The Cycle of Violence in Combatants:
The Interaction of Childhood Maltreatment, Mental Health, and Aggression

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I dedicate this thesis to my father, who taught me to notice, respect and care for the most vulnerable beings.

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Abbreviations

AAS	Appetitive Aggression Scale
AMISOM	African Mission in Somalia
CIDI	Composite International Diagnostic Interview
CNDD/FDD	Conseil National pour la Défense de la Démocratie/Forces de Défense de la Démocratie
DR Congo/DRC	Democratic Republic of Congo
DRRI-2	Deployment Risk and Resilience Inventory-2
DSM-IV/V	Diagnostics and Statistical Manual of Mental Disorders IV/V
FDN	Forces de Défense Nationale
FNL	Front National de la Libération
(FOR)NET	Narrative Exposure Therapy (for Forensic Offender Rehabilitation)
PA	Perpetrated Acts
PHQ-9	Patient Health Questionnaire – 9
PDS	Posttraumatic Stress Diagnostic Scale
PSS-I	PTSD Symptom Scale - Interview
PTSD	Posttraumatic Stress Disorder
RF-CI	Conditional Inference Random Forest
TE-exp	Traumatic Events - experienced
TE-wit	Traumatic Events - witnessed
WWII	World War II

Summary

The present thesis explored the factors fostering and maintaining violence in a post-conflict setting. Therefore, the thesis investigated the sequelae of childhood maltreatment, trauma exposure and violence perpetration with a focus on symptoms of post-traumatic stress disorder (PTSD) and appetitive aggression in Burundian ex-combatants and soldiers. Furthermore, the impact of these factors on self-perpetrated violence during foreign deployment, in the community, and within the family were examined.

Violence usually does not cease in communities of post-conflict countries, and an increase in violence within the families of war- affected populations can also be observed (Catani, Jacob, Schauer, Kohila, & Neuner, 2008). Past research has identified war-related PTSD to contribute to violent behavior after war deployment (MacManus et al., 2013; Orcutt, King, & King, 2003). Yet, a pleasure-driven attraction to violent cues, namely appetitive aggression, was as well linked to violent offenses (Hecker, Hermenau, Maedl, Elbert, & Schauer, 2012; Köbach, Schaal, & Elbert, 2014). Often overlooked when exploring the precursors and consequences of violence in war context is the effect of abusive experiences during childhood. Childhood maltreatment is associated with impaired mental health (Margolin, & Gordis, 2000; Teicher, Samson, Polcari, & McGreenery, 2006). The concept of the cycle of violence presumes that a history of child abuse predisposes one to violence perpetration later in life (Widom, Czaja, & DuMont, 2015).

The first article investigated predictors of PTSD symptoms and appetitive aggression in two groups of currently active soldiers and demobilized combatants. The building-block effect of traumatic experiences on PTSD (Neuner et al., 2004) was confirmed. Self-committed violence was not significantly associated with PTSD symptoms but was the strongest predictor of appetitive aggression. The results of the first article revealed furthermore that

childhood maltreatment was an additional predictor of PTSD. In addition, childhood maltreatment moderated the relationship between the number of traumatic events and PTSD symptoms. This indicates that childhood maltreatment might entail vulnerability for the development of PTSD symptoms after subsequent traumatic events. In interaction with self-committed violence, childhood maltreatment was also positively associated with appetitive aggression.

Findings for the specific trauma-potential of self-perpetrated violence are inconsistent (Hecker, Hermenau, Maedl, Hinkel, Schauer, & Elbert, 2013). Violent offending might also be perceived as appealing, therefore particularly fostering appetitive aggression. Köbach and colleagues (2014) have demonstrated in a sample of ex-combatants of the DR Congo, that violent offences are related to appetitive aggression rather than to PTSD symptoms. The second article of this thesis could replicate this finding in the sample of Burundian ex-combatants who presented with a comparable level of violence exposure.

Examinations of the relationship between PTSD and appetitive aggression postulated a buffering effect of appetitive aggression on the development of PTSD due to a different perceiving of violent cues (Hecker, Hermenau, Maedl, Schauer, & Elbert, 2013; Weierstall, Castellanos, Neuner, & Elbert, 2013). The results of the third article supported the assumption of the protective influence in the sample of Burundian ex-combatants.

PTSD as well as appetitive aggression have been separately linked to violent behavior in past cross-sectional studies (e.g., MacManus et al., 2012; Hecker, et al., 2012). In a longitudinal design, the fourth article could demonstrate the independent contribution of symptoms of the PTSD - hyperarousal cluster as well as appetitive aggression for self-committed violence during deployment in the sample of the currently active soldiers.

Correspondingly, the fifth article found PTSD symptoms and appetitive aggression to predict community violence after deployment. Appetitive aggression was not predictive for intimate partner violence and depression symptoms here mediated the effect of PTSD symptoms. Childhood familial violence was linked to appetitive aggression as well as symptoms of PTSD and depression. Moreover, it was the only predictor for the infliction of violent behavior on children and had additionally direct effects on intimate partner and community violence.

The present thesis demonstrated that beyond PTSD, appetitive aggression is an important phenomenon amongst combatants, which is constantly promoted though violent experiences. While it has the potential to buffer PTSD symptoms up to a certain degree, it poses a high risk for recurrent violent outbursts. The thesis highlighted the prominent role of childhood maltreatment. First as a vulnerability factor for mental health and appetitive aggression and secondly as a risk factor for violent behavior in adulthood. The present thesis has attained further knowledge about the interplay of mental health, appetitive aggression and violent behavior and pointed out the significant role of childhood maltreatment in maintaining the cycle of violence in post-conflict countries.

Zusammenfassung

Die vorliegende Arbeit untersuchte Faktoren, die Gewalt in Post-Konflikt Regionen fördern und aufrechterhalten. Hierfür wurden bei burundischen ehemaligen Kombattanten und Soldaten Folgen von Misshandlung in der Kindheit, Trauma-Belastung und selbst-ausgeübter Gewalt untersucht, mit einem Fokus auf Symptomen der post-traumatischen Belastungsstörung (PTBS) und appetitiver Aggression. Des Weiteren wurden die Einflüsse dieser Faktoren auf das Ausüben von Gewalt während dem Auslands-Einsatz, in der Kommune und innerhalb der Familie untersucht.

In Gesellschaften von Post-Konflikt-Ländern flacht die Gewalt meist nicht ab, und auch ein Anstieg von familiärer Gewalt kann in von Kriegen betroffenen Bevölkerungen beobachtet werden (Catani, Jacob, Schauer, Kohila, & Neuner, 2008). Bisherige Forschungsergebnisse identifizierten eine Kriegs-bedingte PTBS als einen Faktor, der zu gewalttätigem Verhalten nach dem Kriegseinsatz beiträgt (MacManus et al., 2013; Orcutt, King, & King, 2003). Zugleich wurde aber auch eine Lust-gesteuerte Anziehung zu Gewaltreizen, namentlich appetitive Aggression mit Gewaltdelikten in Verbindung gebracht. Bei der Erforschung von Vorläufern und Konsequenzen von Gewalt im Kriegskontext werden jedoch oftmals die Auswirkungen von Missbrauchserfahrungen in der Kindheit übersehen. Kindesmisshandlung wird mit einer beeinträchtigten psychischen Gesundheit in Zusammenhang gebracht (Margolin, & Gordis, 2000; Teicher, Samson, Polcari, & McGreenery, 2006). Das Konzept de "Kreislaufs der Gewalt" nimmt an, dass Erfahrungen von Missbrauch in der Kindheit für spätere Gewaltausübung prädisponieren (Widom, Czaja, & DuMont, 2015).

Der erste Artikel untersuchte Prädiktoren für PTBS Symptome und appetitive Aggression in zwei Gruppen von aktiven und demobilisierten Soldaten bzw. Kombattanten. Der „Building-Block"-Effekt traumatischer Erfahrungen auf PTBS (Neuner et al., 2004) wurde bestätigt.

Selbst-ausgeübte Gewalt war nicht signifikant mit PTBS-Symptomen assoziiert, stellte sich jedoch als stärkster Prädiktor für appetitive Aggression heraus. Die Ergebnisse des ersten Artikels zeigten des Weiteren auf, dass Kindheitsmisshandlungen die Beziehungen zwischen der Anzahl traumatischer Erfahrungen und PTBS-Symptomen moderierten. Dies weist darauf hin, dass Misshandlungen in der Kindheit zu einer erhöhten Vulnerabilität für die Entwicklung von Symptomen einer PTBS nach darauf folgenden traumatischen Erlebnissen führen könnte. In Interaktion mit selbst-ausgeübter Gewalt war Kindesmisshandlung auch positiv mit appetitiver Aggression assoziiert.

Ergebnisse zum spezifischen Trauma-Potential von selbst-ausgeübter Gewalt sind widersprüchlich (Hecker, Hermenau, Maedl, Hinkel, Schauer, & Elbert, 2013). Köbach und Kollegen (2014) zeigten, dass in einer Stichprobe von ehemaligen Kombattanten der DR Kongo Gewaltdelikte eher mit appetitiver Aggression als mit PTSD Symptomen verbunden sind. Der zweite Artikel dieser Arbeit konnte dieses Ergebnis in der Stichprobe der burundischen Ex-Kombattanten, die ein vergleichbares Ausmaß an Gewalterfahrungen aufwiesen, replizieren.

Untersuchungen der Beziehung zwischen PTBS und appetitiver Aggression postulierten einen abmildernden Wirkung von appetitiver Aggression auf die Entwicklung von PTBS Symptomen aufgrund einer anderen Wahrnehmung von Gewaltreizen (Hecker, Hermenau, Maedl, Schauer, & Elbert, 2013; Weierstall, Castellanos, Neuner, & Elbert, 2013). Die Ergebnisse des dritten Artikels konnten den protektiven Einfluss von appetitiver Aggression auf PTBS-Symptome in der Stichprobe der burundischen Ex-Kombattanten bestätigen.

PTSD als auch appetitive Aggression waren getrennt voneinander in früheren Querschnitts-Untersuchungen mit gewalttätigem Verhalten assoziiert (e.g., MacManus et al., 2012; Hecker, et al., 2012). In einem Längs-schnittlichen Design konnte der vierte Artikel einen unabhängigen Effekt von PTSD-Übererregungs-Symptomen als auch appetitiver Aggression für ausgeübte Gewalt während des Ausland- Einsatzes in der Stichprobe des aktiven Soldaten zeigen.

Entsprechend zeigte der fünfte Artikel, dass PTSD Symptome und appetitive Aggression auch Gewalt in der Kommune nach dem Einsatz hervorsagen. Appetitive Aggression war jedoch nicht prädiktiv für Gewalt gegen den Partner und Depressionssymptome mediierten hier den Effekt von PTBS-Symptomen. Familiäre Gewalt in der Kindheit war mit appetitiver Aggression, als auch PTBS und Depressionssymptomen assoziiert. Überdies war familiäre Gewalt in der Familie der einzige Prädiktor für gewalttätiges Verhalten gegen die eigenen Kinder und zeigte zusätzlich direkte Effekte auf die Gewalt gegen den Partner und in der Kommune.

Die vorliegende Arbeit zeigte, dass über PTBS hinaus auch appetitive Aggression ein bedeutsames Phänomen unter Kombattanten ist, das stetig durch Gewalterfahrungen weiter gefördert wird. Während appetitive Aggression PTSD-Symptome bis zu einem gewissen Grad abschwächen kann, stellt sie zugleich ein hohes Risiko für wiederkehrende Gewaltausbrüche dar. Die vorliegende Arbeit unterstreicht die bedeutende Rolle von Kindemisshandlungen. Erstens als ein Vulnerabilitätsfaktor für die psychische Gesundheit und appetitive Aggression und zweitens als ein Risikofaktor für ausgeübte Gewalt im Erwachsenenalter. Die vorliegende Arbeit erweitert das Wissen über die Zusammenhänge von psychischer Gesundheit, appetitiver Aggression und gewalttätigem Verhalten und stellte die bedeutsame Rolle von Kindheitsmisshandlungen für die Aufrechterhaltung des Gewaltkreislaufes in Post-Konflikt-Ländern heraus.

Record of achievement

Article 1: Predictors of posttraumatic stress and appetitive aggression in active soldiers and former combatants (published in *European Journal of Psychotraumatology*, *2015*, *6,* 26553. doi:10.3402/ejpt.v6.26553)

Corina Nandi, Anselm Crombach, Manassé Bambonye, Thomas Elbert, Roland Weierstall

My contributions:

- participated in the design of the study
- carried out a large number of clinical interviews
- participated in the interviewer training
- supervised clinical interviews
- conducted the statistical analysis
- drafted the manuscript.

Article 2: Violent offending promotes appetitive aggression rather than posttraumatic stress – a replication study with Burundian ex-combatants (*in submission*)

Anke Köbach, Corina Nandi, Anselm Crombach, Manassé Bambonye, Britta Westner, Thomas Elbert

My contributions:

- participated in the design of the study
- participated in the interviewer training
- carried out a large number of clinical interviews
- supported the drafting of and revised the manuscript.

Article 3: Appetitive aggression and its relation to posttraumatic stress in Burundian ex-combatants (accepted in *Peace and Conflict: Journal of Peace Psychology)*

Corina Nandi, Anselm Crombach, Manassé Bambonye, Thomas Elbert, Roland Weierstall

My contributions:

- participated in the design of the study
- participated in the interviewer training
- carried out a large number of clinical interviews
- conducted the statistical analysis
- drafted the manuscript.

Article 4: Appetitive aggression and PTSD in soldiers: consequences of war exposure and predictors for the perpetration of violence during deployment (*in submission*)

Corina Nandi, Anselm Crombach, Thomas Elbert, Manassé Bambonye, Rüdiger Pryss, Johannes Schobel, Roland Weierstall

My contributions:

- designed the study
- carried out a substantial part of the interviewer training
- supervised clinical interviews
- conducted the statistical analysis
- drafted the manuscript.

Article 5: Domestic and community violence by soldiers living in a conflict region – associations with experienced childhood adversities, current mental health status and appetitive aggression (*in submission*)

Corina Nandi, Manassé Bambonye, Thomas Elbert, Roland Weierstall, Manfred Reichert, Anje Zeller, Anselm Crombach

My contributions:

- designed the study
- carried out a substantial part of the interviewer training
- supervised clinical interviews
- conducted the statistical analysis
- drafted the manuscript.

