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Posttraumatic growth in combat veterans with PTSD

-A literature review-

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Vivian S. Decker

s1213520

1st reviewer: dr. Anneke M. Sools

2nd reviewer: dr. Mirjam Radstaak MSc

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Abstract

Posttraumatic growth (PTG), the process of developing beyond one's previous level of well-being after having experienced an adverse event, is an extensively studied and well researched concept of positive psychology. Nevertheless, there are calls for more specialized knowledge about mechanisms that are at hand in different sample groups that face adversity (Morris, Shakespeare-Finch, Rieck & Newbery, 2005; Zoellner & Maercker, 2006). One such specialized group are military members who are frequently faced with potential traumatizing events (Suliman et al., 2009). This literature review examines which variables affect PTG in combat veterans and answers the overall question to what extent PTG affects posttraumatic stress disorder (PTSD) -symptoms in combat veterans.

The search for appropriate, empirical studies resulted in a total of 19 articles, which surveyed the effects of PTG on PTSD in mainly male and Caucasian combat veterans. All of these studies assessed PTG and PTSD via self-assessment. This proved to be a major drawback in these studies. Next to that, the review indicated two different relationships of PTG and PTSD in combat veterans. Most of the studies (n=13) proved a negative effect and the minority (n=5) a curvilinear. Furthermore, interventions that supported PTG in combat veterans turned out to have a better effect when taking place after or before the deployment. The results of the 19 reviewed studies formed the basis for the creation of the 'PTG-ComVet'-model, which is the first of its kind. This predictive model consists out of the following seven groups of variables: (1)demographics, (2)military factors, (3)emotions, (4)cognitions, (5)pathologies, (6)individual factors and (7)social factors. These variables predict PTG at three different points of time: before, during and after the deployment. Including this time aspect and solely significant variables for developing PTG in combat veterans, the model receives significance for scientific research and practical treatment.

To create a better understanding about the meaning and the significance of the obtained findings, the results are finally discussed. In bringing together current and former scientific findings, this discussion enabled the creation of ten implications for future research. These implications represent possible directions for future research.

Samenvatting

Een vaak onderzocht concept vanuit de positieve psychologie is posttraumatische groei (PTG). Gedurende het proces ontwikkelt zich het individu boven zijn/haar voormalig niveau van welbevinden. Hoewel het concept van PTG nauwkeurig werd onderzocht, bestaat er tegenwoordig behoefte aan diepgaand kennis over de mechanismen van PTG binnen verschillende bevolkingsgroepen (Morris, Shakespeare‐Finch, Rieck & Newbery, 2005; Zoellner & Maercker, 2006). Een groep die een bijzonder hoog risico oploopt om met tegenvallende situatie geconfronteerd te worden, zijn militairen (Suliman et al., 2009). Om aan de vordering naar specifiek kennis te voldoen, wordt in deze literatuur studie onderzocht welke variabelen PTG bij toenmalige vechters beïnvloeden. Hiermee wordt de algemene onderzoeksvraag in hoeverre PTG invloed op posttraumatische belasting stoornis (PTSS) - symptomen heeft, beantwoord.

Het zoeken naar geschikte, empirische studies resulteerde in 19 artikelen die vooral de effecten van PTG op PTSD in mannelijke en kaukasische toenmalige vechters hebben onderzocht. Alle studies onderzochten PTG en PTSD met behulp van zelfevaluatie. Dit gebruik van zelfevaluatievragenlijsten bleek een limitatie van deze studies te zijn. Daarnaast liet het onderzoek vooral twee effecten van PTG op PTSD in toenmalige vechters zien: een negatief (n=13) en een curviliniair (n=5) effect. Bovendien bleken interventies die het ontwikkelen van PTG bevorderen het meest effectiefst als zij na of voorafgaande aan de inzet plaats vonden. Gebaseerd op de resultaten die in de studies naar voren kwamen, werd het ‘PTG-ComVet’- model opgesteld. Dit is het eerste van zijn soort. Het bestaat uit de volgende zeven groepen van PTG-voorspellende variabelen bij toenmalige vechters: (1)demografische variabelen, (2)militaristische variabelen, (3)emoties, (4)cognities, (5)pathologische variabelen, (6)individuele variabelen, (7)sociale variabelen. Deze variabelen voorspellen PTG op drie verschillende tijdstippen: voor (pre-), gedurende (deployment) en na (post-) de inzet. Door het toevoegen van het tijdsaspect en door het gebruik van variabelen die significant in het voorspellen van PTG in toenmalige vechters bleken, is het model van wetenschappelijk en praktisch belang.

Om de betekenis en het belang van de gevondene resultaten beter te kunnen begrijpen, worden de resultaten aan het eind bediscussieerd. Het uiteenzetten van de recent en eerder behaalde onderzoekresultaten resulteerde in het opstellen van tien implicaties voor toekomstig onderzoek. Deze implicaties wijzen dus de richting voor volgend onderzoek.

1. Introduction

During the lifetime nearly each individual faces a situation that comes unexpected and that may shatter former beliefs (Jakovljević, Brajković, Lončar, & Čima, 2012). Most of the times, these events are recognized as being problematic but fortunately fail to have a long lasting negative impact (Yi et al., 2012). Nevertheless, in some cases people suffer from the experienced adversity in the long-term and develop a so-called posttraumatic stress disorder (PTSD). Those trauma survivors experience several symptoms like frequent intrusions, so-called flashbacks, and nightmares (American Psychiatric Association, 2013).

Recently, there are lively debates about which treatment decreases PTSD symptoms the best (e.g. Friedman, 2011; Taylor, 2004; Wilson, Friedman & Lindy, 2012). More specifically, researchers examine the impact of interventions on PTSD symptoms based on concepts derived from the relatively new approach of 'positive psychology'. Here, the focus is drawn to individual strengths instead of weaknesses, which is expected to decrease symptoms (Seligman & Csikszentmihalyi, 2015). A positive psychological concept that has a promising potential to help especially PTSD-affected individuals, is the one of 'posttraumatic growth' (PTG). This concept implies the basic assumption of adversarial events having an experienced positive impact on the individual afterwards (Tedeschi & Calhoun, 2004). In this field, a high amount of research focused on a general conceptualization of PTG. But as researchers like Morris and colleagues (2005) emphasize, there exists a need for a more narrowed view on the PTG concept by '*... looking at whether the type of traumatic event has an effect on PTG and time.*' (p. 584).

An occupational field wherein individuals risk to be confronted with frequent adverse events is the military. During deployment combatants are faced with combat exposure and are sometimes even threatened by death. These circumstances increase the chances of developing a PTSD (Zinzow, Britt, McFadden, Burnette & Gillispie, 2012). Therefore, examining PTG in PTSD-affected combat veterans is of special interest for the general research field as it broadens the knowledge about possible mechanisms that are at hand in developing PTG in PTSD-affected individuals. In reviewing the recent literature on PTG in PTSD-affected combat veterans, this study will shed more light on the factors that influence PTG in the military context in answering the following research question:

To what extent does posttraumatic growth affect combat veterans' suffering from PTSD following combat experiences?

The succeeding part is based on recent scientific insights and constitutes the theoretical background for this study in clarifying its basic concepts of PTG, PTSD and the military research context.

1.1 Posttraumatic Growth

Tedeschi, Park and Calhoun (1998) coined and defined the concept as 'persons experiencing this phenomenon have developed beyond their previous level of adaption, psychological functioning, or life awareness, that is, they have grown' (p.3). To enable this subjective experience of growth an adverse event must have taken place (Tedeschi, Park & Calhoun, 1998). Posttraumatic growth (PTG) gathered the, to this point, prominent and variously used concepts like 'stress-related growth', 'thriving' or 'positive psychological stress' (Tedeschi, Park & Calhoun, 1998). Several studies emphasize that PTG as a concept is as well a *process* of positive reinterpretation as well as an *outcome* of coping, meaning that PTG must be actively reached (Tedeschi & Calhoun, 1996; Tedeschi & Calhoun, 2004). Special attention is drawn to the fact that this does rather not mean that the adverse event itself is evaluated positively, but rather the process of mastering the situation following the adverse event (Tedeschi & Calhoun, 2004).

