without the therapy specifically addressing it, and could evolve as a consequence of PTSS symptom decline or may occur concurrently. Further research is needed to shed insight into these hypotheses. Interestingly, posttraumatic growth and psychopathology may co-exist (Sleijpen, Haagen, Mooren, & Kleber, 2016; Zoellner & Maercker, 2006), hence, there seems to be no evident direct relationship between the two, and posttraumatic growth does not per definition entails the absence or decrease in psychopathology (Grubaugh & Resick, 2007).

The same applies to resilience, which is not simply defined as the absence of psychological symptoms or distress, but rather as the process wherein someone maintains a fairly stable and healthy level of psychological and physical functioning after PTEs (Bonanno, 2004; Bonanno, Westphal, & Mancini, 2011; Roberts et al., 2009) (chapter 3). Among the many factors that influence resilient outcomes is psychological resilience, meaning the extent to which individuals evaluate themselves as being resilient (Connor, 2006; Windle et al., 2011) (chapter 3). The RES is a valid, non-commercial scale to measure psychological resilience. The RES might add to our (universal) knowledge about this concept and its potential association with responses to trauma, treatment outcomes and targets. Up to now, the RES has been translated into Chinese, Turkish, Persian, French and Greek. Research on the validity and measurement invariance (the latter is seldom examined and was a unique feature of our RES study) of the various versions of the RES is highly encouraged to demonstrate cross-cultural validity (Sousa & Rojjanasrirat, 2011).
Future perspectives

Next to the aforementioned suggestions for further research described above and in the individual chapters of this thesis, we will outline some general points below.

Opportunities in facilitating self-assessment after trauma

In addition to PTSD and depression, SAM was also developed to assess other trauma-related outcomes (e.g. general stress, anxiety symptoms), and to generate a comprehensive profile of risk (e.g. previous mental health problems, peri-traumatic symptoms) and protective factors (e.g. psychological resilience, social support) that may influence these outcomes. Further research should look into the validity of these other trauma-related outcomes next to PTSS and depression within SAM.

Also, prospective studies are warranted wherein individuals use SAM directly upon trauma occurrence to investigate its predictive validity. Regarding prediction, recent developments like digital phenotyping should be explored, which may take screening for psychological problems to a higher level (Insel, 2017). In this new method, passive smartphone data like sensor behavior (e.g. activity, location), keyboard behavior (e.g. scrolling, reaction time) and voice and speech (e.g. sentiment, coherence) are used to gain insight into behavior, cognition and mood, and might even predict upcoming mental problems like a depression (Saeb, Lattie, Schueller, Kording, & Mohr, 2016) or psychosis (Bedi et al., 2015). Since research on digital phenotyping is in its infancy, its predictive effects are promising but need further investigation (Insel, 2017).

Besides the validity of mobile screeners, it is also important to examine the feasibility, usability and acceptability to ensure user acceptability and use beyond the trial (Fleming et al., 2018). Since fear of mental health stigma is common in the general population (Clement et al., 2015), but may be even more problematic in high-risk professions (Haugen, McCrillis, Smid, & Nijdam, 2017) (chapter 4), studying the willingness to use mobile screeners could be especially relevant in these professions. Furthermore, research should look into how to incorporate mobile screeners into existing systems or care, for example as a screening and monitoring tool during regular (mental) health checkups in high-risks professions, as a screening tool actively offered (and voluntary used) after PTEs as traumatic injuries (Price, Sawyer, Harris, & Skalka, 2016), or in clinical care wherein the results of these tools may enhance patients’ self-insight (van Os et al., 2017), or help guide clinicians during face-to-face diagnostic interviews or treatment (chapter 3). Additionally, attention should be paid to whether, how, and by who the results of these tools are monitored, and in which manner (professional) care may be offered when needed.
Chapter 9

**Research endeavors in developing, examining and implementing self-help apps after trauma**

With regard to the development phase, end-users should be involved from the start in developing the content, design and features of self-help apps to really understand their needs and potentially enhance future app uptake and engagement (Kuhn et al., 2014; Olff, 2015; Schellong, Lorenz, & Weidner, 2019).

Considering the research phase, innovative, quick research methods are urgently needed to keep up with the fast developments in the (mental health) app field wherein new apps are constantly being released into the market (Olff, 2015). However, the time-consuming RCT is still the golden standard to evaluate health interventions, so apps may be already outdated after research has ended (Hollis et al., 2015; Mohr, Riper, & Schueller, 2018; Olff, 2015). Suggestions on multiple baseline testing, interrupted times series and collecting more data points through ecological momentary assessments (EMA) are proposed (Sanson-Fisher, D’Este, Carey, Noble, & Paul, 2014), but there is no alternative yet for the classical RCT including a control condition (Olff, 2015). Additionally, similar to mobile screeners, besides determining the efficacy (and possible adverse effects such as worsening of symptoms) of self-help apps, research should also examine the feasibility and acceptability, including usage patterns, user satisfaction, perceived helpfulness, and willingness to use the app (chapter 4 and 5) (Fleming et al., 2018; Owen et al., 2015).

Considering the implementation phase, solid business models to ensure sustainable financial methods to maintain and update apps in the app stores are of crucial importance. Unfortunately, most of the evidence-based self-help apps are not available in the app stores (Donker et al., 2013; Van Ameringen et al., 2017) possibly because of a lack of money when research funding has ended (Olff, 2015). Research on the cost-effectiveness of apps is relevant in general, but may be especially helpful in setting up business models wherein governments, health care policy makers and insurance companies could be involved (Olff, 2015).