1 Introduction

Soldiers and combatants experience war from the perspective of both the victim and perpetrator, particularly when facing many years of war on their home soil. The consequences of stressful and traumatic war experiences are well described in research, including post-traumatic stress disorder (PTSD), depression, and suicidality (e.g., Hoge, Auchterlonie, & Milliken, 2006; Jakupcak et al., 2009). Apart from symptoms of mental ill- health, aggressive and violent behavior has also been observed in individuals who were involved in armed conflict, even after combat and battles have ended (e.g., Elbogen et al., 2014; MacManus et al., 2013). Atrocities and violence continue within post-conflict societies and crisis regions, leading to ongoing insecurity and stress for the resident populations. Traumatization of large parts of the population paired with a drive to cruelty and brutality in individuals who had spent many years fighting and killing both seem to hinder peace-building efforts (Elbert, Weierstall, & Schauer, 2010). Aggression and hostilities can also occur within the family, as soldiers and combatants lash out against their children or intimate partner. Domestic violence post-deployment was found in veterans and had mainly been related to combat experiences and war traumatization (e.g., Marshall, Panuzio, & Taft, 2005; Taft, Watkins, Stafford, Street, & Monson, 2011). Often overlooked within the context of armed conflict are the ramifications of the soldiers' history of early maltreatment within the family. Soldiers' experiences of violence during childhood can not only lead to impaired mental health (Kilpatrick et. al., 2003; Scott, Smith, & Ellis, 2010), but also heighten the risk for later perpetration of violence, referred to as the cycle of violence (Widom, Czaja, & DuMont, 2015). To overcome war and violence and enable the long-term stability in post-conflict regions, it is necessary to understand the underlying factors impairing mental health and leading to aggressive behavior.

1.1 The situation in Burundi

Burundi is a small, densely populated country in East-Africa and one of the poorest countries in the world (Uvin, 2009). In 1993, the assassination of the president triggered a genocide and civil war, lasting for more than a decade and claiming over 300,000 lives. Hundreds of thousands of refugees fled to neighboring countries or were internally displaced. In 2003, a power-sharing agreement between the Tutsi-dominated government and the Hutu rebels was signed to resolve the ethnic conflict and a majority Hutu government, formerly the largest rebel movement CNDD/FDD (Conseil National pour la Défense de la Démocratie/Forces de Défense de la Démocratie), was elected in 2005 (The World Factbook, 2015). Fighting did not end before 2009 until the last armed rebel group, the FNL (Front National de la Libération) laid down their arms. Large segments of soldiers from all armed groups, the national army as well as the different rebel militias, were demobilized. This resulted in large numbers of ex-combatants living in Burundi who were physically and psychologically affected by their experiences and struggling to survive economically. The remaining soldiers and former rebels who were not demobilized now form the national Burundian army. Since 2007, the Burundian army has been sending its soldiers to Somalia as part of the AMISOM (African Mission in Somalia) that supports the Federal Government of Somalia's forces in the battle against the Al-Shabaab militia.

The situation in Burundi itself is still shaped by the devastating war and continuing national political instability and social conflicts. Violence has erupted again recently in the course of the election process, reaching its peak in a failed military putsch. Violent clashes between police and protesters are taking place on a continuing basis. Further, members of the ruling party's youth wing, the *imbonerakure*, are accused of intimidating and attacking opponents, banditry, and carrying out extrajudicial and political killings (Hatcher, 2015). More than

150,000 people have already fled to neighboring countries in fear of a new violent conflict (Putsch, 2015).

1.2 PTSD and mental health in soldiers and combatants

1.2.1 Trauma exposure and mental health

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychiatric Association, 2013), the experience of at least one traumatic event is required to develop potential symptoms of PTSD. Traumatic events include life-threatening accidents, natural disasters or assaultive violence. In particular, the experience of war and armed conflict is linked to post-traumatic stress reactions. Combat exposure, torture, captivity, and massacres are examples of extreme violence and trauma, often resulting in persistent and severe PTSD symptomatology (Priebe et al., 2013; Prigerson, Maciejewski, & Rosenheck, 2001). Moreover, individuals involved in war face multiple traumatic events over a long time span. Repeated exposure to different types of traumata leads to a near linear increase in PTSD symptom severity and the prevalence of PTSD-diagnoses in war-affected populations, also referred to as the building block effect (Neuner et al., 2004). The spontaneous remission of PTSD symptoms depends on the number of traumatic stressors (Kolassa et al., 2010), thus involvement in armed conflict over multiple years bears a high risk of chronic PTSD, still persistent many years after war exposure (Weiss et al., 1992). Symptoms of PTSD due to extreme traumatic stress could be found in Rwandan genocide perpetrators and survivors (Schaal, Weierstall, Dusingizemungu, & Elbert, 2012), former child soldiers in Northern Uganda (Klasen, Oettingen, Daniels, & Adam, 2010; Pfeiffer & Elbert, 2011) and ex-combatants of the DR Congo (Hecker, Hermenau, Maedl, Schauer, & Elbert, 2013; Köbach, Schaal, & Elbert, 2014).

The development of PTSD symptoms is the most typical reaction after exposure to traumatic events, but comorbid symptomatology, such as depression, suicidality, and substance abuse, is common (Brady, Killeen, Brewerton, & Lucerini, 2000; Krysinska & Lester, 2010). These comorbidities have also been reported in military populations (Ginzburg, Ein-Dor, & Solomon, 2010; Hendin, & Haas, 1991; Keane & Kaloupek, 1997; Seal et al., 2011) as well as amongst East-African ex-combatants (Klasen et al., 2010; Köbach et al., 2014; Odenwald et al., 2009; Pfeiffer & Elbert, 2011; Pham, Vinck, & Stover, 2009).

1.2.2 PTSD and aggressive behavior

Besides the aforementioned comorbidities, PTSD has also consistently been linked to aggressive behavior in former soldiers and combatants (Beckham, Feldman, Kirby, Hertzberg, & Moore, 1997; McFall, Fontana, Raskind, & Rosenheck, 1999). Veterans with PTSD were more engaged in aggressive acts compared to veterans without PTSD (Jakupcak et al., 2007). Combat-exposed veterans with PTSD are theorized to have deficits in their ability to inhibit aggressive reactions due to an impaired anger regulation (Chemtob, Novaco, Hamada, Gross, & Smith, 1997). This relationship between PTSD and anger is particularly strong in military populations as compared to populations exposed to other types of traumata (Morland, Love, Mackintosh, Greene, & Rosen, 2012; Orth & Wieland, 2006). According to the DSM-V, irritability and outbursts of anger are crucial symptoms of the PTSD hyperarousal cluster (American Psychiatric Association, 2013). Over-alertness and vigilance are also classified as part of the hyperarousal cluster, lowering the threshold for detecting threat or perceiving a situation as threatening and thus facilitating an aggressive reaction (e.g., Morland et al., 2012). Several studies confirmed the prominent role of PTSD hyperarousal symptoms in the perpetration of aggressive and violent behavior in soldiers and veterans (MacManus et al., 2013; Savarese, Suvak, King, & King, 2001; Taft et al., 2007).

In light of these findings, combat exposure is an experience that cannot only cause a severe

PTSD symptomatology but can also result in maladaptive aggressive behavior in the aftermath. Chemtob and colleagues presume that combat-related PTSD entails a shift into a "survival mode" of functioning, which is an adaptive response to life-threatening situations (Chemtob et al., 1997; Chemtob, Roitblat, Hamada, Carlson, & Twentyman, 1988). A traumatic response to life-threat can result in the survivor getting trapped in this "ready to act" mode. In terms of a network theory of traumatic memory (Elbert & Schauer, 2002; Foa & Kozak, 1986), cognitive representations and emotions related to the traumatic event are associated with sensory experiences during the trauma and integrated into a neural "fear network", which continuously expands with ongoing traumatization. Cues that resemble those of a past traumatic situation can trigger the perception of threat and initiate the same, albeit often dampened, physical and emotional reactions experienced during the initial trauma. Being exposed to combat over a long time span can hence lead to an outlasting general tendency to interpret ambiguous stimuli as potentially dangerous and to react aggressively in defense (Morland et al., 2012). Hyperarousal symptoms, in general, reflect a readiness for "flight or fight" (Elbert & Schauer, 2002).

During military training and later in combat, a violent reaction to perceived threat is encouraged as it is required and can be essential for survival in war. However, despite being adaptive in combat situations the same reactions become maladaptive once back in civil life. Previous research with veterans and soldiers returning home from deployment demonstrates that violent and aggressive behavior is associated with combat-related PTSD (e.g., MacManus et al., 2013; Stappenbeck, Hellmuth, Simpson, & Jakupcak, 2014). At the family level, the effect of deployment could be shown in a recent study with soldiers that found increased rates of perpetrated violence against their children after deployment (Rabenhorst et al., 2014). Intimate partner violence in veterans is widely investigated in research, postulating PTSD to be a crucial risk factor (Orcutt, King, & King, 2003; Taft et al., 2011; Teten et al., 2010).

In a study in post-war Liberia, intimate partner violence was associated with the males' exposure to war events, PTSD and depression symptoms (Vinck & Pham, 2013). PTSD was often found to mediate the relationship between war violence exposure and intimate partner violence (Marshall et al., 2005; O'Donnell, Cook, Thompson, Riley, & Neria, 2006; Orcutt et al., 2003).

1.3 Appetitive aggression

1.3.1 Appetitive aggression in war and violent conflict

For combatants and soldiers, war and armed conflict are not just confined to experiencing and witnessing violence. Involvement in these events also includes perpetrating violence such as harming and killing others. Like other conflicts in East-Africa, the Burundian war was characterized by extreme cruelty and brutality (Uvin, 2009). Fighting was not restricted to the battlefield and atrocities and massacres against the civilian population were common. Horrific methods of killing and torture were reported. The perpetrated atrocities often went far beyond a defensive behavior that would be taken to save one's own life when being attacked or serve to gain victory during a battle or control over a region or population. Reports of former combatants and individuals actively involved in violence revealed underlying emotions like excitement and pleasure associated with violent perpetration rather than fear and horror (Elbert et al., 2010; Silva, Derecho, Leong, Weinstock, & Ferrari, 2001). Similar testimonies exist across various wars and conflict regions. Indeed, the perpetration of acts of extreme violence was typically not restricted to single cases, but was found to be rather prevalent in armed groups and even in the general population (Schaal, Heim, & Elbert, 2014; Weierstall, Castellanos, Neuner, & Elbert, 2013).

How can violence arise to such an extreme level? Elbert and colleagues (2010) stated, that the aggressive act itself, with all included cues such as the victim's suffering and screaming, and bloody wounds, may be intrinsically rewarding and thus reinforcing the urge and desire to kill, torture, and mutilate. This lust-driven type of aggressive behavior is termed appetitive aggression (Elbert et al., 2010). Appetitive aggression is considered to be a proactive type of aggression, characterized by an approach and attraction to violence and underlying emotions like pleasure, lust and fascination (Elbert et al., 2010; Weierstall & Elbert, 2011). In contrast, the aforementioned aggressive behavior occurring as a reaction to life-threat and PTSD is triggered by a perceived threat in the sense of a defense reaction. This affective and impulsive form of aggression is often referred to as reactive aggression (Anderson & Bushman, 2002; Fontaine, 2007; Poulin & Boivin, 2000). Violent outbursts and escalations seem hence to be determined by both fear and pleasure driven mechanisms of aggression. The extreme brutality and cruelty may however mainly be rooted in the appetitive type of aggression. This assumption is supported by several studies which found appetitive aggression to be widespread in combatants of various conflict areas (e.g., Weierstall et al., 2013; Weierstall, Schalinski, Crombach, Hecker, & Elbert, 2012) and strongly related to violent perpetration. For example, Hecker and colleagues demonstrated that appetitive aggression was correlated with self-committed violence in former combatants of the DR Congo (Hecker, Hermenau, Maedl, Elbert, & Schauer, 2012). Further studies with combatants of the DR Congo and Rwandan genocide perpetrators found the same relationship between violent perpetration and appetitive aggression, while there was no connection to symptoms of PTSD (Köbach et al., 2014; Weierstall, Schaal, Schalinski, Dusingizemungu, & Elbert, 2011).

In contrast to studies that investigated violent behavior in veterans after deployment and, more specifically, intimate partner violence, the abovementioned studies focused on extreme forms of violent acts. Analogous to the "survival mode" of functioning related to PTSD

(Chemtob et al., 1997; Chemtob et al., 1988), an "aggressor mode" is assumed when referring to appetitive aggression (Elbert et al., 2010). After an armed conflict has ended or combatants have left the armed group, a switching back to the "aggressor mode" can occur, even if such a switch were unintended. Even though violent perpetration and the positive emotions related to it shall be inhibited in civil life, common salient cues can trigger these emotions and, as a result, lead to aggressive outbursts. At the same time, the experience of positive emotions while perpetrating violence within an armed group may mean that some combatants actively seek situations where committing violence is possible. Combatants' reports indicate that violence and killing can indeed be "addictive" (Elbert et al., 2010). A hunting network, similar to the aforementioned fear network, may explain the switch back to the "aggressor mode". Here, violent cues are integrated into a network of sensations, cognitions, and physiological components. However, re-exposure to similar violent cues does not evoke an alarm response but rather elicits an appetitive arousal.

1.3.2 Appetitive aggression and PTSD

In the past, it was debated whether the perpetration of violence is as traumatic as experiencing violence as a victim or even has a higher traumatizing potential. Several studies could demonstrate that self-perpetrated violence and killing in war induce symptoms of PTSD, even after controlling for combat exposure (Dohrenwend, Yager, Wall, & Adams, 2013; Maguen et al., 2010; Van Winkle & Safer, 2011). However, in populations where appetitive aggression was prevalent, this relationship could not be found (Köbach et al., 2014; Weierstall et al., 2011) or could only be found for forcibly recruited combatants, but not for combatants who volunteered themselves (Hecker, Hermenau, Maedl, Hinkel, Schauer, & Elbert, 2013). These results indicate that appetitive aggression may be a decisive factor for the potential of killing and atrocities to be traumatic. Appetitive aggression is assumed to serve as a protective mechanism that counters the integration of violent cues into the fear network and embeds them in the hunting network instead. Therefore, the development of PTSD symptoms may be prevented. Previous research found a negative relationship between the level of appetitive aggression and PTSD symptom severity in Rwandan genocide perpetrators (Weierstall et al., 2011), German soldiers of WWII (Weierstall, Huth, Knecht, Nandi, Elbert, 2012) and different populations of combatants and child soldiers in DR Congo, Uganda, and Columbia (Hecker et al., 2013; Weierstall et al., 2013; Weierstall et al., 2012). However, symptoms of PTSD still develop when the trauma load exceeds a certain threshold. Violent events as either perpetrator or victim share many common cues. When exposed to ongoing violence, elements of the fear and hunting network begin to overlap so that violent cues begin to trigger a fear reaction.