In coining the concept, Tedeschi and Calhoun (2004) proposed a five-dimensional concept structure. The first domain incorporates a greater appreciation of life and a changed sense of priorities. Next to that, people reporting PTG show comparatively warmer and more intimate relationships with others as they did before, as well as a greater sense of personal strength. The fourth domain of PTG is the recognition of new possibilities or of new paths for one's life. The last domain that goes together with PTG is a spiritual development. Individuals can show a different amount of growth in each domain.

Linley and Joseph (2004) conducted a literature review about adverse growth, which is, according to their definition, equivalent to PTG. They reviewed 39 empirical articles that report growth after adversity and identified individual factors that contribute to growth. According to these authors, optimistic and intrinsically religious individuals show the highest amount of PTG (Linley & Joseph, 2004). Next to that, their findings demonstrate that a highly traumatic experience, which is dealt with positive reinterpretation and acceptance coping, has the highest potential to be the origin of PTG (Linley & Joseph, 2004). Besides emphasizing the influence of individual characteristics like personality on PTG, Ramos and Leal (2013) found that environmental characteristics as well as coping strategies and rumination style contribute to the development of PTG.

PTG research emphasizes a required distinction between PTG and resilience. As Westphal and Bonanno (2007) point out, resilience already includes the ability to cope with adverse events, whereas PTG seeks to gain this ability at the end of the process. Therefore, resilient people will suffer mainly in the beginning, but their complaints decrease comparably fast. Individuals who already possess the ability to cope with adversity may therefore even report lower PTG (Westphal & Bonanno, 2007).

The theoretical construction of the PTG concept did receive some critique though. Maercker and Zoellner's (2004) '*Janus-model of posttraumatic growth'* represents one of the most prominent objections raised. These authors criticize the lack of differentiating between the individual and environmental perception of PTG (Zoellner & Maercker, 2006). To overcome this theoretical shortcoming, they propose to add next to Tedeschi and Calhoun's (2004) *constructive growth*, a second consequence of experiencing adversity: *deceptive growth* (Maercker & Zoellner, 2004). Individuals that perform deceptive growth may report growth but do not really grow from the adverse event. Instead of actively performing the process of growth, these individuals passively report growth without reflecting about what happened and what this meant for their own life (Maercker & Zoellner, 2004). At first both, the constructive and the deceptive side, will cause a higher reported amount of PTG. In the long run, the effects of deceptive growth will diminish, because unprocessed feelings are hypothesized to cause increased health complaints and decreased well-being (Maercker & Zoellner, 2004). Hobfoll and colleagues (2007) confirm this illusive and deceptive character of PTG. Their empirical study indicates that PTG is even related to higher scores of emotional distress and therefore a factor negatively related to mental health.

Concluding, the insights of recent literature give ambiguous implications about if and how PTG affects the individual and the overall pathology.

1.2 Posttraumatic Stress Disorder

According to Alonso and colleagues (2004), each year 1.9 percent of the European population develops a posttraumatic stress disorder (PTSD). To diagnose a PTSD the DSM-V determines several criteria that need to be fulfilled (American Psychiatric Association, 2013). First, the individual must have experienced or witnessed a highly threatening event. Secondly, the individual suffers from intrusions that occur without any control or prediction, like flashbacks or nightmares. Thirdly, veterans prevent a confrontation with trauma-related stimuli or thoughts in avoiding any possible situation of confrontation. Fourthly, the cognition and mood worsen, as survivors start feeling alienated from others or start blaming themselves for what

happened. Fifthly, reactivity and arousal increase, meaning that survivors suffer from concentration problems, hyper vigilance or aggressive behavior. The last PTSD-criterion demands symptoms that last longer than one month.

PTSD symptoms can occur directly after the adverse event took place (*immediate onset*) or six month post-event (*delayed onset*). Events that cause a PTSD are found to be diverse. In six different European countries the most frequent PTSD-causing events have been identified to be rape or getting beaten (Darves-Bornoz et al., 2008).

Jakovljević et al. (2012) summarized potential risk factors for developing a PTSD. Individuals that face a high amount of stress or have been exposed to trauma in an early life stage have a high potential to start suffering from PTSD following adversity. Regarding potential individual characteristics neuroticism, pessimism, impulsivity and lack of parental care increased the chances to develop a PTSD (Jakovljević et al., 2012).

1.3 Combat veterans

Nowadays, European troops are again participating in military war operations, like the mission in Afghanistan. The involvement in such deployments caused concerns about potential deployment-related health problems in combatants (Price et al., 2012). This concern is scientifically not ungrounded as military members are faced with a high amount of potentially traumatic events (PTE's), which increases the chances to develop psychopathologies (Suliman et al., 2009). Cumulative experienced PTE's prove to cause mainly PTSD, depression and alcohol misuse in combat veterans, which can also co-occur (Hoge et al., 2004). Hoge et al. (2004) identified the most frequent PTE's in American combatants '… such as being shot at, handling dead bodies, knowing someone who was killed, or killing enemy combatants' (p. 16). Therefore, combat veterans possess a risk to develop PTSD, which can develop during or after deployment. Lowering the risk of developing PTSD in those deployed military members can take place at three several times: before deployment, during deployment and after deployment. Pre-deployment interventions seek to prepare the soon deployed for PTE's as well as lowering the barriers to seek help when symptoms arise after deployment. Introducing potentially helpful resource trainings like resilience or combat stress control treatments proved to decrease such barriers to seek help (Zinzow et al., 2012; Price et al., 2012). During deployment relaxation techniques and supportive psychotherapy are frequently utilized to lower the risk to develop PTSD (Penix et al., 2016). Treating combat veterans after deployment consists mostly out of 'Exposure Therapy', which aims to let the veteran re-experience and re-live the traumatic situation

through imagination or through virtual reality exposure (Cukor et al., 2015). In focusing on the effects of PTG on PTSD in combat veterans, this literature review has the potential to give new directions for future treatment of PTSD symptoms in combat veterans.

1.4 Contribution to research and practical relevance

In answering the research question, this study adds to the scientific and practical psychological field. Although several empirical studies have been conducted that assessed the factors influencing PTG and their effects on PTSD in the military context, until today no study exists that gathers these insights into a review. Therefore, conducting a literature review on PTG and its effects on PTSD contributes to a better understanding on how these processes are working and gives an overview about the present state of research. To enable an answer to the research question to what extent PTG does affect PTSD symptoms in combat veterans, the following sub-questions are answered in this literature review:

1. *How are the studies designed that examine the influences of PTG on PTSD in combat veterans?*

   The answer to this question sheds more light to the current state of empirical research conducted in the military PTG-research field and enables a sorrow understanding of how PTG and PTSD have been assessed.

2. *What are identified analytical and practical drawbacks of PTG in military research?*

   The answer to this question identifies possible factors to which future researchers and practitioners need to pay attention.

3. *What are the effects of PTG on PTSD in combat veterans?*

   In answering this question, the direction of a potential relation between PTG and PTSD will be outlined.

4. *Does the timing of treatment affect the relation between PTG and PTSD in combat veterans?*

   As outlined above, literature showed that interventions could take place at several points of time. In reviewing the literature, the answer to this question could give practical insights in when PTG-interventions would be the most advantageous.

5. *Which factors are related to PTG in combat veterans?*

   Reviewing recent empirical studies about the effects of PTG on PTSD in combat veterans may identify certain variables that are related to PTG. This gives an overview about which factors have been already assessed and which factors still need to be assessed.