Finally, when apps do get released into the app stores, it is highly recommended to surveillance their use, reach and impact by gathering anonymously aggregated data as was done for PSTD Coach (Owen et al., 2015). Studies on how to keep end-users engaged with the app content should be conducted, including the role of reminders, gamification, online app usage tutorials, and (therapist) guidance (Cernvall, Sveen, Bergh Johannesson, & Arnberg, 2018; Fleming et al., 2018).
Further directions for a broader view on PTSD treatment outcomes

Since we were the first to report on residual PTSD symptoms on an individual symptom level after TF-CBT in police officers (chapter 7), our results should be replicated in other samples of PTSD patients, including the general population and other high-risk professions, who endured various trauma types. Future research on (individual) residual PTSD symptoms may contribute to a more comprehensive evaluation of treatment effectiveness that goes beyond effect sizes, and may broaden our knowledge on the strengths and limitations of evidence-based PTSD interventions and potential targets to improve their effectiveness (Larsen et al., 2019). Additionally, associations between post-treatment residual symptoms with trauma type, baseline PTSS, sociodemographic variables, treatment characteristics, lingering impairments, and the risk of PTSD relapse over time need to be further explored. Also, research should focus on positive outcomes and factors as posttraumatic growth and psychological resilience and their relationship with psychopathology after PTSD treatments to provide a more in-depth understanding of treatment effectiveness and the underlying mechanisms in thriving after trauma (Hagenaars & van Minnen, 2010; Knaevelsrud, Liedl, & Maercker, 2010; Roepke, 2015; Zoellner & Maercker, 2006).

Limitations and strengths

In addition to the specific limitations and strengths mentioned for each study in the individual chapters of this thesis, we will mention a few overall points that might have general implications.

Although our study on SAM provides evidence for the validity of a mobile post-trauma screener, we did not examine the feasibility and acceptability of SAM in this particular study (chapter 3). Both of our studies on PTSD treatment outcomes (chapter 7 and 8) lack a control condition. The absence of a control condition in investigating PTSD treatment outcomes is a common problem that could partly stem from ethical reasons, and may lead to biased results, like overestimations of the therapies’ effectiveness. Comparison to no treatment may be especially of value for PTSD, because PTSS may naturally dissolve over time. Further, our PTSD treatment outcomes studies included direct post-treatment assessments, but no long-term follow-up assessments. Hence, the potential long-term effects of the described psychotherapies on PTSS reduction, posttraumatic growth enhancement, and course of residual symptoms is unknown. This is unfortunate, especially since multiple studies have shown long-lasting effects of TF psychotherapies over months, and even years (Larsen et al., 2019). Similarly, our study on SUPPORT Coach lacks a long-term follow-up assessments as well, therefore, the potential effects of the app beyond one month remain unclear.
Finally, four of our studies were performed in high-risk occupation populations, i.e. three in police officers and one in health care professionals, so generalization to other high-risk jobs and the general population with various trauma types, education levels and cultural backgrounds remains to be confirmed.

This thesis comprises several strengths. Our study population of trauma-exposed healthcare professionals could be considered as a limitation, but is a strength as well. Up to now, literature on the impact of psychotrauma and presence of PTSS in this group is relatively scarce compared to other high-risk professions like veterans and fire fighters. Moreover, individuals with limited PTSS have unfairly received little attention, and studies in this at-risk group have been rarely conducted. Overall, our studies focus on multiple trauma phases and levels of PTSS, from directly (i.e. assessment and self-help) to potentially years after trauma (clinical PTSD patients and treatment outcomes), providing a broad view of opportunities to empower individuals in various phases following trauma. Moreover, all our studies have large sample sizes, including the large group of healthcare professionals in our SUPPORT Coach RCT (chapter 5), and our unique large group of treatment seeking and receiving police officers (chapter 6 and 8), enabling the detection of actual differences between groups. Furthermore, instead of only focusing on PTSS, we examined other trauma-related outcomes and factors as well (chapter 3, 5, 8), and valid instruments were used in all our studies.

**Overall conclusion**

In all, this thesis shed insight into opportunities for empowering trauma-exposed individuals regarding (self) assessment, self-help and formal treatment after trauma. The findings in this thesis demonstrated that apps offer possibilities in facilitating (self) assessment of trauma-related symptoms and delivering easy-accessible self-help to self-manage these symptoms. We observed that SAM could be a valid (diagnostic) screener to assess PTSD and depression. Further, SUPPORT Coach may provide self-help to diminish negative trauma-related cognitions and strengthen psychological resilience. Importantly, apps cannot replace face-to-face care, but offer possibilities in enhancing a stepped care model after trauma. Of notice, we are still at the beginning of exploring these possibilities.

Regarding clinical PTSD populations, our study indicated that the absence of a PTSD diagnosis post-treatment does not imply the absence of residual PTSD symptoms, and attention should be paid to (individual) residual PTSD symptoms and their potential predictors. Also, focusing on positive outcomes and factors as posttraumatic growth and
psychological resilience and their association with psychopathology post-treatment add to a more in-depth understanding of treatment effectiveness and the underlying mechanisms in thriving after trauma (Hagenaars & van Minnen, 2010; Knaevelsrud et al., 2010; Zoellner & Maercker, 2006).

Similar to the ancient Japanese tradition *Kintsugi* wherein broken objects are repaired with gold because of the philosophy that the suffered damage make them more valuable, trauma-survivors may view their trauma as precious, golden scars and value life more. We encourage future research and clinical practice to further explore ways to empower individuals affected by trauma, and to ultimately help trauma-survivors *finding the golden lining*. 
References


Van Ameringen, M., Turna, J., Khalesi, Z., Pullia, K., & Patterson, B. (2017). There is an app for that! The current state of mobile applications (apps) for DSM-5 obsessive-compulsive disorder, posttraumatic stress disorder, anxiety and mood disorders. *Depress Anxiety, 34*(6), 526-539.