1.4 Childhood maltreatment and family violence in war and violent conflict

1.4.1 Childhood maltreatment and mental health in war-affected populations

The deleterious effects of childhood maltreatment on mental health have been thoroughly investigated (Edwards, Holden, Felitti, & Anda, 2003; Teicher, Samson, Polcari, & McGreenery, 2006). Maltreatment during childhood, including physical, verbal, and sexual abuse as well as neglect, are risk factors for different psychological disorders, inter alia PTSD (Brewin, Andrews, & Valentine, 2000) and depression (Heim, Newport, Mletzko, Miller, & Nemeroff, 2008; Norman et al., 2012). Childhood maltreatment often implies multiple cases of abuse over a longer period, and single types of maltreatment seldom occur separately and independently from each other (Dong et al., 2004). Abuse during childhood hence typically entails a complex pattern of long-lasting PTSD symptoms (Cloitre et al., 2009).

Furthermore, early abuse and childhood adversities are often considered as vulnerability factors for the development of PTSD after subsequent trauma, such as war and combat, and determine the symptom and disorder severity (Iversen et al., 2007; Van Voorhees et al., 2012). McCrory and Viding (2015) speak of a latent vulnerability due to changes in neurobiological systems which were originally adaptive, for instance, a heightened vigilance to threat. Early stressful and abusive experiences can cause enduring neuroendocrine, structural, and functional changes in brain development, impairing effective coping with subsequent stressors and may thus be a critical factor for the development of psychological disorders (Elbert, Rockstroh, Kolassa, Schauer, & Neuner, 2006; Teicher et al., 2003; Van Voorhees & Scarpa, 2004). In the "critical periods" during childhood, even a single traumatic experience can make a child more vulnerable to subsequent stressors when a cascade of dynamic brain processes was initiated (Elbert et al., 2006).

Despite the severe implications of abuse during development for mental health, it is often overseen as a risk factor in populations who have been exposed to the overwhelming experiences of war. In a study with two war-affected generations living in Northern Uganda, the salient role of childhood maltreatment for PTSD and other psychological disorders beyond war trauma could be highlighted (Olema, Catani, Ertl, Saile, & Neuner, 2014). They authors concluded that its effect could even surpass that of war trauma.

Research with soldiers returning home from deployment investigated the specific contribution of child abuse and adversities beyond combat exposure for the development of PTSD. This research could find unique effects, even after controlling for combat exposure (Dohrenwend et al., 2013; Van Voorhees et al., 2012; Zaidi & Foy, 1994). Several studies focused on the effect of physical child abuse (Clancy et al., 2006; Dedert et al., 2009; Donovan, Padin-Rivera, Dowd, & Blake, 1996), but the relevance of neglect could also be stressed (LeardMann, Smith, & Ryan, 2010). Besides main effects, some studies revealed interaction effects for combat exposure and child abuse, indicating that soldiers abused during childhood may be more vulnerable to the effect of combat-related traumata (Iversen et al., 2007; Zaidi &

Foy, 1994). A study including troops before and after a deployment demonstrated that childhood adversities significantly predicted PTSD and depression beyond the contribution of combat (Cabrera, Hoge, Bliese, Castro, & Messer, 2007). In longitudinal studies, adverse childhood experiences predicted the inclusion of soldiers in non-resilient trajectories of PTSD (Berntsen et al., 2012) and were associated with PTSD after deployment (Jones et al., 2013). According to the latter authors, vulnerability factors such as childhood adversity may be at least as important as combat experiences for the prediction of PTSD.

1.4.2 The cycle of violence

Curtis' (1963) statement „violence breeds violence" initiated essential research on the link between self-experienced child abuse and neglect and perpetrated violence later in life. Curtis‘ concern that battered children „may become tomorrow's murderers and perpetrators of other crimes of violence, if they survive“ was supported by Widom (1989) who coined the term „cycle of violence“. The „cycle of violence“ hypothesis suggests that a childhood history of physical abuse predisposes one toward violence perpetration later in life. In Widom's study (1989), abused as well as neglected individuals had higher rates of adult criminality and arrests for violent offenses. A recent 30-year follow-up prospective study demonstrated that individuals with a history of child abuse and neglect are at a higher risk to maltreat their own children (Widom et al., 2015). The intergenerational transmission of childhood maltreatment could also be confirmed in another prospective study by Pears and Capaldi (2001). Here again, parents who had been abused during childhood were more prone to resort to abusive behavior against their children.

Not in all cases, however, does a personal history of abuse lead to abusive behavior later in life. Research sought to find factors determining, mediating or modulating the cycle of violence. Parental psychopathology, more precisely PTSD and depression have been shown to result from childhood maltreatment. At the same time, PTSD and depression have been shown to increase the risk for violent behavior (Fazel et al., 2015; MacManus et al., 2013). Evidence for this relation comes particularly from studies on intimate partner violence in military populations, where symptoms of PTSD and depression are common (e.g., O'Donnell et al., 2006). The pathways of the effect of childhood abuse and to what extent mental health symptoms mediate the link between experienced childhood abuse and self-perpetrated abuse remains as yet unclear. Pears and Capaldi (2001) could not find mediating effects of mental health, but independent effects of childhood abuse as well as PTSD and depression. Apparently, a history of child abuse may predict perpetrated violence against children also independently from symptoms of PTSD and depression. In a study with war-affected families in Northern Uganda, the personal experience of childhood maltreatment was the strongest independent predictor for abusive parenting (Saile, Ertl, Neuner, & Catani, 2014). Likewise, perpetrated violence against children was significantly predicted by parents' history of childhood maltreatment in Burundian families (Crombach & Bambonye, 2015) and a population of Rwandan genocide survivors (Rieder & Elbert, 2013).

The consequences of child abuse and neglect are not only visible in adolescence and adulthood. Consequences in the form of externalizing and aggressive behavior already start during early childhood (Gershoff, 2002). Hecker and colleagues demonstrated that corporal punishment is closely linked to externalizing problems in Tanzanian children of primary school age (Hecker, Hermenau, Isele, & Elbert, 2014). Abuse and neglect in childhood has an immediate impact on children's behavior, a time when plasticity of the brain is greatest (Elbert et al., 2006). Childhood maltreatment may cause substantial changes within the neurobiological stress response system that contribute to an increased risk for both mental health symptoms as well as aggressive behavior (McCrory, De Brito, & Viding, 2010).

Although the cycle of violence persists beyond PTSD symptomatology, childhood maltreatment within the family and war experiences or living in a conflict region are not independent from each other (Catani, Jacob, Schauer, Kohila, & Neuner, 2008; Saile et al., 2014). Dysregulated behavior of maltreated children provokes further maltreatment by irritated, war trauma-exposed parents, thereby exacerbating the intergenerational cycle of violence.

Children living in conflict regions are not only at risk of being exposed to violence by caregivers but also to organized violence. Growing up in war zones or even becoming part of an armed group when still a child can have a detrimental impact on the children's behavior. Military violence was shown to be associated with children's aggressive and antisocial behavior, including reactive and proactive aggression as well as aggression-enjoyment in two Palestinian samples (Qouta, Punamäki, Miller, & El- Sarraj, 2008). Crombach and Elbert (2014) investigated Burundian street children and demonstrated that not only reactive but also appetitive aggression - initially attributed to combatants - was prevalent amongst them. Appetitive aggression was negatively related to symptoms of PTSD and positively related to recent violent offending, whereupon the authors concluded that developing an appetite for aggression may function as an adaption for children to survive in a violent environment, but in turn fosters the emerging of further violence.

1.5 The rationale of the present thesis

The present thesis examines the cycle of violence in combatants living in a post-conflict-setting. Beginning with the consequences of exposure to violence within the family during childhood as well as violence in war, the thesis first focuses on PTSD and appetitive aggression as well as their interrelation. Then, the role of PTSD and appetitive aggression for self-committed violence as a soldier is investigated. Finally, the thesis takes a closer look at the perpetration of violence in different settings - the community and the family – and focuses thereby again on familial violence experienced as a child.

The following research questions were asked:

1. What are the predictors of appetitive aggression and PTSD in combatants? Which roles do childhood maltreatment, war trauma exposure and violent offending play?
2. Does appetitive aggression buffer the risk of developing symptoms of PTSD?
3. How are PTSD and appetitive aggression related to self-committed violence in soldiers during deployment?
4. How do childhood maltreatment, symptoms of mental health, and appetitive aggression contribute to violence against children, intimate partner violence, and community violence?

The five articles that constitute this thesis sought to answer the research questions:

The first article investigates factors predicting PTSD and appetitive aggression including war trauma, self-committed violence and childhood maltreatment in Burundian soldiers prior to their deployment in Somalia as well as demobilized combatants. Differences between the two groups are considered.

The second article focuses on the specific role of violent offending for PTSD and appetitive aggression in the sample of demobilized combatants.

The third article investigates the influence of appetitive aggression on the development of PTSD symptoms in the same sample of demobilized combatants, hypothesizing a protective effect.

In a longitudinal design, the fourth article examines the independent contribution of symptoms of the different PTSD clusters as well as appetitive aggression for self-committed violence during deployment in the sample of the active soldiers, while also regarding the course of PTSD and appetitive aggression and the role of unit support.

The fifth article seeks to disentangle the independent contribution of childhood maltreatment, mental health and appetitive aggression for the prediction of violent behavior in soldiers after returning from deployment. Relative effects of the predictors on violence against children, intimate partner violence, and community violence are examined.

2 Predictors of post-traumatic stress and appetitive aggression in active soldiers and former combatants

2.1 Abstract

Background: During the period between 1993 and 2005, the people of Burundi were trapped within a violent civil war. In post-conflict regions, symptoms of post-traumatic stress disorder (PTSD) were found to be widespread. At the same time, combatants often reported having perceived committing violence as exciting and appealing, an experience referred to as appetitive aggression. Both of these phenomena hamper the building of a functional and peaceful society.

Objective: This study aims to investigate the factors that are associated with the level of PTSD and appetitive aggression in former and still active combatants.

Methods: Semi- structured interviews were conducted with 948 male Burundians: 556 active soldiers and 392 ex-combatants. PTSD symptom severity was assessed using the PTSD Symptom Scale Interview (PSS-I), while appetitive aggression was assessed using the Appetitive Aggression Scale (AAS).

Results: Linear regression analyses revealed that the number of traumatic events, childhood maltreatment, and their interaction predicted PTSD symptom severity, whereas self-committed violence did not. The number of traumatic events and self-committed violence were associated with appetitive aggression. Childhood maltreatment alone was not associated with appetitive aggression, however its interaction with self-committed violence did predict appetitive aggression. When controlling for predictors, ex-combatants reported a higher degree of PTSD symptomatology, whereas active soldiers reported a higher degree of appetitive aggression.

Conclusion: We conclude that childhood maltreatment is an additional, significant risk factor that exacerbates the psychological consequences of violent conflicts. Self-committed violence may not necessarily engender trauma-related disorders, but is highly related to appetitive aggression.

Keywords: PTSD, trauma, aggression, childhood maltreatment, combatants, violence, Burundi, risk factors

2.2 Introduction

Since 1965, Burundi has been the scene of violent conflicts, with violence breaking out at least once every decade. The longest and most recent episode of conflict lasted from 1993 until 2005 (Watt, 2008). It is estimated that more than a quarter of a million people lost their lives and that over a million people from a population of ten million were displaced as a consequence of the civil war (Uvin, 2009). The war was characterized by violence and atrocities against the civilian population as Tutsi-dominated national army and Hutu rebel groups fought for control. Following the peace agreement in 2005, demobilization of both the army and rebel groups began. Some members of the rebel groups were integrated into the army to form the national Burundian army that is still active today. No novice combatants have been recruited for the army since the end of the civil war. As a consequence, both former and currently active combatants in Burundi represent a population that has experienced numerous and diverse war events.

Numerous studies of war-affected populations have demonstrated that repeated exposure to different types of traumatic events cumulatively increases the risk of PTSD. This relationship is also known as the "building block effect" (Kolassa et al., 2010; Neuner, Schauer, Karunakara, Klaschik, Robert, & Elbert, 2004). Throughout Burundi, symptoms of PTSD were found within the general population (Yeomans, Forman, Herbert, & Yuen, 2010). However, researchers have yet to investigate the existence of PTSD symptomology in a population of Burundian combatants specifically. Studies with comparable populations of combatants in other conflict regions in East-Africa found that such individuals suffered from substantial mental health impairment and, in particular, PTSD symptoms (Bayer, Klasen, & Adam, 2007; Hecker et al., 2013; Pfeiffer & Elbert, 2011). Experiencing war as a combatant not only includes the exposure to horrifying events such as injury or witnessing the death of comrades or civilians. Especially in civil wars, combatants additionally take on the role of perpetrating violent acts. Several studies have postulated that the perpetration of violent acts is a potentially traumatic experience that enhances the risk of developing PTSD (Bayer, et al., 2007; Maguen et al., 2010; Van Winkle, & Safer, 2011). However, in a study with combatants in the Democratic Republic of the Congo , perpetrating violence was found to be traumatic for forcibly recruited combatants, but not for combatants who volunteered themselves (Hecker et al., 2013).

In the context of war and combat, PTSD symptoms are often viewed as direct consequences of traumatic war experiences. By now however, there are a large number of studies showing that other factors play an important role in the development and maintenance of PTSD symptoms in individuals exposed to war (Brewin, Andrews, & Valentine, 2000; Dohrenwend et al., 2013; Fontana, & Rosenheck, 1994; King, King, & Foy, 1996). In particular, childhood maltreatment was found to substantially increase the risk of PTSD following exposure to subsequent traumatic events (Catani, Gerwirtz, Wieling, Schauer, Elbert, & Neuner, 2010; Iversen, Fear, Simonoff, Hull, Horn, Greenberg, Hotopf, Rona &Wessely, 2007; Van Voorhees, Dedert, Calhoun, Brancu, Runnals, & Beckham, 2012). The effect of childhood adversities, such as physical, sexual or verbal abuse – but also neglect – in the development of PTSD could also be demonstrated in recent prospective studies of western soldiers deployed in foreign missions (Berntsen et al., 2012; Polusny et al., 2011). In the context of the Burundian civil war, the situation for the combatants was different in comparison to soldiers participating in foreign missions with peaceful conditions in their home country. Burundian combatants were both victims and perpetrators of the civil war, and a portion of the combatants fighting in this war was a still child when the war started. Research demonstrated that childhood maltreatment is more common in families that are affected by war (Catani et al., 2008). Thus, maltreatment experienced by caregivers as a child and traumatic war experiences are not completely independent of one another. Still, or precisely because of that, it is important to clarify the individual contributions of these diverse types of experiences to the development of PTSD symptoms in the context of war.