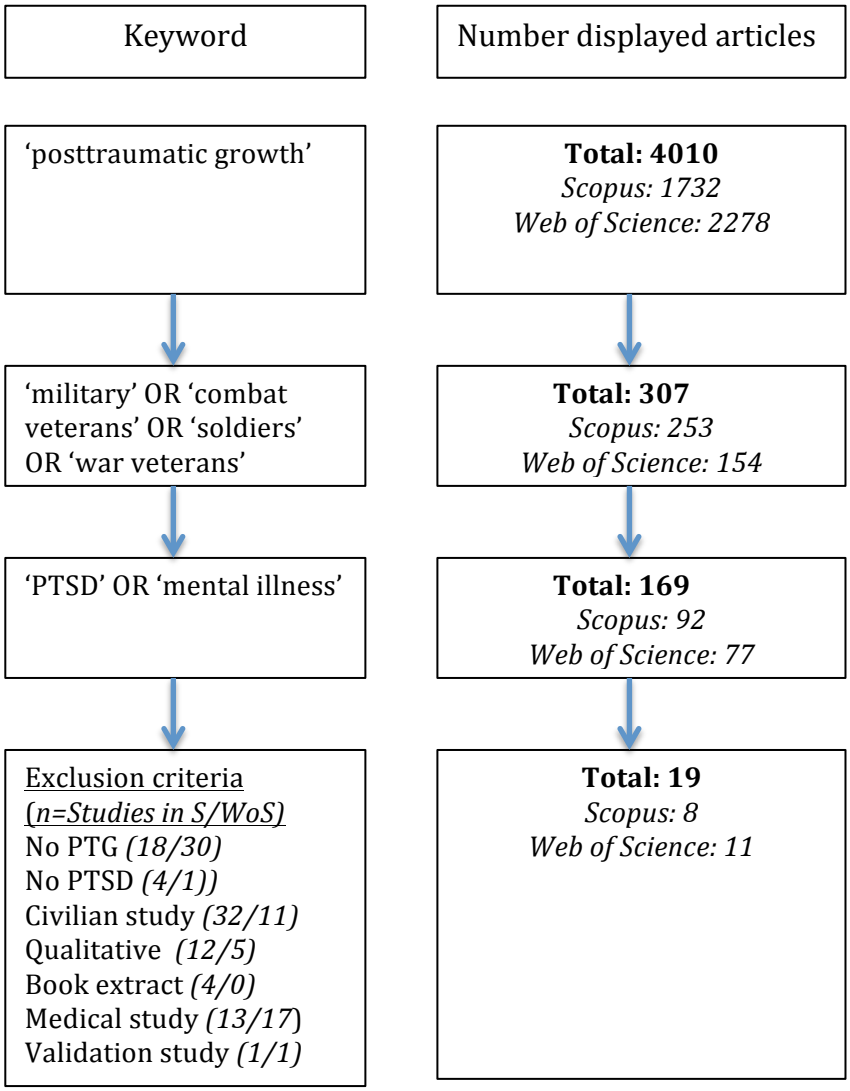
2. Method

The answer to the research question has been given through the conduction of a literature review. For this purpose, the scientific search engines '*Scopus*' and '*Web of Science'* have been scanned. Figure 1 represents the sharpened search for empirical articles that provide an answer to the research question graphically. Adding related terms as 'posttraumatic stress' or 'benefit finding' did not lead to advanced results and therefore 'posttraumatic growth' has been chosen as sole starting term. Following the final entry of the search terms 169 articles remained. Thereafter, the abstracts of those articles have been scanned and the below described exclusion criteria have been applied. This resulted in a final article pool of 19, which included only articles that met the inclusion criteria in assessing PTSD, PTG and the effects in combat veterans. Those remaining articles have been analyzed thoroughly with the help of the five, previously formulated sub-questions. The answers to each sub-question are outlined in the result section and enable a concluding answer to the overall research question. All of the summarized insights can be found in Appendix A to C.

2.1 Exclusion criteria

As figure 1 shows, seven exclusion criteria have been applied. Articles have been excluded that did not incorporate the for this research important variables of 'posttraumatic growth', 'PTSD', 'military context' or 'combat veterans'. Furthermore, all qualitative studies like Moran, Burker and Schmidt (2013) have been excluded. This decision has been made due to the statistical significance-increasing character of empirical studies. Search results that have been text parts of a book were excluded as well, due to the risk that the content of the chapter was detached from the context of the remaining book. The article of Solomon and Dekel (2005) investigated effects of PTG in a military context, but compared ex-prisoners of war and conventional combat veterans. This literature review sought to identify the effects of PTG in just conventional combat veterans. Therefore, the comparison within the military would have been of low use to this study. A high amount of matched articles have not been part of psychological research. Yu et al. (2013), for example, assessed the negative impact of single prolonged stress on the bone development in mice. As this had nothing to do with this researches aim, such studies have been excluded. The last exclusion category contains survey-validating studies. As this research category has not been linked to any of the for this study important variables, this category has been excluded.

Figure 1. Literature review chart



3. Results

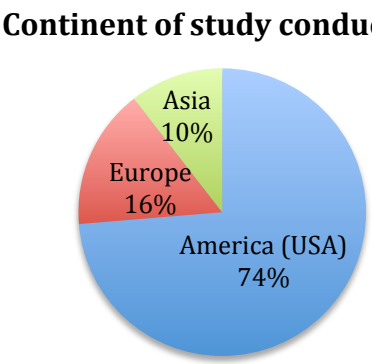
3.1 Sub-question 1

How are the studies designed that examine the influences of PTG on PTSD in combat veterans?

3.1.1 Research design

The majority of the studies (n=12) have been designed cross-sectional. The remaining articles (n=7) assessed longitudinal effects in combat veterans, which enabled an increased validity and generalizability of the findings. The sample groups are drawn exclusively based on the participant's belonging to the military, meaning that they have been or will be deployed to a military mission abroad. Fifteen assessments took place in the United States, three in Europe and two in Asia (see Figure 2). In the majority of the articles, participants have been Caucasian and up to 98 percent have been male (see Steger, Owens & Park, 2015). An exception to these male dominated samples are the studies of Maguen et al. (2006), Yi et al. (2012) and McLean (2013) due to a female participation of more than twenty percent. This increased female participation may be explained by the fact that these studies assessed PTG in military medical personal. As Smith (2007) found before, healthcare is one of the domains where most of the female combatants are occupied. Therefore, the sample choice might have influenced the different gender representation.

Figure 2. Distribution of continent of study conduction



3.1.2 Operationalization

All fifteen studies that analyzed the effects of PTG agreed upon the subjective character of the concept and seven studies emphasized its multidimensionality, which is in line with the original definition of Tedeschi and Calhoun (1996). Three studies used benefit finding instead of PTG as dependent variable (Wood et al., 2012a; Wood et al., 2012b, Wood et al., 2011). In contrast to PTG, benefit finding was defined as a coping strategy and not as a process. Steger, Owens and Park (2015) incorporated PTG in the concept of stress-related growth, which develops as a result of restoring one's beliefs and goals to feel purpose again.

Despite slightly deviating definitions, all articles defined PTG as a change following a traumatic experience. However, several studies explicitly operationalized PTG as a process, meaning that it is not just a change that suddenly takes place but rather an active development initiated by the individual's abilities and resources (e.g. Staugaard et al. 2015; Engelhard, Lommen & Sijbrandij, 2014).

3.1.3 Assessment of PTG

In line with the statement of the individual character of PTG, all studies utilized self-assessment surveys to measure the individual amount of PTG. For the measurements the PTGI (Tedeshi & Calhoun, 1996) or the PTGI-SF (Cann et al., 2010) have been used. This survey has a good validity and consists out of 21 items, which relate to perceived changes in the three constructs of individual self-perception, interpersonal relationships and changed philosophy of life (Morris, Finch, Rieck & Newberry, 2005; Tedeschi & Calhoun, 1996). The construction of the PTGI is in line with the basic assumption of the multidimensional character of PTG. Using an abbreviated, non-validated assessment tool like Pietrzak et al. (2010), has the advantage of saving time but results in an overall limited generalizability. Even though the participants had a military background, seven studies did not assess the specific deployment situation of the participants. Instead, soldiers received the same surveys as civilians would have had. The other studies investigated military specific variables like most frequent combat experiences and social support during or after deployment (Maguen et al., 2006).

3.1.4 Assessment of PTSD

Unlike the overall agreement in measuring PTG, the assessment of PTSD had not been the same in all studies. Nevertheless, a great number of studies (n=13) assessed PTSD symptoms with the help of the PCL (Weathers, Litz, Herman, Huska & Keane, 1993). Interestingly, this symptom list had several names in this literature. Here, the PCL-M (military version), PCL-S (specific version) or PCL-C (civilian version) has been used. All four versions contain the

same 17-items, which need to be scored on a 5-point Likert-Scale. The items support the diagnosis of PTSD according to the DSM-IV criteria. Due to the change of diagnostic criteria of PTSD in the new version of the DSM-V, the PCL changed into the PCL-5 (Hoge et al., 2014). This 20-item version has already been utilized by three longitudinal studies (Tsai, Mota et al., 2016; Gallaway et al., 2011; Tsai, Sippel, et al, 2016). Here, the revision turned out to be problematic, because the participants received the PCL during their first assessment and the PCL-5 during the second. The change of assessment tools decreased the overall validity of the study. Four of the studies utilized different assessments that sought to measure PTSD symptoms. Deviating from the PCL, those surveys, like the BSI-18, screened a broad range of psychological symptoms and had therefore been not exclusively focused on identifying PTSD. Maguen et al. (2006) used a dichotomous 'exposure to warfare scale' to assess in how far participants experienced potentially traumatizing events. Yi et al. (2012) did not measure PTSD at all, but drew conclusions on its relation to PTG in the discussion afterwards.

3.1.5 Conclusion

All in all, the cross-sectional designed studies assessed a sample that consisted to a high degree out of Caucasian and male combat veterans. The effect of PTG on PTSD has been most commonly measured using the self-assessment surveys PTGI and PCL. A table containing the compressed findings is represented in Appendix A.

3.2 Sub-question 2

What are potential analytical and practical drawbacks to PTG in the military research field?

In analyzing PTG in combat veterans, all articles evaluated the individual character of posttraumatic growth as being problematic. Every study employed an assessment that utilized surveys that have been solely based on the participant's perceived positive amount of change in PTG. Consequently; this has been identified as impeding the reliability and objectivity of the overall results of each study. Another drawback of assessing PTG proved to be its 'post'-event character. Seven of the articles conducted the study more than two years after the traumatic event took place. As McLean et al. (2013) elucidated, such a long time span risks to result in altered answers to the questions related to the traumatic event.

The findings of Engelhard et al. (2014) represent a strong drawback concerning the practical application of PTG in combat veterans. The participating veterans, who reported higher PTG five month after their deployment, finally suffered from higher PTSD symptoms

15-month later. This has been the only study out of the nineteen studies that confirmed the outlined deceptive side of Maercker and Zoellners (2004) '*Janus-model of posttraumatic growth'*.

3.2.1 Conclusion

The flaws in analyzing and applying PTG in combat veterans proved to be a general issue in each of the studies. One should mainly be aware of the subjective and belated character of the PTG assessment and possible illusive effects. The exact findings can be found in Appendix C.

3.3 Sub-question 3

What are the effects of PTG on PTSD in combat veterans?

The majority of the articles (n=15) showed that PTG and PTSD are correlated and affect each other. In thirteen articles, this relation has been negative, meaning that higher PTG led to lower PTSD scores (e.g. Currier et al, 2013). Dekel et al. (2016) showed that higher PTSD scores predict higher PTG scores in the long run. Several articles (n=5) found evidence for a curvilinear relation of PTSD and PTG. This means that in case of too high or low PTSD scores PTG will not take place. An exception to the demonstrated positive effects represents the study of Engelhard, Lommen and Sijbrandij (2014). They found that higher PTG scores predicted higher PTSD scores 15 months after deployment.

The great majority of the scientific articles (n=17) found that PTG and PTSD are separate variables, which are related to each other or work as moderator (e.g. Wood et al., 2012a; Tsai, Mota et al., 2016). Solely McLean and colleagues (2013) and Tsai and colleagues (2016) identified PTSD and PTG as not being mutually exclusive (McLean et al., 2013). They argue that PTG and PTSD are located at the same continuum instead of being one of two different outcome variables.

The five dimensions of posttraumatic growth and their impact on PTSD have been assessed as well. As Tsai et al. (2016) encounter, perceiving personal strength is the most protecting dimension against developing PTSD. Gallaway et al. (2016) discovered the effects of less developed PTG domains. Lower amounts of personal strength, new possibilities and relating to others resulted in overall low PTG scores. In line with that, Maguen and colleagues (2006) showed that the five domains of Tedeschi and Calhoun (1996) predicted PTG. Here, personal strength and appreciation of life predicted PTG the best.

3.3.1 Conclusion

In summary, the majority of the studies treated PTSD and PTG as separate variables, where PTG had a decreasing or curvilinear effect on PTSD in combat veterans. Here, personal strength proved to be the most protective PTG-factor against PTSD in combat veterans. Appendix B gives a tabular overview of these results.

3.4 Sub-question 4

Does the timing of treatment affect the relation between PTG and PTSD in combat veterans?

Using the categorization of Davis and Brody (1979) the majority of studies (n=13) advise a *tertiary prevention treatment* to help lowering PTSD in combat veterans, meaning that the prevention is utilized as a '… form of crisis intervention.' (Yassen, 1995, p. 180). As Dekel et al. (2016) proved, PTSD symptoms decrease over time when supported by a psychological, PTG-fostering intervention. In line with that, Tsai et al. (2016) discovered that PTG was still prominent after a two-year period. This indicates a long lasting effect of PTG. The minority of the articles (n=4) advised to apply PTG interventions as primary prevention, meaning that treating veterans happened before deployment and the potential confrontation with an adverse event. All of these studies emphasize the protective character of PTG and suggest utilizing it as a buffer towards potential first or repeated adversity. Maguen et al. (2006) found an opposing mechanism. These studies assessed the impact of demographic, pre-, actual-, and post-deployment variables on PTG. Despite pre-deployment, all variables had an impact on PTG, which pleads against utilizing PTG-promoting interventions before deployment takes place. None of the articles explicitly plead for a secondary prevention treatment. This is in line with the observation that none of the studies measured the impact of PTG directly after the traumatizing event.

3.4.1 Conclusion

The identified studies mainly indicated an application of tertiary as well as primary prevention treatment-focused intervention in combat veterans. The effects of these treatments are expected to have long lasting effects that protect the individual from future adversity. No study indicated a secondary prevention treatment. The table that contains the findings of each study can be found in Appendix C.

3.5 Sub-question 5

Which factors are related to PTG in combat veterans?

The answer to this question is manifold. Each study added different variables that were hypothesized to affect PTG. Therefore, the results are summarized and categorized into one of the following seven domains: demographics, military factors, emotions, cognitions, pathologies, as well as individual and social factors.

3.5.1 Demographics

Hijazi, Keith and O'Brien (2015) as well as Gallaway, Millikan and Bell (2011) identified ethnicity as being a significant factor for PTG. Ethnic minorities proved to show higher PTG scores than majorities. This pattern is explained through the findings of Maguen and colleagues (2006). They found that minority groups have a higher feeling of new possibilities when deployed to military missions, which lead to higher perceptions of growth. Furthermore, age proved to be negatively related to PTG, meaning that older veterans show less PTG (Pietrzak et al., 2010). Married individuals showed lower amounts of benefit finding, too. Wood et al. (2011) justified their findings with the separation from their partner. Due to this, less feelings of meaningfulness are attributed to the deployment situation.