In addition to PTSD symptomatology, the experience of war and violence is often also associated with increased violent and aggressive behavior in individuals (Schauer & Elbert, 2010). Research has repeatedly demonstrated that PTSD symptoms (and in particular hyperarousal) may trigger violent behavior caused by anger and hostility (Elbogen, Wagner, Calhoun, Fuller, & Kinneer, 2010; Jakupcak et al., 2007). This affective and impulsive type of aggressive behavior often occurs in reaction to a perceived threat, and is referred to as reactive aggression (Anderson & Bushman, 2002; Fontaine, 2007; Hubbard et al., 2002; Vitiello & Stoff, 1997). Instrumental or proactive aggression, on the other hand, is planned, purposeful and goal-oriented. Such aggression is adopted in order to achieve some positive outcome, driven therefore by a secondary reward such as social status (Fontaine, 2006; Schwartz et al., 1998). However, reports of combatants and individuals perpetrating violence have indicated that committing violent acts can also be perceived as fascinating, appealing and exciting (e.g., Crombach, Weierstall, Hecker, Schalinski, & Elbert, 2013; Elbert, et al., 2010). In addition to aggression driven by perceived threat or secondary reward, there is another type of aggression evoked by the rewarding cues of the aggressive act itself. The perpetration of violence or the infliction of harm on a victim occurs for the purpose of satisfying violence-related passion. This kind of aggression is referred to as appetitive aggression (Elbert et al., 2010; Weierstall & Elbert, 2011). We investigated appetitive aggression in different populations of ex-combatants. In these studies a considerable proportion of participants reported perceiving violence and aggression as positive and thrilling (e.g., Weierstall et al., 2011; Hecker et al., 2012). The high prevalence of appetitive aggression in these studies indicates that this is not limited to a psychopathological subgroup, but is rather a common trait in the context of war. Combatants and soldiers involved in armed conflict have to inflict violence as part of their job and duty. Committing violence may be necessary to survive in a violent environment. Hence appetitive aggression facilitating violent or cruel behavior can have adaptive and advantageous functions in such a context.

While potential predictors for PTSD symptoms are well defined in literature, the factors fostering appetitive aggression have only recently begun to be investigated. Reports from former combatants depict a gradual shift in their perception of killing and atrocities: In the beginning these acts were frightening, but after a time they became used to it and even found it exciting (Maclure & Denov, 2006). As this gradual transformation in the perception of violence implies, several studies have also demonstrated that the perpetration of aggressive acts predicts appetitive aggression (Crombach, et al., 2013; Hecker et al., 2012; Weierstall et al., 2011). Since appetitive aggression can be seen as an adaptive mechanism when living in a cruel environment, not only perpetrating violence but also witnessing cruelty or experiencing it by oneself could be positively associated with appetitive aggression. Prior studies revealed ambivalent findings concerning the relationship between traumatic experiences and appetitive aggression (Hecker et al., 2012; Weierstall et al., 2011). To date, the role of childhood maltreatment in influencing the level of appetitive aggression experienced by an individual has not been investigated. However, it should be considered as a potential predictor, as insecure and violent environments seem to facilitate the development of violent behavior, promoting a cycle of violence (Crombach & Elbert, 2014; Elbert et al., 2006).

Both PTSD symptoms and appetitive aggression are widespread amongst populations of combatants (Weierstall et al., 2011; Hecker et al., 2012). Which types of experiences predict these two phenomena so prevalent in conflict settings? Do the same factors underlie both or do different experiences play a role in their emergence? The present study aims to disentangle the influential factors of PTSD symptoms and appetitive aggression in a sample of male Burundian combatants. A portion of the combatants had been demobilized after the end of the civil war whereas the other segment remains actively enlisted in the Burundian military. As the demobilization process might have influenced the present mental health state of the combatants and former combatants, we examined differences between these two groups.

We hypothesized that the experience of traumatic events would be the best predictor for current PTSD symptom severity, whereas self-committed violent acts would best explain the variability of appetitive aggression. Childhood maltreatment was expected to be an important factor for PTSD symptomatology specifically, but we expected that it might also promote appetitive aggression in the sense of a circle of violence.

2.3 Method

2.3.1 Participants

We investigated 948 male Burundian combatants of which 392 had been demobilized after war and 556 were still active as soldiers. Those still active in the military were preparing for deployment in the African Union Mission for Somalia (AMISOM) at the time of our investigation. Participants in the demobilized group were contacted through an official national veteran association. Active soldiers were randomly chosen from two battalions of the Burundian army. Descriptives of both groups are shown in Table 2.1. The data for two active soldiers and one ex-combatant were excluded from analyses due to missing data in the main outcome variables.

Participation in the study was voluntary and all participants had to sign an informed consent sheet prior to the interview. In case of illiteracy, oral informed consent was collected. All participants agreed to take part in the research project. The ethics committees of the University of Konstanz, Germany and of the University Lumière of Bujumbura, Burundi approved the study. The active soldiers received no payment for their participation. A financial compensation equivalent to 5€ was paid to cover transportation costs for the ex-combatants. With respect to the special vulnerability of the population, anonymity and confidentiality were ensured through the electronic coding and storage of the data, which fulfilled the highest and most secure data encryption standards.

Table 2.1

Descriptives of active soldiers and ex-combatants

Variable	Active soldiers (n = 554)	Ex-combatants (n = 391)	Statistics
Former rebel, No. (%)	184 (33.21)	129 (32.99)	χ^2 (1, 945) = .01
Traumatic event types, *M* (*SD*) [*range*]	10.02 (3.10) [0-17]	13.64 (2.39) [6-19]	$t_{935.92}$ = 20.32***, *d* = 1.28
Childhood maltreatment, *M* (*SD*) [*range*]	0.48 (.82) [0-4]	1.06 (1.08) [0-4]	$t_{693.10}$ = 8.97***, *d* = .62
Self-committed violence, *M* (*SD*) [*range*]	4.04 (3.18) [0-13]	8.59 (3.23) [0-14]	$t_{943.00}$ = 21.57***, *d* = 1.42
PSS-I sum score, *M* (*SD*) [*range*]	3.04 (4.66) [0-32]	13.63 (11.31) [0-42]	$t_{484.10}$ = 17.50***, *d* = 1.31
AAS sum score, *M* (*SD*) [*range*]	19.75 (10.62) [0-46]	28.37 (14.51) [0-58]	$t_{672.84}$ = 10.01***, *d* = .70

Note. *M*= mean, *SD* = standard derivation, asterisks indicate statistical significance *p < .05 **p <.01 ***p <.001.

2.3.2 Measures

Traumatic event types. Exposure to different types of traumatic events was assessed using a checklist of 19 potentially traumatic war-related and non-war-related events (e.g., assault by weapon, life-threatening accidents), which also included events from the checklist of the Posttraumatic Stress Diagnostic Scale (PDS; Foa, Cashman, Jaycox, & Perry, 1997). The checklist was a version of a previously published checklist (Neuner et al., 2004) that was adapted to the Burundian cultural context. It showed a high test-retest reliability (r = .73, $p \leq$ .001) and significant accordance with the Composite International Diagnostic Interview (CIDI) Event List (Ertl et al., 2010) in an earlier study of former child soldiers in the Great Lakes Region of Africa. The exact frequency of a specific traumatic event was not measured, as this is considered to be unreliable due to memory biases (Kolassa et al., 2010). Instead, the items were coded dichotomously. If a participant had ever experienced an event, this was coded as “1”, otherwise it was coded as “0”. As a measurement of trauma-load, the number of experienced traumatic event types was summed.

Childhood maltreatment. Exposure to different types of childhood maltreatment was assessed by means of four single items oriented on the common domains of childhood maltreatment (physical abuse, verbal abuse, neglect and sexual abuse, cp. e.g., Teicher et al., 2006). The items were coded dichotomously, as “1” if the participant had experienced a type of childhood maltreatment and as “0” if not. As a measurement of childhood maltreatment, the number of experienced types of childhood maltreatment was summed. The following questions were asked: “Have your parents/caretaker neglected you during childhood?”, “Have your parents/caretaker regularly humiliated you verbally during childhood?”, “Have you been physically abused by your parents/caretaker during childhood?”, “Have you experienced a sexual assault by a family member/caretaker/friend or foreign person during childhood?”.

Self-committed violence. To measure self-committed violence, we systematically assessed 14 different types of perpetrated violence (e.g., mutilation, rape or killing). The items were coded dichotomously and were summed up to create a self-committed violence sum score.

PTSD symptom severity. Symptoms of PTSD were investigated using the PSS-I (Foa, Riggs, Dancu, & Rothbaum, 1993). The PSS-I is a semi-structured interview which consists of 17 items and has proven its validity in comparable East-African samples (Ertl et al., 2010). The items correspond to the 17 symptoms of PTSD in the DSM-IV, divided into the three clusters of re-experiencing, avoidance and hyperarousal. The assessment of symptom severity refers to the last two weeks and is based on a 4-point Likert scale ranging from 0 (not at all) to 3 (five or more times per week/almost always). For analysis, a sum score of all symptoms was computed to assess PTSD symptom severity, with a possible range of 0 to 51. The PSS-I comes with good psychometric properties, with an internal consistency of Cronbach's $\alpha = .86$ (Foa & Tolin, 2000). In the present study Cronbach's α was .94.

Appetitive aggression. To assess experiences of appetitive violence we used the Appetitive Aggression Scale (AAS), a semi-structured interview that has been used and validated in other comparable populations with more than 1600 participants (Weierstall & Elbert, 2011). The AAS consists of 15 items regarding the perception of violence or appetitive aggression (e.g., ‘‘Is it exciting for you if you make an opponent really suffer?’’ or ‘‘Once fighting has started, do you get carried away by the violence?’’). The interviewer rated the level of the interviewee's agreement on a 5-point Likert scale ranging from 0 (‘‘I totally disagree’’) to 4 (‘‘I totally agree’’). For analysis, a sum score with a possible range of 0 to 60 was computed. In the validation study, the AAS score showed a Cronbach's α coefficient of 0.85 and further analysis revealed that the AAS measures a distinct construct of human aggression (Weierstall & Elbert, 2011). In the present study Cronbach's α was .87.

2.3.3 Procedure

Interviews with the demobilized combatants were conducted at the campus of the Université Lumière in Bujumbura, Burundi. Interviews with the active soldiers were mostly conducted at the military camp Mudubugu (Bubanza province, Burundi), and a smaller number were conducted at other military camps in Gakumbu (Bujumbura rural, Burundi) and Bubanza province (Burundi). At the time of the study, the active soldiers were receiving a two-month training session in preparation for AMISOM. The training took place in these camps, with one battalion at a time. Six clinical psychologists of the University of Konstanz, four military psychologists of the Burundian army and six advanced students of clinical psychology from the University Lumière interviewed the participants. Interviews were conducted in Kirundi. Non-local interviewers conducted the interviews with the help of six bilingual interpreters. Different interpreters translated all questionnaires into Kirundi and back into English. The translations were discussed in detail with the interpreters before their application in the interview. All interviewers and interpreters had been trained in the concepts of mental disorders and aggression in an intensive six-week training session prior to data collection and also received permanent supervision to ensure data quality. The interviews lasted one and a half hours on average.

2.3.4 Data analysis

The Robust multiple linear regression analyses were conducted to investigate the prediction of *PTSD symptom severity* as well as *appetitive aggression* by the number of *traumatic event types*, *childhood maltreatment* and *self-committed violence*. The aforementioned predictors as well as all two-way interactions were included in the regression models. To identify potential differences between ex-combatants and active soldiers, group assignment was included in the model and dummy-coded using 0 for the ex-combatants and 1 for the active soldiers. The predictors were mean-centered to reduce potential multicollinearity (Kleinbaum, Kupper, Nizam & Muller, 2008). In a first step, all variables were simultaneously entered into the model. In a second step, the insignificant variables were excluded in a stepwise manner. The final model was selected according to Bayesian Information Criterion (BIC, Schwarz, 1978). All analyses used a two-tailed $\alpha = .05$.

2.4 Results

2.4.1 Predictors of PTSD symptom severity

We conducted a robust multiple linear regression to identify significant predictors of *PTSD symptom severity* and to assess if their influence differed between the ex-combatants and active soldiers. The results are presented in Table 2.2 (Model 1). The selected model revealed main effects for the group variable and the variables *traumatic event types* and *childhood maltreatment. Self-committed violence* was no additional predictor. Of all included interactions, the interaction of *traumatic event types * childhood maltreatment* significantly predicted *PTSD symptom severity*. Additionally, the interactions of *group * traumatic event types* and *group * childhood maltreatment* were significant, indicating a stronger impact of *traumatic event types* as well as childhood maltreatment on *PTSD symptom severity* in the group of the ex-combatants. The model accounted for 43% of the variance of *PTSD symptom severity* (F (6, 944) = 104.12, p < .001, f^2 = .75). The maximum Variance Inflammation Factor did not exceed 1.84. Hence, multicollinearity could be discounted.

Table 2.2 *Robust multiple linear regression analysis predicting PTSD symptom severity (Model 1) and appetitive aggression (Model 2)*

	Model 1		Model 2	
	PTSD symptom severity		Appetitive aggression	
Predictor variables	β	t	β	t
Group[a]	-.25	-10.41***	.13	3.61***
Traumatic event types	.29	11.93***	.22	5.75***
Childhood maltreatment	.18	7.45***	<-.01	-0.07
Self-committed violence	-	-	.52	14.07***
Traumatic event types * childhood maltreatment	.11	4.18***	-	-
Traumatic event types * self-committed violence	-	-	-	-
Childhood maltreatment * self-committed violence	-	-	.09	3.20***
Group[a] * traumatic event types	-.17	-6.48***	-.10	-2.57*
Group[a] * childhood maltreatment	-.05	-2.39*	-	-
Group[a] * self-committed violence	-	-	-.09	-2.27*

Note. β = standardized regression coefficient. R^2_{adj} (Model 1) = .43, R^2_{adj} (Model 2) = .39.

Asterisks indicate statistical significance *p < .05 **p <.01 ***p <.001. [a] ex-combatants were used as the reference group.

Apart from the impact of exposure to *traumatic event types*, regression analysis also highligted the significance of *childhood maltreatment*. The development of PTSD in relation to both classes of stressors is illustrated in Figure 2.1, which shows the fitted PSS-I sum score based on the selected linear regression model (Model 1). The grey scale indicates the predicted *PTSD symptom severity*. Active soldiers and ex-combatants are separately plotted to enable comparison between the two groups. Both *childhood maltreatment* and *traumatic event types* cumulatively contribute to the development of *PTSD symptom severity*. *PTSD symptom severity* is more pronounced in ex-combatants at all levels of predictors.