3.5.2 Military factors

Engelhard and colleagues (2014) identified a negative effect of deployment length on PTG. When deployed for half a year veterans reported PTG. This changed after a six month lasting deployment into overall lower PTG scores. Combat exposure is a variable that was frequently assessed to test potential influences on PTG and PTSD (n=11). The results concerning this factor are contradictory. Pietrzak and colleagues (2010), as well as Wood, Foran, Britt and Wright (2012) found that a higher frequency of combat exposure increases the level of PTG and benefit finding. Opposing to this finding, Wood et al. (2011) showed an increased amount of benefit finding when faced with less combat exposure. Another military specific factor was the military rank of deployed veterans (Gallaway, Millikan & Bell, 2011). Compared to low-ranked veterans, mid-ranked veterans scored lower on PTG. This was explained by a higher amount of deployments, combat exposures and a higher amount of responsibility (Gallaway et al., 2011). Pietrzak et al. (2010) added unit member support as PTG predictor to the military factors. The higher the amount of camaraderie, the higher the perception of PTG has been.

3.5.3 Emotions

Dekel et al. (2016) discovered that veterans with higher feelings of guilt, showed higher scores on PTG surveys afterwards. These findings are in line with the results of Hijazi, Keith and O'Brien (2015) who explained this phenomenon by reasoning that guilt requires the existence of moral rules, which needed to be restored actively. These authors assessed the effects of anger as well. Unlike guilt, anger prohibits individuals from growth, due to impairing their cognitive flexibility. Yi et al. (2012) found evidence for a positive effect of experiencing positive emotions on PTG. In line with that, negative emotions turned out to be negatively related to PTG.

3.5.4 Cognitions

Following a traumatic experience the centrality of positive and negative events played a crucial role in developing PTG (Staugaard et al., 2015). In perceiving the event as being central to one's life, the individual facilitated coping with the event. Recognizing both the negative and the positive aspects seemed to be especially important in enabling a realistic view on the event, which turned out to facilitate PTG later on. Steger, Owens and Park (2015) tested several models that would either lead to PTSD or to stress-related growth. They found that individuals who perceived higher amounts of meaning tended to show increased growth. To perceive meaning, they detected that the violation of individual goals has been crucial. In supporting the individual formulation of new goals, future meaning making and PTG could be therefore facilitated. Individuals that already possessed a high amount of meaningfulness, the ability to find meaning in adverse events, proved to promote PTG as well (Forstmeister et al., 2009). Another factor that turned out to facilitate PTG was re-experiencing the traumatic event (Tsai et al., 2015). Typical PTSD-symptoms like flashbacks and nightmares result in continuous exposure to the situation, which proved to be helpful in experiencing PTG afterwards. The individual ability to encounter situations with cognitive flexibility has been identified as having PTG-increasing effects, too (Hijazi et al., 2015). Due to the tendency to create flexible and complex assumptive belief systems, cognitive flexible individuals seem to adapt faster to adverse events and are more likely to perceive growth (Hijazi et al., 2015).

3.5.5 Individual factors

Stauggard et al. (2015) found proof for the hypothesis that individual openness predicts higher amounts of PTG. Another personality trait that had a positive effect on PTG is extraversion, meaning that individuals scoring high on extraversion scored higher on PTG (Engelhard et al., 2014). Next to that, an active lifestyle increased the scores of PTG (Tsai et al., 2016). In this study, active lifestyle has been operationalized as reading books. This is thought to enhance

the individual's imagination and broaden the horizon, which fosters the ability to integrate the traumatic experience into one's life. A third individual factor that turned out to be predictive to higher levels of PTG was the individual's urge to disclose the traumatic experience (Currier et al., 2013). Individuals who disclosed themselves to their social environment reported higher levels of PTG. These findings are explained by the observation, that the disclosure of feelings and thoughts enhances an active processing of the experience (Currier et al., 2013). Recently, Tsai et al. (2016) identified five clusters of PTG: consistently low, consistently high, moderately declining, dramatically declining and dramatically increasing PTG and related the clusters to individual factors. Interestingly, the consistently high PTG cluster reported higher extraversion-, agreeableness- and conscientiousness-scores. People of the increasing PTG cluster showed greater purpose in life and intrinsic religiosity.

3.5.6 Social factors

Forstmeister and colleagues (2009) had a closer look at the influences of social factors on PTG. They discovered that social acknowledgement increased the individual perception of PTG. The authors hypothesized that especially the support of important others is of crucial significance in perceiving growth. Counter intuitively, the disapproval of society might even foster PTG. In case of social critique, veterans might be even more prompted 'to seek personal growth and acknowledgment as survivors by significant others.' (Forstmeister et al., p.1037). Stauggard et al. (2015) pointed to the significance of social support in increasing PTG. Unlike the passive form of social acknowledgment; social support addresses the active behaviour of dear ones. In line with that, Tsai et al. (2015) showed that a feeling of social connectedness supported posttraumatic growth.

3.5.7 Pathologies

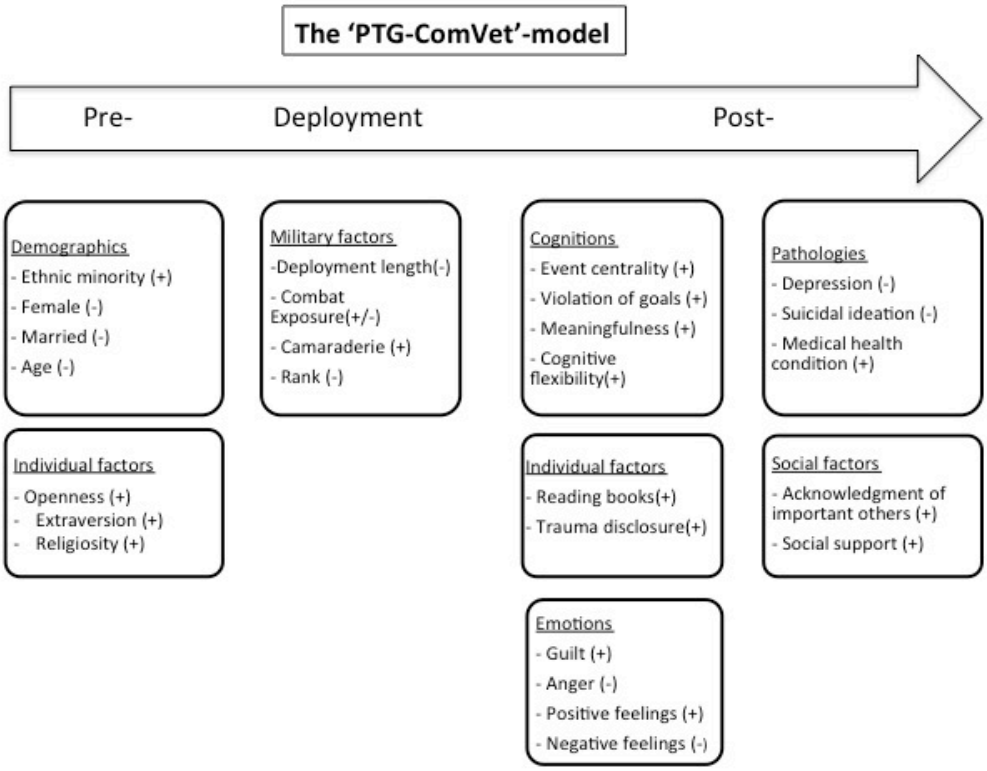
Reporting less symptoms of depression resulted in higher PTG scores (Wood et al., 2011). In line with that, Gallaway et al. (2011) reported that the presence of suicidal ideations influenced PTG negatively. Another finding of Tsai, Sippel and colleagues (2016) signified the existence of medical health conditions having a positive effect on PTG. The authors hypothesized that health issues represent constant reminders of the individual vulnerability and are thereby supporting a greater appreciation of life.

3.5.8 Model of PTG affecting factors

Based on the insights of the reviewed articles the predictive 'PTG-ComVet'-model has been created (see figure 2). Here, all variables are incorporated that proved to be of statistical significance in predicting PTG. To create the model, all variables have been first categorized

into one of the following domains: (1)demographics, (2)military factors, (3)emotions, (4)cognitions, (5)pathologies, (6)individual factors and (7)social factors. These domains have been again divided into one of the three identified time dimensions of military interventions: before (pre-), during (deployment) and after (post-) deployment. In this model, the effect of the variable on PTG is indicated with a '+' (positive relation) or a '–' (negative relation).

Figure 2. The predictive 'PTG-ComVet'-model



4. Conclusion

This literature review intended to identify to what extent PTG influences PTSD in combat veterans. Due to the contradictory findings of the nineteen studies, this question could not been answered clearly. Nevertheless, the review gave an overview about how recent empirical research in the military research field has been conducted to assess the effects of PTG on PTSD. In the assessment, the subjective character of both PTG and PTSD assessments proved to be a major drawback. Next to that, two main effects of PTG on PTSD have been identified: a negative and a curvilinear, whereas a considerable amount of studies (n=13) found a negative relationship. Treating PTSD with the help of PTG turned out to be the most

advantageous after and to a lower degree before deployment. Finally, the review enabled the creation of the predictive 'PTG-ComVet'-model for developing PTG in combat veterans. This model consists out of the seven domains (1)demographics, (2)military factors, (3)emotions, (4)cognitions, (5)pathologies, (6)individual and (7)social factors. These domains are categorized into one out of three time categories: before, during and after deployment. This model is up to now the first of its kind. Other literature reviews, like Larner and Blow (2011), focused their studies on the development and prevention of PTSD through PTG, instead of focusing on the identification of PTG-related variables.

These literature review-results demonstrate a representation of the results of already conducted research concerning the effects of PTG on PTSD in combat veterans. The answers to each sub-question have a potential impact for future research and practitioners. For this reason, the following section discusses the findings and finally outlines implications and potential directions for future research.

Concerning the general study design, the review showed that one third of the studies did not assess military specific variables. This lack of assessing military specific variables harmed the final findings of the studies. The PTG-predicting variable model shows that military factors are of importance for PTG in combat veterans, because studies that assessed such variables were able to proof their predicting character (Wood et al., 2011; Pietrzak et al., 2010). Assessing such context-specific variables might decrease the generalizability of results. On the other hand, as the studies are conducted in a specific context, leaving them out will definitely result in a lack of assessing important context factors.

Implication 1: To enable a better understanding of how context specific variables influence PTG and potential effects on PTSD, future research in the military context should assess context specific, meaning military related variables.

Another point of attention in reviewing the study designs have been the nearly unanimously study samples of male and Caucasian combat veterans. This finding raises two distinct concerns. Firstly, in 2010 16 percent of active duty enlisted men in the U.S. Army have been black, 12 percent have been Hispanic and 71 percent have been white (Statista, 2016). Therefore, the strong dominance of the Caucasian ethnicity in the research samples is at odds with the real ethnical distribution inside the military, where one fourth are non-Caucasians. The ethnic domination in the studies may be a potential source of biased research results. Hijazi et al. (2015), Gallaway et al. (2011) and Maguen et al. (2006) for example assessed the influence of ethnic membership and found that ethnic minority status improved

PTG. Having in mind that the samples consist nearly exclusively out of the ethnic majority members, this raises doubts about the validity of the findings. Possible causes for the overhang of Caucasian participation may be difficulties in getting access to the research, as mainly Caucasians may have been asked to participate.

Implication 2: Future research should effort to carry out assessments in military samples that consists out of a representative military sample.

The second concern is linked to the gender-related research in combat veterans. Until today, the military field is dominated of male combatants (Statista, 2016). In some domains like medical supply teams, this relation may be distributed more evenly, but, still, male members are in the majority. This is per se not problematic, but studies like Maguen et al. (2012) did assess gender effects and found that female combatants risked to develop PTSD during deployment, although they have faced less combat situations. This has on the one side, practical implications, as female veterans need obviously more professional help after deployment. On the other side, research needs to assess why this differences in male and female PTSD development during deployment occur. The finding of Maguen et al. (2012) also implies that non-combat related factors may play an increased role in the development of PTSD in female veterans, as they are faced with less combat exposure but develop more PTSD-symptoms compared to their male counterparts. Research that focuses on the whole context of veterans' deployment situation may be helpful in identifying, which factors contribute to the deviating PTSD-development in male and female combatants.

Implication 3: To gain an understanding about which factors cause gender-specific reactions to deployment research is needed that assess reasons for developing PTSD during deployment. In responding to possible gender-specific needs of combat veterans, prevention and treatment can be improved.

PTG has been measured exclusively with the help of self-assessment tools like the PTGI. Possible deceptive growth tendencies that had been proposed by Maercker and Zoellner (2004) have not been assessed or discussed. This is in line with Zoellner and Maercker's (2006) critique on PTG literature: that the assessment is most of the times biased in wanting to proof '… that PTG fosters psychological adjustment' (p. 635) and therefore 'The phenomenon of self-perceived PTG is still not well understood and cannot yet be described in a theoretically satisfying manner or measured with reliability and validity.' (p. 649). Given that this critique has been uttered more than ten years ago, one would assume that

recent assessments would control for possible illusive growth tendencies, but this, as it turned out, is still not the case. Therefore, the question of why this has not been executed earlier needs to be raised. A possible explanation may be the difficulty of assessing growth objectively. Possible assessment methods that may create more objectivity could be observations or reports from the respondents' social environment. As this is more time consuming than assessing and analysing growth solely via self-assessment, this might be a plausible explanation of the recent lack of deceptive-growth assessment in military PTG literature. Next to that, even if participants report deceptive PTG, this, different to Zoellner and Maercker's (2006) expectations, did obviously not result in lower PTSD, even in the long-term. This means that even if PTG is just an individual illusion and does not really exist, the individual growth experience might be sufficient in decreasing PTSD symptoms. This would make a supplementary measuring of illusory effects redundant, because the individual's perception would be sufficient enough to decrease reported suffering. To finally rule out worries about negative impacts of PTG or to contrarily proof maladaptive, illusive mechanisms of PTG, it is crucial to execute objective assessments in reality. If and only if this is done, the mechanisms of the PTG-experience can be understood.

Implication 4: To gain knowledge into possible illusory version of PTG, future research should take the trouble to assess PTG objectively. Possible methods could be observations or reports from the individual's environment.

Another drawback that attracted attention in this literature review was the lack of assessing which event caused the PTSD symptoms from which the combat veterans needed to grow. As outlined several times, the specific and individual treatment of trauma survivors is of crucial importance (Morris et al., 2015). Most of the studies did use combat exposure scales to measure to what extent the veterans had experienced combat exposure. But this does not imply that this exposure caused the trauma. Unlike civilians, combatants are prepared and trained to face combat situations. Therefore, it is not clear in how far the trauma developed during deployment. In the worst case, studies would assess former traumata that are unrelated to the combat experience. This would decrease explanatory power of the relation between PTSD and PTG in combat veterans. Some researches, like McLean et al. (2013), controlled for this possibility in assessing the PTSD symptoms (PCL) before and after the deployment. In case of a symptom increase, veterans developed a PTSD during deployment. This idea is still problematic, because previous literature found that the deployment situation as such might be sufficient for pre-traumatized combatants to increase symptoms (Smid, Kleber,

Rademaker, van Zuiden & Vermetten, 2013). This would be an example for a delayed onset of PTSD and would have little to do with the combat situation. A solution to the problems that occur while assessing the impact and development of combat exposure could be the utilization of e-Mental health techniques. Such techniques, like for example smartphone applications that permanently assess the condition of the combat veteran, could enable a constant assessment of participants (see van Gemert-Pijnen, Peters & Ossebaard, 2013). Utilizing this method would face researchers with less administrative involvement and offers the possibility to directly assess how the state of mind possibly changes.