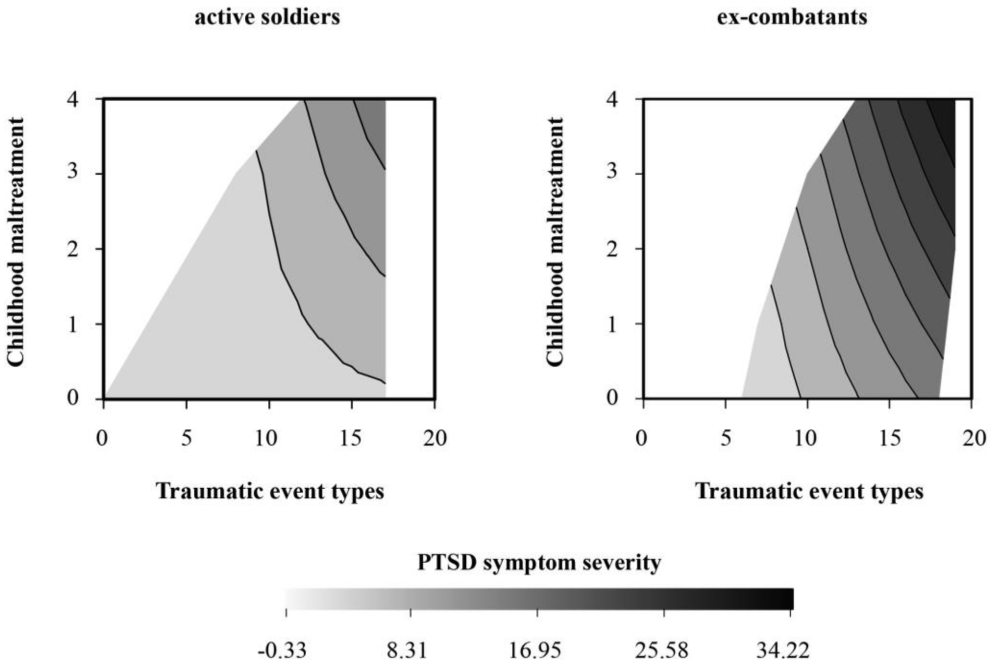

Figure 2.1

Relationship between the number of traumatic event types, childhood maltreatment and PTSD symptom severity

At any given level of exposure to traumatic events, PTSD symptoms increase alongside childhood maltreatment and vice versa – with increasingly different types of childhood maltreatment, PTSD symptoms increase alongside the experience of multiple traumatic stressors. PTSD symptom severity is more pronounced in ex-combatants at all levels of both predictors.

2.4.2 Predictors of appetitive aggression

Results of the multiple linear regression analysis for the prediction of *appetitive aggression* are presented in Table 2.2 (Model 2). The selected model revealed a main effect for the group variable. *Appetitive aggression* was higher in active soldiers than in ex-combatants. Furthermore, main effects were found for *traumatic event types* and *self-committed violence*. *Childhood maltreatment* was not an additional predictor. The final model included the significant interactions of *childhood maltreatment *self-committed violence, group * traumatic event types* and *group * self-committed violence*. The model accounted for 39% of the variance of *appetitive aggression* (F (7, 944) = 76.03, p < .001, f^2 = .64). The maximum Variance Inflammation Factor did not exceed 2.11. Hence, multicollinearity could be neglected.

Figure 2.2 illustrates the emergence of *appetitive aggression* in relation to *traumatic event types* and *self-committed violence*, separately plotted for ex-combatants and active soldiers. It shows the fitted AAS sum score based on the selected linear regression model (Model 2). The grey scale indicates the predicted values of *appetitive aggression.* Both predictors cumulatively contribute to the emergence of *appetitive aggression.* At the same level of predictors, *appetitive aggression* is more pronounced in active soldiers.

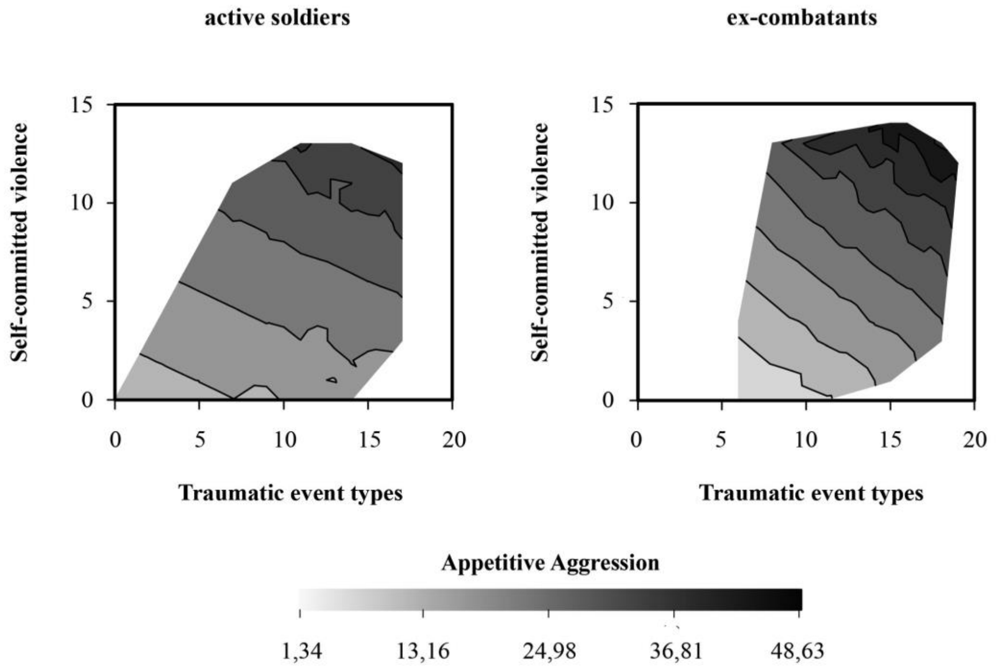

Figure 2.2

Relationship between the number of traumatic event types, self-committed violence and appetitive aggression

With increasingly different types of traumatic events, appetitive aggression increases alongside self-committed violence. The highest levels of appetitive aggression are found in ex-combatants; however, at the same level of predictors, appetitive aggression is more pronounced in active soldiers.

2.6 Discussion

In this study, ex-combatants reported a higher exposure to different forms of traumatic events and childhood maltreatment than active soldiers. Furthermore, they specified having committed more violence. They were also more affected by PTSD symptoms and showed an overall higher degree of appetitive aggression.

Concordant with previous research, the “building block effect” – that is, the increasing likelihood of PTSD with an increasing variety of traumatic stressors – was found for both the ex-combatants and the active soldiers (Neuner et al., 2004; Schauer et al., 2003). Even when controlling for the level of traumatic experiences and the exposure to childhood maltreatment, ex-combatants presented with more severe PTSD symptoms than currently active soldiers. Hence, active soldiers represented a more resilient group compared to ex-combatants. Even though we do not know the mental health status of ex-combatants and active soldiers directly after the end of the war, it is likely that this played a crucial role in their demobilization. Soldiers suffering from PTSD symptoms might have preferred to leave armed groups, while healthier individuals might have been interested in remaining in or being integrated into the army.

In accordance with previous research, childhood maltreatment was found to be an additional predictor of PTSD symptoms (Berntsen et al., 2012; Van Voorhees et al., 2012). The results indicated a moderating effect of childhood maltreatment: both kinds of adversities potentiated the risk of trauma symptoms, which is in line with other research in conflict regions where the interplay of different types of stressors such as family violence and war events was shown to enhance vulnerability to PTSD (Catani et al., 2010). However, childhood maltreatment and other traumatic events did not occur completely independently of each other: the minimum number of different traumatic events experienced increased with the extent of childhood maltreatment – that is, no participants reported childhood maltreatment along with no or only a few traumatic experiences. This result is in line with research emphasizing that maltreated children are at a higher risk of experiencing traumatic events ouside the family, especially in combat situations (Iversen et al., 2007; King et al., 1996). Maltreated children probably leave families earlier to join armed groups. On the other hand, childhood maltreatment is also more common in families that are affected by war (Catani, Jacob, Schauer, Kohila, M. & Neuner, F., 2008).

In contrast to other research (Bayer et al., 2007, Van Winkle, & Safer, 2011), self-committed violence was not a predictor of PTSD symptoms in our study. Allthough exercising violent acts such as killing can be traumatising, this is not necessarily the case for everyone or in every situation. Hecker and colleagues (2013) demonstrated that perpetrating violence is not traumatizing for combatants who had voluntarily joined an armed force. In our sample, this was the case for over 95% of the participants. Whether self-perpetrated violence is traumatizing for a person or not apparently depends on the particular situations and circumstances. Future research therefore needs to separately assess different types of violence (reactive vs. appetitive) and consider the range of emotions that was present when the violence was enacted.

In line with previous studies in post-conflict regions (e.g., Hecker et al., 2012), this study also demonstrated that high levels of appetitive aggression can generally be found in a combatant population. Self-committed violence was a strong predictor of appetitive aggression, which is consistent with prior studies demonstrating that commiting violent acts fosters the perpetrator’s perception of aggression as appetitive (e.g., Crombach & Elbert, 2014; Hecker et al., 2012). Traumatic events also predicted appetitive agression. This effect is consistent with research that has emphasized an increase in aggressive behaviour in adverse environments as an adaptive mechanism (e.g., Weierstall et al., 2011). Furthermore, the results of our study support the hypothesis that growing up in a violent environment is related to subsequent violent behavior. Even though childhood maltreatment itself did not directly predict appetitive aggression in our study, it moderated the effect of self-committed violence on the preception of aggression. Experiencing childhood maltreatment increased the association between self-committed violence and appetitive aggression. A possible explanation for this is that childhood maltreatment happens particularly in environments that favor violent behavior, which in turn socializes the mistreated children (Schwartz, Dodge, Pettit, & Bates, 1997).

At an absolute level, ex-combatants reported more appetitive aggression than active soldiers. However, when controlling for exposure to traumatic events and childhood maltreatment as well as for self-committed violence, the active soldiers showed a relatively higher degree of appetitive aggression. Again, this may have been due to selection effects during the demobilization process after the war. Individuals with higher appetitive aggression and at the same time lower PTSD symptom severity might be more likely to have remained in the army.

A methodological limitation of this study is the correlational design. It is thus not possible to prove causal inferences about the relations between variables. We also do not have a longitudinal picture of the onset and history of either PTSD or appetitive aggression. It could be, for example, that the PTSD was much worse in the immediate aftermath of the war, and has subsequently improved. Furthermore, for traumatic events and self-committed violence, we did not measure exactly when they occurred in the participants' lives. As our data are based on subjective reports, there might be a potential bias due to retrospective recall or social desirability. We cannot rule out that active soldiers systematically under-reported symptoms of PTSD. This might have enlarged the observed difference between groups of active soldiers and former combatants. However, conducting interviews allowed us to get also a clinical impression, which supported the huge difference between the two groups.

2.7 Conclusion

In conclusion, the results of the present study indicate that childhood maltreatment is a severe risk factor that exacerbates the psychological consequences of violent conflicts in post-conflict or crisis regions. Self-committed violence frequently may not promote trauma-related disorders but poses a risk factor for the development of appetitive aggression. The level of appetitive aggression seems to be a source of potential risk in both former and active combatants. The present research disentangled and highlighted several important aspects of the complex interplay between different factors leading to PTSD and appetitive aggression.

2.8 Acknowledgements

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3 Violent offending promotes appetitive aggression rather than posttraumatic stress – a replication study with Burundian ex-combatants

3.1 Abstract

Research has identified appetitive aggression, i.e., the perception of committed, violent acts as appealing, exciting and fascinating, as a common phenomenon within populations living in precarious and violent circumstances. Investigating demobilized soldiers in the Democratic Republic of Congo demonstrated that violent offending is associated with appetitive aggression and not necessarily with symptoms of posttraumatic stress. In the present study, we sought to replicate these results in an independent and larger sample of demobilized soldiers from Burundi. As with the Congolese ex-combatants, random forest regression revealed that the number of lifetime perpetrated violent acts is the most important predictor of appetitive aggression and the number of lifetime experienced traumatic events is the main predictor for posttraumatic stress. Perpetrated violent acts with salient cues of hunting (pursuing the victim, the sight of blood, etc.) were most predictive for perceiving violent cues appealingly after demobilization. Moreover, the association of violent acts and appetitive aggression as well as traumatic events and posttraumatic stress remains strong even years after demobilization. Patterns of traumatic events and perpetrated acts as predictors for posttraumatic stress and appetitive aggression seem to be robust among different samples of ex-combatants who fought in civil wars. Psychotherapeutic interventions that address these complementary facets of combat-related disorders – namely, posttraumatic stress and appetitive aggression – are indispensable for a successful reintegration of those who fought in armed conflicts and to achieve a successful transition to peace.

Keywords: ex-combatant, soldier, demobilization, DDR, DRC, aggression, PTSD, violence

3.2 Introduction

Combatants who fight in the current civil wars are exposed to numerous forms of extreme violence. They often witness, experience and also perpetrate acts like killing, torture, rape, and other violent attacks. The exposure to combat has consistently been associated with heightened risks for posttraumatic stress disorder (PTSD) (Dohrenwend et al. 2006; Hoge et al., 2006; Odenwald et al., 2009; Priebe et al., 2013; Schaal et al., 2012). In the dynamics of scientific research, PTSD is widely considered as disorder of memory where sensory, interoceptive, cognitive, and emotional cues associated with the traumatic event(s) are highly cohesive and insufficiently innervated by contextual information (Brewin, Gregory, Lipton, & Burgess, 2010; Ehlers & Clark, 2000; Elbert, Schauer, & Neuner, 2015; Schauer, Neuner, & Elbert, 2011). Therefore, anchoring traumatic cues into autobiographic structures using exposure techniques had been proven highly effective during the last decades (Elbert et al., 2014; Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010; Robjant & Fazel, 2010). Recent literature however demonstrated that these interventions were less effective in veteran populations (Steenkamp & Litz, 2013) and that the offender status may hamper treatment gains (Stenmark, Guzey, Elbert, & Holen, 2014).

Combat high or traumatic stress

Researchers have been demonstrating that trauma symptoms in veterans are particularly prominent among those who have participated in killing, or have actively been implicated in atrocities (Komarovskaya et al., 2011; MacNair, 2002; Maguen et al., 2010; Maguen et al., 2009; Van Winkle & Safer, 2011). Therefore, they categorized perpetration as traumatic (MacNair, 2002). Accordingly, heightened levels of aggression have been found in military personnel exposed to combat (Hecker et al., 2012; Morland et al., 2012) and in some cases, violent outbursts may be explained by the hypervigilance symptoms of posttraumatic stress disorder (Morland et al., 2012). However, perpetrating violent acts might also be perceived appealingly (Elbert et al., 2010; Nell, 2006); a concept termed appetitive aggression (Elbert et al., 2010).