Implication 5: In assessing which event caused the development of PTSD, future research contributes to a better understanding about the context specific behavior of PTG and PTSD. E-Mental health tools like permanent assessment via smartphone applications could be utilized to support the assessment.

The findings of Yi et al. (2015) give reason to discuss the assessed relationship between resilience and PTG. This study found a positive relation between PTG and resilience in medical cadets and pled for utilizing PTG in enhancing individual's amount of resilience and vice versa. This is contradictory to findings of former studies like Westphal and Bonanno (2007), which showed a negative relation between both. They argued that resilient people do not show PTG, because they are already able to cope with the adverse event and to integrate it into their life story (Westphal & Bonanno, 2007). The opposing findings of Yi et al. (2015) might be explained with the help of their research design. Here, medical cadets received PTG training as prevention against future adverse events. That means that no combat adversity has been experienced yet and medical cadets show growth based on the comparison of pre and post PTG scores. The lack of a real adverse event may have caused the deviating findings from other studies. It is therefore crucial, that studies inside the PTG-research field make a clear distinction between resilience and PTG.

Implication 6: In operationalizing and assessing PTG, future research should consider that resilience and PTG can not be replaced easily.

The findings of the fourth sub-question, which sought to identify the effects of PTG on PTSD in combat veterans, demonstrated two different effect patterns: a negative and a curvilinear. The first relation contains the assumption that lower PTG-scores will appear in line with higher PTSD-scores and vice versa. A curvilinear relation between PTG and PTSD means that too high or low scores of PTSD will not evoke PTG. How is it possible that the

articles of this literature review found proof for such obviously distinct relationships? One possible explanation for the surplus of negative-relation proving studies could have been low effect sizes and exaggerated total PTG-scores in the research sample. Like Staugaard et al. (2015) pointed out, low effect sizes are problematic for proving the curvilinear U-shape effect, because the results are in general too low to be able to show a wide-ranging effect. In case of a lack of extreme high or low total PTSD-scores in the sample group, their effects on PTG could not have been assessed and hereby bias the analysis. This thought is supported by small sample sizes of assessment groups and the reported lack of strikingly deviating PTSD-symptoms. In line with that, studies that reported large standard deviations and high overall PTGI-scores were able to proof the U-Shape effect (Tsai et al., 2015, McLean et al., 2013; Wood et al., 2012a; Tsai, 2016).

Implication 7: To proof the existence of a possible curvilinear relation between PTG and PTSD, more research is needed that utilize assessments that are normally distributed and that reach high effect sizes to avoid biased findings.

The identification of the PTG-related variables resulted in the creation of the 'PTG-ComVet'-model. This predictive model relates to the specific, military context. However, the question needs to be raised in how far the military context deviates from the remaining population. Social and individual factors are just examples for variables, which are applicable to each individual in society. Therefore, the identified factors may also contribute to PTG in individuals that are non-combat veterans.

Implication 8: To prove a possible generic character of the 'ComVet'-model, future research should assess in how far the identified variables predict PTG in non-combat veterans.

However, a group of variables that is certainly related to the military context is the one of military factors. Factors as rank and camaraderie represent the dynamic of the military society (Woodward, 2000). Nevertheless, their effects may be different in distinct military members. As marine members make probably different experiences and operate within different environments than army members, generalizing military specific variables to all military members may fall too short. This concern of generalizing the results too all military-members is part of a general research issue. In seeking to formulate universal rules that hold true for each individual, the deviating, individual characteristics risk to be left behind. Therefore, caution must be paid, when trying to create generic models like the 'PTG-ComVet'-model. Even though the model relates to a relative specific context, researchers and

practitioners must be aware of the fact that individuals may behave differently than it has been predicted in theory.

Implication 9: Researchers and especially practitioners should not forget the individual behaviour of PTSD-affected individuals that may cause a deviation from predicted PTG- variables.

The 'PTG-ComVet'-model incorporates a time-axis, meaning that variables can be of influence in PTG at different point of times: pre, during and post deployment. This classification is based on Davis and Brody's (1979) assumption that psychological treatment can take place at several points of time. The shift from the original psychological-treatment time aspect to the time aspect in PTG-predicting variables has been made based on the assumption that the model's variables represent important linkages to enhancing the chances of developing PTG in PTSD affected combat veterans. Due to the incorporation of a time-aspect, the model becomes more specific and gives more precise indications for practitioners about which variables are important when faced with (potential) deployment adversity. The influence of time on PTG has already been assessed in studies like Price et al. (2011) and Reshaw (2010). Whereas Price et al. (2011) stated that prevention treatment has a positive impact on combat veterans, Reshaw (2010) reported the opposing negative effect. These studies symbolize the significance of making a distinction in time. Therefore, the theoretical assumption developed in the 'PTG-ComVet'-model needs to be proven in future research.

Implication 10: The theoretical applied time aspect in the 'PTG-ComVet'-model needs to be assessed in future, empirical research to enable an improved treatment of combat veterans.

Each of the ten implications represents a possible pathway for future research in the military research field and emphasizes the importance to conduct further research in this field. In doing so, answers to the questions and objections that have been raised in this literature review can be given.

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APPENDIX

Appendix A

Table 1. Research design and assessment of PTG (Sub-question 1)

Article	Sample size	Specific sample group	Nationality	Research design (l/c)	Operationalization PTG	Assessment military variables	Assessment PTG	Assessment PTSD
1. Dekel, S. et al. (2016)	221	veterans and ex-POWs from Yom Kipur War	Israelian	l (3 times, 12 years)	multidimensional	no	PTGI	PTSD Inventory
2. Tsai, et al. (2016)	1057	no	US	l (2 years)	multidimensional	no	PTGI-SF	PCL-S & PCL-5
3. Marotta-Walters et al. (2015)	107	Afghanistan	US	c	PG as stagewise process; continuum with PS	Combat Exposure (CES)	PTGI	CAPS
4. Staugaard, et al. (2015)	251	Afghanistan	Danish	l (5 times, 1.5 years)	multidimensional	Combat Exposure (CES), CES-centrality of events	PTGI	PCL
5. Tsai, El-Gabalawy, et al. (2015)	3157	no specific	US	c	multidimensional	no	PTGI-SF	PCL-S
6. Currier, et al. (2013)	182	Iraq & Afghanistan (medical)	US	c	contiuum of maladaptive and adaptive cognitive processing	Combat Exposure (CES)	PTGI	PCL-C
7. McLean, et al. (2013)	253	Air force (medical)	US	l (5 times, 2 years)	subjective experience, no explicit multidimensionality	Combat Exposure (CES); General Military Experience Scale (GMES)	PTGI	PCL-M
8. Pietrzak, et al. (2010)	272	National representative sample (OEF/OIF)	US	c (27 years pd)	multidimensional	Combat Exposure (CES), PCL-M, Unit Support Scale (USS), Postdeployment Social Support Scale (PSSS)	PTGI abbreviated version	PCL-M
9. Forstmeier, et al. (2009)	103	World War II child soldiers	German	c (60 years pd)	subjective experience, no explicit multidimensionality	no	PTGI	BSI-18
10. Engelhard, et al. (2014)	479	Infantry soldiers; Iraq	Dutch	l (2 times, 2years)	as outcome (PTSD and PTG exclusive)	no	PTGI	PSS
11. Hijazi, et al. (2015)	167	no specific	US	c	multidimensional	Combat Exposure (CES)	PTGI-SF	PCL-S
12. Gallaway,et al. (2011)	1834	Infantry brigade combat team	US	c	subjective experience, no explicit multidimensionality	Combat Exposure (CES)	PTGI	PCL-S & PCL-5
13.Tsai, Sippel, et al. (2016)	1838	Nationally representative	US	l (2 years period)	multidimensional	no	PTGI-SF	PCL-S & PCL-5
14. Yi, et al. (2012)	378	Medical cadet students	Chinese	c	normal trauma response	no	PTGI	no
15. Maguen, et al. (2006)	83	Gulf War I	US	l (2 times)	multidimensional	military status, exposure to warfare, deployment and postdeployment social support	PTGI	Exposure to Warfare Scale
16. Wood, Britt, et al. (2012)	2086	Junior enlisted soldiers; Iraq	US	c	Benefit Finding-coping strategy	Combat Experience Scale for Iraq; Benefit Finding for Peacekeeping Operations, deployment length	Benefit finding Scale (Britt et al., 2001)	PCL
17.Wood, Foran, et al. (2012)	583	Junior enlisted soldiers; Iraq	US	c	Benefit Finding-coping strategy	Combat Experience Scale for Iraq; Benefit Finding for Peacekeeping Operations, Supportive Leadership of NCOs and officers	Benefit finding Scale (Britt et al., 2001)	PCL
18. Wood, et al. (2011)	1925	NCO's; Iraq	US	c	Benefit Finding-coping strategy	Combat Experience Scale for Iraq; Benefit Finding for Peacekeeping Operations	Benefit finding Scale (Britt et al., 2001)	PCL
19. Steger, et al. (2015).	130	Vietnam war I	US	c	Meaning making-beliefs and goals to feel purpose	PTSD military version (PCL-M)	Stress-Related Growth Scale (SRGS)	PCL-M

Appendix B

Table 2. Identified effects of PTG on PTSD (Sub-question 3)

Article	Effects of PTG on PTSD	U-Shape	PTG and PTSD exclusive variables?	PTG scores (m=mean; sd=standard deviation
1. Dekel, S. et al. (2016)	PTSD predicts PTG level	not examined	yes	not reported
2. Tsai, et al. (2016)	PTG (personal strength) protects against PTSD	not examined	yes	not reported
3. Marotta-Walters et al. (2015)	PTSD explains 14.8% of variacnce in developing PTG	not examined	yes	PTGI: m=47.11 sd=22.98
4. Staugaard, et al. (2015)	no relation PTG and PTSD	not possible to assess	yes	PTGI:m=35.89 sd=26.16
5. Tsai, El-Gabalawy, et al. (2015)	curvliniair relation	yes	yes	PTGI: m=17.1 sd=14.2
6. Steger, et al. (2015).	Violation of goals leads to PTSD, Search for meaning leads to stress-related-growth	not examined	yes	SRG: m=16.81 sd=8.9
7. Currier, et al. (2013)	Adaptive processes (PTG) negatively related to PTSD & depression	not examined	yes	PTGI: m=47.83 sd=25.95
8. McLean, et al. (2013)	PTG positively related to PTSD	yes	not multually exclusive	PTGI: m=38.56 sd=25.64
9. Wood, Britt, et al. (2012)	High BF=PTSD buffer in the short run	yes	buffer	BF: m=17.68 sd=5.72
10.Wood, Foran, et al. (2012)	High BF=buffer	yes/no	buffer	BF: m=3.30 sd=0.8
11. Pietrzak, et al. (2010)	PTG and PTSD negatively correlated	not examined	yes	PTGI: m=18.3 sd=1.0
12. Forstmeier, et al. (2009)	no relation PTG and PTSD	no	yes	PTGI: m=63.27 sd=20.69
13. Engelhard, et al. (2014)	PTG predicted higher PTSD symptoms after 15 month-illusiory effects	no	negative influence	PTGI: m=t1:40.77 t2:38.78 sd=t1:20.75 t2:19.40
14. Hijazi, et al. (2015)	no relation PTG and PTSD	no	yes	PTGI: m=21.62 sd=10.67
15. Gallaway,et al. (2011)	PTG = apositive outcome of trauma	no		PTGI: m=41.1 sd=25.8
16.Tsai, Sippel, et al. (2016)	PTG depends on PTSD to occur	yes	not multually exclusive	no raw scores
17. Yi, et al. (2012)	PTG related to resilience	no	yes	not reported
18. Maguen, et al. (2006)	no relation PTG and PTSD	no	yes	PTGI itemscore: m=2.54 sd=1.34
19. Wood, et al. (2011)	BF=moderator PTSD	no	buffer	BF: m=17.46 sd=5.28

Appendix C

Table 3. Timing and Limitations (Sub-question 2 & 4)

Article	Recent/retrospective	Timing (1-Primary prevention/2-Secondary prevention/3-Tertiary prevention	Limitations
1. Dekel, S. et al. (2016)	retro	3	PTGI=self-assessment; time lapse between trauma too big (18 years!)
2. Tsai, et al. (2016)	recent	1	different assessment tools for PTSD; two measurement points relatively low to assess longitudinal effects, protective effect could lower over time just moderate ptgi scores
3. Marotta-Walters et al. (2015)	recent	1 & 3	No measurement of time and onset trauma No military identification measured MPD too long with 112 items, m
4. Staugaard, et al. (2015)	retro	3	missing data, high drop-out, different sample (analysis) sizes; comparatively low correlations between different predictors and PTGI (regression model explained less than 1/3 of total variance→ still a lot of unexplained variances; PCL is not directly related to combat event, therefore a non-military event could have influenced
5. Tsai, El-Gabalawy, et al. (2015)	recent	3	cross-sectional design; retrospectiv, therefore long time ago, PTSD assessed with unvalidated PCL, no assessment of military context
6. Steger, et al. (2015).	retro	3	cross-sectional design, retrospective, asessement of appraisals of discrepancy is relatively new
7. Currier, et al. (2013)	retro	3	cognitive processing mediator of relationship between disclosure attitudes and study outcomes has not ben tested!; sample: a lot of Caucasian males, small sample size, self assessment and retrospective
8. McLean, et al. (2013)	retro	3	cross sectional, CES and MHSS not validated externaly, retrospective, self-assessment
9. Wood, Britt, et al. (2012)	recent	1	cross-sectional design, different deployment length (just min 30 days), self-assessment, previous deployment not taken into account, not valid assessment PTG
10.Wood, Foran, et al. (2012)	recent	3	cross-sectional design, self-assessment, measuremnt of BF (just 6 items)
11. Pietrzak, et al. (2010)	recent	3	low survey response rate (self-selection bias), abbreviation and limited generalizaility
12. Forstmeier, et al. (2009)	retro	3	selection bias (recrutment via newspaper), cross-sectional research, self-assessment, high amount of bivariate correlations (SOLUTION self asessment-supported with SKID?)
13. Engelhard, et al. (2014)	recent	0	PTSD level of participants low, mainly males, no special focus on military context applied-may have changed results
14. Hijazi, et al. (2015)	recent	3	cross-sectional, dichotomized ethncity (caucasian or not, assessment wrongdoing not validated and not linked to trauma event
15. Gallaway,et al. (2011)	recent	3	cross-sectional, civilian tools may be insufficient in military populatio, not representative, becuase conducted in only 1 brigade combat team
16.Tsai, Sippel, et al. (2016)	recent	3	self-assessment, prospective-just 2 measure moments; low effect sizes (maybe due to ptg being a PROCESS which makes it difficult to predict it)
17. Yi, et al. (2012)	recent	1	small sample size, gender assymetry, homogenous group frmo cadet univerity, study based on only one month
18. Maguen, et al. (2006)	retro	2 & 3	small sample size(cross sectional), third variable factors like personality have not been assessed, bias due to overload caucasian participants , only gulf war I veterans
19. Wood, et al. (2011)	recent	3	cross-sectional design, self-assessment, poor validity assessment tool (BF)