Appetitive aggression

Aggression is commonly defined as overt behavior that has the intention of inflicting physical harm (Anderson & Bushman, 2002). The concept covers two different subtypes: impulsive-reactive and controlled-instrumental (Anderson & Bushman, 2002; Elbert et al., 2010; Nell, 2006; Vitiello & Stoff, 1997). Reactive aggression refers to all aggressive behavior that is provoked by an external trigger. In contrast, instrumental aggression is exerted to achieve a certain goal and - if the behavior was successful - is followed by a positive outcome (Vitiello & Stoff, 1997). Appetitive aggression is a subcategory of the latter; it is exerted to gain a positive feeling and thus, is intrinsically motivated. For the trait of appetitive aggression, cues associated with violent acts are perceived appealingly rather than traumatically (Elbert et al., 2010). The enjoyment of violence in men had been postulated in psychological research before; for instance, Nell (2006) described ”the emotional state of the warrior in combat” as ”that of predators and hunters, with high arousal, positive affect, and heightened libido (...)”. In Grossman (1995) a need for aggression is defined as ”combat addiction”, which develops from preceding ”combat highs” where the combatant was ”float[ing] around, laughing, joking, having a great time, totally oblivious to the dangers around” him. Recently, Moran et al. (2014) demonstrated distinct neural circuitries for appetitive vs. reactive aggression (Moran, Weierstall, & Elbert, 2014).

Elbert et al. (2010) framed the etiological concept of appetitive aggression as an analogue to the theory of de-contextualized neural representations in PTSD: as perpetrated violent acts, and thus combat highs accumulate the memory develops a strong but fragmented associative collection of cues (interoceptive, sensory, cognitive, emotional) that are gathered at different points in time. As with traumatic events, context-related neural structures are assumed to be less active in combat highs, and thus implicit/hot and explicit/cold/context information will later be represented by insufficiently connected memory structures. In contrast to the trauma network, the so-called hunting network contains however a positive valence (Elbert et al., 2010; Elbert et al., 2014).

The exposure of violence - regardless whether witnessed, experienced or perpetrated – shares a considerable number of cues (e.g., blood, suffering, screaming, knife, weapon, or heart beat), which may be associated with both trauma and/or perpetration. Therefore, the hunting and the trauma networks are linked – they do not however merge due to their opposing valence. According to the context and the current brain state, external stimuli can trigger one or the other network, and thus the corresponding cognitions, emotions, interoception, behavior and/or sensory perception. The line between posttraumatic stress and appetitive aggression blurs with each additional ambivalent cue that is associated with traumatic stress and combat high. Due to the potential domination of shared cues by the hunting network, appetitive aggression may have a preventive effect on posttraumatic stress. This had been demonstrated in various studies (e.g., Weierstall et al., 2011). This antagonistic effect seems to be constrained to patients with low to moderate PTSD symptom severity. After a certain threshold of traumatic events, even people with high appetitive aggression will succumb to PTSD (Weierstall et al., 2013).

During the last five years, the concept has been validated in various countries, including Germany (Weierstall et al., 2012), South Africa (Weierstall et al., 2013), DRC (Hecker et al., 2012), Burundi (Crombach & Elbert, 2014) Uganda (Weierstall et al., 2012), Rwanda (Weierstall et al., 2011), and Colombia (Weierstall et al., 2013). In sum, the major findings demonstrate that (1) heightened levels of appetitive aggression are common in former combatants/veterans (Weierstall & Elbert, 2011), even years after their demobilization (Weierstall et al., 2012; Nandi, Crombach, Bambonye, Elbert, & Weierstall, 2015), (2) a building block effect for appetitive aggression, i.e., the more types of violent acts are committed, the higher the level of appetitive aggression (Crombach, Weierstall, Hecker, Schalinski, & Elbert, 2013; Hecker et al., 2012; Hermenau, Hecker, Maedl, Schauer, & Elbert, 2013) (see also the building block effect for posttraumatic stress (Schauer et al., 2003), (3) a heightened level of appetitive aggression has a protective impact on posttraumatic stress (Weierstall et al. 2011, Weierstall et al., 2012; Weierstall et al., 2012) – up to a certain threshold of PTSD symptom severity (Weierstall et al., 2013), and (4), higher ranks in the armed group seem to be associated with a stronger tendency towards violence (Crombach et al., 2013).

Replication

In an attempt to account for reports of combat high and its etiology, one of our earlier studies (Köbach et al., 2014) in the eastern Democratic Republic of Congo (DRC) assessed recently demobilized Congolese ex-combatants and found perpetrated violent acts with salient cues of hunting (e.g., attacking a village or settlement, participating in a massacre, etc.) to be the most important predictors for appetitive aggression compared to other specific events or acts. Furthermore, we found evidence that violent offending was significantly associated with appetitive aggression, but only weakly predictive for symptoms of posttraumatic stress

(Köbach et al., 2014). Nevertheless, neither events of traumatic stress nor acts of perpetration were totally negligible for the level of appetitive aggression or posttraumatic stress.

Focusing on the overlap between victimization and perpetration, we sought to replicate the results in an independent and larger sample. To examine the association of violent acts and traumatic events with appetitive aggression and posttraumatic stress, we analyzed data from formally demobilized Burundian ex-combatants. A priori hypotheses were set out according to the major findings in DRC (Köbach et al., 2014): (1) Specific types of traumatic events and perpetrated acts (specTE/PA) and the total number of types of traumatic events, witnessed (totTE-wit), experienced (totTE-exp) and perpetrated (totPA), predict the level of appetitive aggression and posttraumatic stress. Perpetrated violence with salient cues of hunting show higher predictive importance than other events. (2) The total number of perpetrated types of violent acts (totPA) is the best predictor for appetitive aggression, while the total number of self-experienced traumatic event types (totTE-exp) is the best predictor for posttraumatic stress.

3.3 Method

3.3.1 Participants and Procedure

We interviewed 392 male Burundian ex-combatants, who were contacted through an official national veteran association. A total of 24 participants had to be excluded due to missing data and one because of invalid answers; the final sample (N = 367) had an average age of 36 years (SD = 8.5, range: 19-62) and reported 7 years (SD = 3.0, range: 0-17) of formal education. On average, they had been recruited by the age of 19 years (SD = 4.2, range: 6-39), had spent 12 years (SD = 7.3, range: 0-35) in a (para)military group and had been demobilized 5.5 years (SD = 2.0, range: 0-14) before we conducted the interviews. The ethical review boards of the University of Konstanz, Germany and of the University

Lumière of Bujumbura, Burundi approved this study. Participation was voluntary and participants had to sign an informed consent prior to the interview (including an explanation of confidentiality requirements in psychological research and therapy). In case of illiteracy, oral informed consents were collected. Fulfilling the highest and most secure data encryption standards, a new electronic data coding and storage procedure using tablet-PCs (iPad) ensured confidentiality. Participants received compensation equivalent to 5 Euro to cover transportation expenses. Interviews were conducted at the campus of the University Lumière in Bujumbura and took on average 1.5 hours. Five clinical psychologists from the University of Konstanz, one clinical psychologist and six advanced students of clinical psychology from the University Lumière interviewed the participants. Interviews were carried out in Kirundi. Non-local interviewers conducted the interviews with the help of five interpreters. Before the application of the interview, all questionnaires had been translated into Kirundi using blind, back and forth translations and were intensively discussed with local experts to guarantee a precise interpretation. All interviewer and interpreters had been trained in the concepts ofmental disorders and forms of aggressive behavior prior to the data collection and received continuous supervision to ensure data quality.

3.3.2 Measures

All instruments were applied as a semi-structured interview beginning with the informed consent. In the following first part of the interview, socio-demographic information was collected including age, former (para)military affiliation, age of recruitment, and the years spent in armed groups. Afterwards exposure to violence, posttraumatic stress, and appetitive aggression were assessed (Nandi et al., 2015).

Exposure to violence. We assessed exposure to distinct types of violent and potentially traumatic events with a dichotomous (yes/no) checklist of 31 items (9 lifetime self-experienced potentially traumatic events, 7 potentially traumatic childhood experiences, 9 lifetime witnessed potentially traumatic events, 6 lifetime perpetrated violent acts (Nandi et al., 2015). Aiming for consistency with the original study (Köbach et al., 2014), we excluded 5 events that had not been assessed in DRC (deprived of food during childhood, social exclusion during childhood, neglect during childhood, loss of caregiver during childhood, witnessing suicide). By summing up the remaining items (26 in total), we calculated the total number of witnessed traumatic event types (totTE-wit; possible range: 0-8) and experienced traumatic event types (totTE-exp; possible range: 0-12), and the number of types of perpetrated violent act (totPA; possible range: 0-6). Furthermore, we used each of the 26 specific traumatic events and perpetrated acts (specTE/PA) as predictors. Figure 3.1 provides an overview of the events included in the analysis of data assessed in Burundi and DRC and their incidence rates.

Posttraumatic stress. Symptoms of PTSD were investigated using the PTSD Symptom Scale – Interview (PSS-I; Foa et al., 1993; Foa & Tolin, 2000). The PSS-I is a semi-structured interview, which consists of 17 items corresponding to the diagnostic criteria of the DSM-IV and referring to the last four weeks. Each item is rated on a four-point scale ranging from 0 (*not at all/only once*) to 3 (*five or more times per week/almost always*). The instrument has proven validity in comparable East-African samples [11]. In the present study Cronbach's α was .93.

Appetitive aggression. To assess appetitive aggression we used the Appetitive Aggression Scale (AAS; Weierstall & Elbert, 2011), a semi-structured interview that has also been used and validated in comparable populations. The AAS consists of 15 items rated on a five-point scale ranging from "0" (*I totally disagree*) to "4" (*I totally agree*). Appetitive aggression is conceptualized as trait, thus referring to a positive perception of violence (e.g.,

”Is it exciting for you if you make an opponent really suffer?”, ”Once fighting has started do you get carried away by the violence?”, or ”Once you got used to being cruel, did you want to be crueller and crueller?”). In the present study Cronbach's α was .89.

3.3.3 Analysis

As in the original study (Köbach et al., 2014), we used random forest regression with conditional inference trees (RF-CI), a non-parametric machine learning technique. Unlike the classical random forest, the RF-CI does not display a bias towards predictors with many categories in the variable selection process (Strobl, Boulesteix, Kneib, Augustin, & Zeileis, 2008). Following the principles of ensemble methods, a certain number of trees are aggregated to compose the random forest. Each tree is built using binary splits of the previously subsampled data (subsampling rate = 63.2%; Strobl, 2008; Strobl, Hothorn, & Zeileis, 2009). The splitting variable is chosen according to the strength of the association between the covariates and the outcome (Hothorn, Hornik, & Zeileis, 2006; Strobl, Malley, & Tutz, 2009) from a set of randomly preselected predictors (Grömping, 2009). Next, the importance of each predictor variable is ranked based on the ensemble of trees (conditional variable importance, *cvi*; Strobl et al., 2008). The goodness of fit can be assessed using the out-of-bag data (OOB). The results are used to calculate a pseudo-R^2 from the mean squared error (MSE) and the total sum of squares (SST; OOB-R^2 = 1-MSE/SST; Grömping, 2009). RF-CI provides a ranking of variables according to their importance for the outcome prediction (conditional variable importance, *cvi*), thus in this study for traumatic events and perpetrated acts in order to predict the level of appetitive aggression and posttraumatic stress. Further, the OBB-R^2 implies the fit of the model (Strobl et al., 2009). Consequently, four models are presented in this study: (1) the AAS sum score predicted by specTE/PA (RF-CI:1, spec-model$_{AAS}$), (2) the AAS sum score predicted by totTE-exp, totTE-wit, and totPA (RF-

CI:2, tot-model$_{AAS}$), (3) The PSS-I sum score predicted by specTE/PA (RF- CI:3, spec-model$_{PSS-I}$), (4) PSS-I sum score predicted by totTE-exp, totTE-wit, and totPA (RF-CI:4, tot-model$_{PSS-I}$). The analysis was conducted using R (version 2.15.0). The implementation we used was cforest (Hothorn, Bühlmann, Dudoit, Molinaro, & van der Laan, 2006), from the R package party (Strobl et al., 2009) with unbiased variable selection (Hothorn et al., 2006; following Westner, 2013). Furthermore, Brandt et al. (2014) recently published a ”replication recipe” including crucial criteria for such endeavors. This guideline provides an efficient and standardized way to present the importance of a replication, the methods, and the results. The “36-question guide of the Replication Recipe” was applied in the present study (see Table 3.1 at the end of the article).

Table 3.1 *36-question guide to the Replication Recipe*

The Nature of the Effect		
1	Verbal description of the effect I am trying to replicate:	(a) Cumulative lifetime perpetrated acts of violence are associated with higher levels of appetitive aggression.(b) Particularly, events that incorporate salient cues of violence have higher predictive importance for appetitive aggression.
2	It is important to replicate this effect because...	...the appealing aspect of violence is often neglected although it has an immense impact on (post-war) societies and mostly co-occurs with poor mental health.
3	The effect size of the effect I am trying to replicate is:	n/a; As in the original study we used RF-CI. Outcome measures can be drawn from Figure 1 in the article.
4	The confidence interval of the original effect is:	n/a
5	The sample size of the original effect is:	*N*=95
6	Where was the original study conducted? (e.g., lab, in the field, online)	In the field.
7	What country/region was the original study conducted in?	Democratic Republic of Congo, North Kivu, Goma.
8	What kind of sample did the original study use? (e.g., student, Mturk, representative)	Demobilizing, male, adult, Congolese ex-combatants.
9	Was the original study conducted with paper-and pencil surveys, on a computer, or something else?	The original study was conducted with paper-and pencil. The replication study was conducted with iPads.
Designing the study		
10	Are the original materials for the study available from the author?	On demand.
11	I know that assumptions (e.g., about the meaning of the stimuli) in the original study will also hold in my replication because:	Yes.
12	Location of the experimenter during data collection:	On site.
13	Experimenter knowledge of participant experimental condition:	Interviewers did not know the hypothesis.
14	Experimenter knowledge of overall hypotheses:	Interviewers did not know the hypothesis.
15	My target sample size is:	n/a
16	The rationale for my sample size is:	Interview capacity, time, availability of ex-combatants.

continued...

Documenting Differences between the Original and Replication Study For each part of the study indicate whether the replication study is *Exact*, *Close*, or *Conceptually Different* compared to the original study. Then, justify the rating.		
17	The similarities/differences in the instructions are:	[Exact]
18	The similarities/differences in the measures are:	[Close]; few events/acts were not asked in the replication study and vice versa. Outcome (AAS, PSS-I sum scores) was measured by exactly the same instruments.
19	The similarities/differences in the stimuli are:	n/a
20	The similarities/differences in the procedure are:	[Close]; iPads were used documenting the answers in the replication study. The interview setting was the same, but in different countries.
21	The similarities/differences in the location (e.g., lab vs. online; alone vs. in groups) are:	[Exact]
22	The similarities/differences in remuneration are:	[Exact]; transport money was paid in the replication study; in the original study ex-combatants were on site and thus no transport necessary.
23	The similarities/differences between participant populations are:	[Close]; similarities: ex-combatants in both studies fought in one or more African civil wars with similar kinds of events and living conditions; differences: ex-combatants in DRC have been in their demobilization process, while those in Burundi had been demobilized on average 6 years ago.
24	What differences between the original study and your study might be expected to influence the size and/or direction of the effect?	In the replication study participants had been demobilized for a longer period of time.
25	I have taken the following steps to test whether the differences listed in #24 will influence the outcome of my replication attempt:	n/a
Analysis and Replication Evaluation		
26	My exclusion criteria are (e.g., handling outliers, removing participants from analysis):	Participants with missing(s) in the event list, PSS-I or AAS as well as participants who gave invalid answers were excluded from the analysis.
27	My analysis plan is (just if it differences from the original):	n/a
28	A successful replication is defined as:	(a) Similar pattern of variable importance (*cvis*) and (b) acceptable model fits.

continued...

Registering the Replication Attempt		
29	The finalized materials, procedures, analysis plan, etc. of the replication are registered here:	In the main article.
Reporting the Replication		
30	The effect size of the replication is:	n/a
31	The confidence interval of the replication effect size is:	n/a
32	The replication effect size [is/is not] (circle one) significantly different from the original effect size?	n/a
33	I judge the replication to be a(n) [success/informative failure to replicate/practical failure to replicate/inconclusive] (circle one) because:	Success; The patterns of variance importances (*cvi*s) are similar and the model fits acceptable.
34	Interested experts can obtain my data and syntax here:	On demand.
35	All of the analyses were reported in the report or are available here:	In the article. Further information about the Burundian sample are published in [31].
36	The limitations of my replication study are:	Few events were not asked in the replication study and vice versa.

3.4 Results

3.4.1 Exposure to violence

The participants were exposed to a high range of experienced (M = 6.1, SD = 2.0, range: 0-12) and witnessed (M = 6.8, SD = 1.0, range: 2-8) traumatic event types, and perpetrated violent acts (M = 3.4, SD = 1.4, range: 0-6). Only 16 (4.4%) participants reported having committed none of the perpetrated violent acts. Everyone had witnessed at least two traumatic event types, and only one participant reported not having experienced any of the traumatic events. The high variance of combat exposure is also reflected in the levels of appetitive aggression (M = 28.5, SD = 14.6, range: 0-58) and posttraumatic stress (M = 13.7, SD = 11.2, range: 0-42).

3.4.2 Specific traumatic events and perpetrated acts (RF-CI:1 and RF-CI:3)

Figure 3.1 illustrates the *cvi*s for the AAS and PSS-I sum scores in comparison with the original study. The OBB-R^2 explained 36% of variance for the AAS and 30% for the PSS-I sum score (in the Congolese sample of the original study, 33% of the variance was explained for the AAS and 27% for the PSS-I sum score).

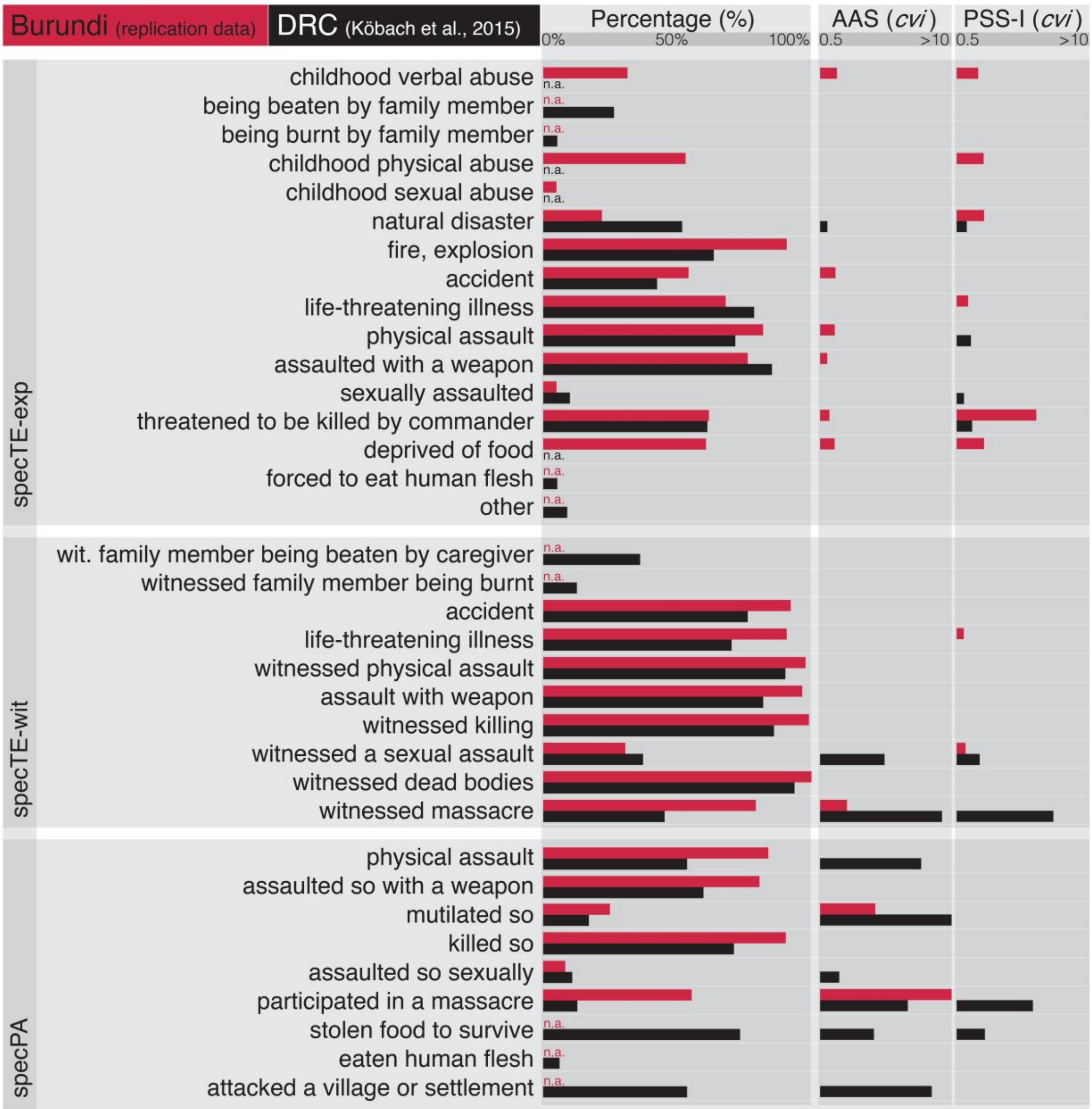

Figure 3.1 *Lifetime exposure to violence (%) and cvis for the AAS and PSS-I sum scores resulting from ex-combatants in Burundi vs. DRC. The figure shows similar patterns of prevalence rates as well as the predictor's importances in predicting AAS and PSS-I for Burundian and Congolese ex-combatants. The cvis reveal violent acts with salient cues of hunting (e.g., participating in a massacre) to be most predictive for the AAS score. The prediction of PSS-I by participation in a massacre and stolen food to survive was not replicated. Abbr.: specTE-exp = specific traumatic events – experienced, specTE-wit = specific traumatic events – witnessed, specPA = specific perpetrated acts, n.a. (red) = not assessed in Burundi, n.a. (black) = not assessed in DRC.*

3.4.3 Total scores of events and acts (RF-CI:2 and RF-CI:4)

The pattern of the *cvi*-values of the total scores was similar in Burundian ex-combatatants, compared to Congolese ex-combatants. TotPA had the highest predictive value for the AAS sum score ($cvi_{Burundi}$ = 28, cvi_{DRC} = 88), compared to totTE-exp ($cvi_{Burundi}$ = 13, cvi_{DRC} = 4) and totTE-wit ($cvi_{Burundi}$ = 5, cvi_{DRC} = 4). TotTE-exp ($cvi_{Burundi}$ = 24, cvi_{DRC} = 10) had the highest impact on participants' PSS-I sum scores; totTE-wit had a lesser impact ($cvi_{Burundi} \leq 1$, cvi_{DRC} = 8). Essentially, the importance of the totPA in predicting the PSS-I sum score was negligible in both studies: $cvi_{Burundi}$ = 1 and cvi_{DRC} = 2. The OBB-R^2 explained 37% of the variance for the AAS sum score (RF-CI:2) and 24% for the PSS-I sum score (RF-CI:4); (in the Congolese sample, 44% of the variance was explained for the AAS and 34% for the PSS-I sum score).

3.5 Discussion

In this article, we successfully replicated the most important findings presented in a previous study with Congolese ex-combatants. With a larger sample of Burundian ex-combatants, we showed that specific types of traumatic events and violent acts, as well as the total number of these incidents, predicted appetitive aggression and posttraumatic stress. Moreover, the total number of perpetrated violent acts (totPA) was the best predictor for the level of appetitive aggression, while the total number of experienced traumatic event types (totTE-exp) was the best predictor for posttraumatic stress. Specific event types and violent acts with salient cues of violence had the strongest impact on the level of appetitive aggression in both samples, which thereby seems to be a robust finding. The accumulated number of violent acts and traumatic event types (tot-model$_{AAS/PSS-I}$) was not superior in predicting the level of appetitive aggression or posttraumatic stress, in comparison to models that used specific events (spec-model$_{AAS/PSS-I}$). The findings in this article strengthen the evidence that perpetrated violent acts can be perceived as appealing (Elbert et al., 2010), thus not as traumatic (MacNair, 2002) and most importantly, are rather associated with appetitive aggression ($cvi_{Burundi}$ = 28, cvi_{DRC} = 88) than with posttraumatic stress ($cvi_{Burundi}$ = 1, cvi_{DRC} = 2). In addition, none of the specific perpetrated acts were predictive for posttraumatic stress in this replication study. Nevertheless, traumatic events seem not to be negligible for predicting appetitive aggression. This became particularly obvious in the current study. For psychotherapeutic interventions with individuals previously involved in violent conflicts it is imperative to abandon the dichotomous victim-perpetrator archetype. The symptoms of posttraumatic stress and heightened levels of aggression can be addressed and treated more effectively when all forms of exposure to violence – experienced, witnessed, and perpetrated– as well as the associated feelings are taken into consideration without judgment. Such an attempt has been made in Narrative Exposure Therapy for Forensic Offender Rehabilitation (FORNET; Crombach & Elbert, 2014; Elbert, Hermenau, Hecker, Weierstall, & Schauer, 2012; Hermenau, Hecker, Schaal, Mädl, & Elbert, 2013; Köbach, Schaal, Hecker, & Elbert, (2015). In 5-7 sessions, the therapist and the client intensively reflected on the most poignant incidents of violence (exposure in sensu) and framed crucial, transitory changes from combatant to civilian. FORNET successfully reduced posttraumatic stress (Hermenau et al., 2013; Köbach et al., 2014) and the number of violent offenses (Crombach & Elbert, 2014). Further research is required. Furthermore, this study replicated the results that ”participation in a massacre”, ”having mutilated someone”, and ”having witnessed a massacre” – events/acts with very salient and predatory cues of violence (e.g., blood, screaming, suffering, etc.) – are the best predictors for the level of appetitive aggression. In the present study, this was the case even years after demobilization! These events may deserve particular focus in psychotherapy. The discrepancy in the time difference since demobilization in the current sample (6 years) in comparison to the Congolese sample in which the participants were interviewed during the demobilization process, suggests that the associations between perpetrated acts and appetitive aggression as well as traumatic events and posttraumatic stress remain stable over time; in fact, the patterns of variable importances are astonishingly similar, both for single specific event types/acts as well as the total exposure to different forms of violence (see Figure 3.1). The model fits were generally lower in the replication study. This replication article has limitations. First, the earlier result indicating that the total number of lifetime traumatic event types and violent acts would predict PTSD better than specific event types was not replicated for both the level of appetitive aggression and posttraumatic stress. Further, the models were not exactly the same as were used in the original study, owed to the slightly varying eventlists.

3.6 Conclusion

In conclusion, we demonstrated that the perpetration of violent acts during war continuously shapes a perpetrator's perception of and affiliation for violence. To create stable communities, secure family environments and healthy minds, evidence-based mental health care needs to abandon simplistic victim-perpetrator dichotomies and develop interventions that take the whole range of combat-related complications into account.

3.7 Acknowledgements

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4 Appetitive aggression and its relation to posttraumatic stress in Burundian ex-combatants

4.1 Abstract

Background: Former combatants have experienced many traumatic events and violence in their past. Symptoms of PTSD are prevalent amongst them, but at the same time, many combatants do not suffer from PTSD. Appetitive aggression - the perception of violent acts as appealing and exciting - was found to reduce the risk of developing PTSD symptoms in several studies with combatants of different countries. However, this protective influence waned when traumatization of combatants got too severe.

Objective: The aim of the present study was to replicate previous findings in a sample of Burundian ex-combatants. The relationship between appetitive aggression and PTSD symptom severity was investigated, expecting a negative correlation between these variables. Corresponding to previous studies, we expected to find this relationship only after excluding the most traumatized participants.

Method: Semi-structured interviews were conducted with 392 Burundian ex-combatants, assessing traumatic event types, self-committed violent acts, PTSD symptom severity (PTSD Symptom Scale Interview) and appetitive aggression (Appetitive Aggression Scale).

Results: Appetitive aggression was not correlated with PTSD symptoms severity in the total sample. After excluding the most severely traumatized participants, appetitive aggression was negatively related to PTSD symptom severity.

Conclusion: The findings of the present study confirmed previous findings on the relationship between appetitive aggression and PTSD. Appetitive aggression was shown to lower PTSD symptom severity, but is no ultimate protection against PTSD.

Keywords: aggression, traumatic stress, PTSD, combatants, genocide

4.2 Introduction

Burundi has repeatedly been the scene of violent riots and acts of war since its independence in 1962 (Uvin, 2009). The last episode of violence began in 1993, resulting in more than a decade of civil war and thousands of casualties. After the peace agreement in 2005, it took another four years until the last rebel group officially laid down their arms. In this conflict, the Tutsi-dominated army and Hutu rebels were fighting for control of the country, not only characterized by battles against each other but also by atrocities against civilians. From a population of 10 million, more than ¼ million had lost their lives and over a million people were displaced (Uvin, 2009).

People involved in war and armed conflict face a broad range of different traumatic experiences, which can lead to symptoms of Post-traumatic stress disorder (e.g., Berntsen, Johannessen, Thomsen, Bertelsen, Hoyle, & Rubin, 2012; Dohrenwend et al., 2006; Prigerson et al., 2001). Numerous studies could demonstrate a dose-response relationship between the extent of exposure to different traumatic event types and PTSD symptom severity, also known as the “building-block effect” (e.g., Neuner et al., 2004). For those who are actively involved in fighting, the horror of war and conflict is not just confined to experiencing and witnessing violence. Studies with soldier populations have demonstrated that self-perpetrated violence and the infliction of death, specifically, can precipitate serious mental-health disturbances in the aftermath of war and even increase symptoms of PTSD (Bayer, et al., 2007; Maguen et al., 2010).

Combatants, regardless of the wider context of armed conflict, find themselves in an environment characterized by violence and cruelty of all sorts. Often, these life-threatening conditions persist over long periods of time, entailing an immense risk of traumatization for the persons involved. Nevertheless, while research revealed that PTSD symptoms are very prevalent in former combatants, there is a notable portion of them who do not suffer from trauma symptoms even though they were confronted with horrendous events like torture and violent death (Elbert et al., 2010).

Based on these findings, there must be mechanisms of adaption that enable combatants to survive and function in ongoing armed conflicts, buffering the development of PTSD. In the past, research focused mainly on factors that hold potential resilience against PTSD in the aftermath of traumatic experiences, such as social support (Pietrzak et al., 2010). Unit support and unit cohesion were discussed as resilience factors addressing the context of military and the period before and during deployment (Brailey, Vasterling, Proctor, Constans, & Friedman, 2007; Pietrzak et al., 2010). Still escaping the scrutiny of research, however, are underlying adaption processes operating in the individual while being exposed to violent traumata or committing violence and atrocities. Kira and colleagues (2011) investigated the concept of militancy in Palestinian adolescents and found it to be associated with decreased PTSD symptoms, which led them to the conclusion that militancy functions as an anxiety buffer (Kira, Alawneh, Aboumediane, Mohanesh, Ozkan, & Alamia, 2011).

Similar to the idea of an adaption mechanism that buffers anxiety is the assumption that the processing of potential traumatizing violence can differ between people involved in armed conflict and that these violent cues do not inevitably have to be processed as traumatic stressors. Weierstall and colleagues, for instance, found no correlation between PTSD symptoms and self-committed violent acts in Rwandese genocide perpetrators (Weierstall et al., 2011). In a study with combatants in the eastern DR Congo (Hecker et al., 2013) self-committed violence was found to be traumatic only for forcibly recruited combatants and not for those who actively volunteered to be involved in an armed group. Hence, the authors suggest that there must be another perception of violent cues when in an “aggressor mode” that does not necessarily lead to a traumatic processing of experiences even of the utmost horror and cruelty. Case reports of former combatants provided initial insights into this altered perception when they describe cruel acts as appealing and fascinating and resort to violence in order to experience these positive emotions (Elbert et al., 2010; Maclure, & Denov, 2006). The perpetration of violence or the infliction of harm on a victim for the purpose of experiencing violence-related enjoyment that can be found in these combatants is defined as appetitive aggression (Elbert et al., 2010; Weierstall & Elbert, 2011).

The concept of appetitive aggression has been systematically investigated with quantitative methods in different populations of combatants and child soldiers in DR Congo, Uganda, and Columbia (Hecker et al., 2013; Weierstall et al., 2013; Weierstall et al., 2012), in German soldiers of WWII (Weierstall et al., 2012) and Rwandese genocide perpetrators (Weierstall et al., 2011). Beyond trauma symptoms a notable prevalence of appetitive aggression has been found amongst these populations. Furthermore, it has been shown that individuals who report higher levels of appetitive aggression were less likely to show symptoms of PTSD, postulating a protective influence of appetitive perception of war experiences on PTSD symptom severity. The studies revealed a negative linear relationship between the level of PTSD symptoms and the degree of appetitive aggression. However, this inverse relation could no longer be observed when the burden of trauma exceeded a certain threshold (Hecker et al., 2013; Weierstall et al., 2013). Thus, even if appetitive aggression might delay the development of PTSD symptoms, there seems to be no ultimate resilience against the detrimental consequences of war.

Based on these findings, the objective of this study was to replicate the linear relationship between the severity of PTSD symptoms and appetitive aggression and to confirm the threshold beyond which the adaptive effect of appetitive aggression wanes. We examined these hypotheses in a sample of demobilized Burundian combatants. Among this sample we found an average level of PTSD symptomology that was similar to the two previous studies that identified a specific threshold for the diminished effectiveness of appetitive aggression in reducing PTSD symptomology (Hecker et al., 2013; Weierstall et al., 2013).

Alongside the aforementioned potential predictors for PTSD symptom severity – the extent of different traumatic experiences, self-committed violence and appetitive aggression – this study considered the relations between other possible confounds to take account of in the Burundian context: During the civil war, Burundian ex-combatants were either part of the national army or a rebel group. Differences between these armed groups concerning the extent and quality of violent experiences might account for group differences across different combatant populations. Furthermore, previous research revealed that former child soldiers suffered to a higher extent from PTSD symptoms than adult ex-combatants (Hermenau et al., 2013). The time spent in armed group correlated negatively with the PTSD symptom severity in a prior study with abducted combatants from Northern Ugandan (Pfeiffer, & Elbert, 2011), proposing that many of them had adapted to the violent circumstances of an armed group. The Burundian ex-combatants had left armed groups at different time points, implying diverse periods of time since the last armed conflict. All of the aforementioned factors were considered in the analyses to control for potential confounds.

Our principal hypothesis was that there exists a negative linear relationship between appetitive aggression and PTSD symptom severity, indicating a beneficial effect of an appetitive perception of violence on the development of PTSD symptoms. Corresponding to previous studies (Hecker et al., 2013; Weierstall et al., 2013), we expected to find this effect only after excluding the most severely traumatized ex-combatants from the analyses, using the same threshold already found in the mentioned studies as a reference for the present study. In line with prior findings in comparable populations, we did not expect self-committed violence to significantly predict PTSD symptom severity (Hecker et al., 2013; Weierstall et al., 2011), but we expected a significantly positive relation between the number of experienced traumatic events and PTSD symptom severity thus confirming the building block effect.

4.3 Method

4.3.1 Participants and Procedure

We obtained data from 392 male Burundian ex-combatants. All participants were contacted via an official national veteran association. Out of the full sample 24 participants with missing data in the crucial variables were excluded from further analysis. At assessment, the final sample (N = 368) had a mean age of 36.0 years (SD = 8.5 years, range: 19-62). During the civil war, 67% of the ex-combatants were enlisted in the national army and 33% belonged to one of the Hutu rebel groups (mainly CNDD-FDD and FNL).

The ethical review boards of the Universities of Konstanz, Germany and of the University Lumière of Bujumbura, Burundi approved this study. Participation was voluntary and participants had to sign an informed consent prior to the interview. In case of illiteracy, oral informed consents were collected. Interviewers and interpreters also had to sign the informed consent to guarantee confidentiality. A new electronic data coding and storage procedure using tablet-PCs (iPad) additionally assured confidentiality, fulfilling the highest and most secure data encryption standards. Participants received compensation equivalent to 5€ to cover transportation costs.

Interviews were conducted at the campus of the University Lumière in Bujumbura and took, on average, one and a half hours. Five clinical psychologists from the University of Konstanz as well as one clinical psychologist and six advanced students of clinical psychology from the University Lumière interviewed the participants. Interviews were carried out in Kirundi. Non-local interviewers conducted the interviews with the help of five interpreters. We ensured sufficient privacy in the individual interview setting, which consisted always of one participant, the interviewer (and in case of a non-local interviewer of additionally a local interpreter). Before their application in the interview, all questionnaires had been translated into Kirundi using back and forth translations and were intensively discussed with local experts to guarantee a precise interpretation. All interviewer and interpreters had been trained in the concepts of mental disorders and aggression prior to the data collection and received continuous supervision to ensure data quality. Interpreters were trained to translate word by word, without including their own interpretations of the participants' response. Furthermore, interpreters and interviewers were interchanged to avoid systematic interpreter effects.

4.3.2 Measures

All instruments were applied as a semi-structured interview.

Socio-demographic data and military experiences. In the first part of the interview, socio-demographic information was collected including age at the time of assessment. Participants had been asked if they were part of either the national army or a rebel group in the past. The type of armed group was dummy coded, with "0" = national army and "1" = rebel group. Additionally, we collected information about the age of entry into armed group, the number of years spent with armed group as well as the number of years that had passed since leaving the armed group.

Traumatic event types. Exposure to different types of traumatic events was assessed using a checklist of 19 war- and non–war-related potentially traumatic events (e.g., being assaulted with a weapon, life-threatening accidents), which also included all events from the checklist of the Posttraumatic Stress Diagnostic Scale (Foa et al., 1997). The checklist was a version of a previously published checklist for war-affected populations (Neuner et al., 2004) and was adapted to the Burundian cultural context. It showed a sufficient test-retest reliability (r = .73, $p \leq .001$) and significant accordance with the CIDI Event List (Ertl et al., 2010) in an earlier study with former child soldiers in the East African context. The exact frequency of a specific traumatic event was not measured, as it is considered to be unreliable due to memory biases (Kolassa et al., 2010). Instead, the items were coded dichotomously. If a participant had ever experienced an event it was coded “1”, otherwise it was coded “0”. As a measure for trauma-load, the number of experienced traumatic event types was summed.

Self-committed violent acts. To measure self-committed violence, we systematically assessed 14 different types of perpetrated violence (e.g., mutilation, rape, or killing) with a checklist that has already been utilized in multiple combatant populations (Weierstall & Elbert, 2011). The items were coded dichotomously in the same manner as the traumatic event types and also summed up to a self-committed violence sum score.

Appetitive Aggression. To assess appetitive violence experiences we used the Appetitive Aggression Scale (AAS), a semi-structured interview that has also been used and validated in other comparable populations with more than 1.600 participants (Weierstall & Elbert, 2011). The AAS consists of 15 items referring to a positive perception of violence, measuring the concept of appetitive aggression (e.g., ‘‘Is it exciting for you if you make an opponent really suffer?’’ or ‘‘Once fighting has started do you get carried away by the violence?’’). The interviewer rated the level of the participant’s agreement to the 15 items on a 5-point Likert scale ranging from 0 (‘‘I totally disagree’’) to 4 (‘‘I totally agree’’) by using a manual that described examples of response for each response category. For the analyses, a sum score was computed, with a possible range from 0 to 60. In the validation study, the AAS score showed a Cronbach's α of 0.85 and further analyses on its validity revealed that the AAS measures a distinct construct of human aggression (Weierstall & Elbert, 2011). In the present study Cronbach's α was .89.

PTSD symptom severity. Symptoms of PTSD were investigated using the PSS-I (Foa et al., 1993). The PSS-I is a semi-structured interview, which consists of 17 items and has proven its validity in comparable East-African samples (Ertl et al., 2010). The items correspond to the 17 symptoms of PTSD in the DSM-IV, divided into three clusters: Re-experiencing, avoidance and hyperarousal. The assessment of symptom severity refers to the last two weeks and is based on a 4-point Likert scale ranging from 0 (not at all) to 3 (five or more times per week/almost always). For the analyses, a sum score of all symptoms was computed to assess PTSD symptom severity, with a possible range from 0 to 51. The PSS-I comes with good psychometric properties, with an internal consistency of Cronbach's $\alpha = .86$ (Foa & Tolin, 2000). In the present study Cronbach's α was .93.

4.3.3 Data Analysis

All analyses used a two-tailed $\alpha = .05$. Statistical analyses were performed using SPSS 21. A sequential multiple regression analysis was conducted to calculate a model for the prediction of *PTSD symptom severity.*

Initially, an analysis including all ex-combatants was carried out ($N = 368$). In the first step, only the control variables *age*, *type of armed group*, *age of entry into armed group*, *years spent with armed group*, and *years since leaving armed group* were included. The maximum variance inflation, however, indicated extreme collinearity between the variables *age* and *years spent with armed group*. The subsequently calculated Pearson correlation coefficient for the relation between the latter two variables was $r = .83$, $p < .001$. Further collinearity diagnostics revealed that the two variables had high variance proportions on the same small Eigenvalue, indicating that the variances of their regression coefficients are highly dependent. Consequently, to prevent bias in the model, we excluded age as a control variable from all further analyses. This decision was based on prior research that had revealed *PTSD symptom severity* to be related to the *years spent in armed grou*p in a similar setting (Pfeiffer & Elbert, 2011). After excluding *age* from the analysis, multicollinearity no longer had to be taken into account, as the maximum variance inflation factor did not exceed 1.49.

The second step of the regression analysis consisted of adding the number of *traumatic event types* and *self-committed violent acts* as potential predictors for *PTSD symptom severity*. In the third step, *appetitive aggression* was added into the model. No univariate outliers were identified. Mahalanobis' distance revealed one multivariate outlier that was thus excluded from further analyses. Underlying assumptions for regression analyses have been met: The residuals did not deviate significantly from normality, homoscedasticity or linearity. Multicollinearity could be rejected, as the maximum variance inflation factor did not exceed 1.78.

Subsequently, based on previous studies (Hecker et al., 2013; Weierstall et al., 2013), we ran the same analysis after excluding all participants with a PSS-I sum score higher than 21 (n = 88), which was equivalent to the upper quartile of the sample. Again, no univariate outliers were identified and Mahalanobis' distance revealed one multivariate outlier that was thus excluded from further analyses. The residuals did not deviate significantly from normality, homoscedasticity or linearity. Multicollinearity could be rejected, as the maximum variance inflation factor did not exceed 1.81.

Based upon the aforementioned studies (Hecker et al., 2013; Weierstall et al., 2013), we expected to find a negative linear relationship between *PTSD symptom severity* and *appetitive aggression* after excluding the upper PSS-I sum score quartile of the sample. For the total sample we predicted that there would be no significant relationship between the two variables. To test this thoroughly we also conducted polynomial regression up to the third order testing non-linear effects of *appetitive aggression* in the total sample and in the sub-sample to avoid overlooking a potential significant non-linear relationship between *PTSD symptom severity* and *appetitive aggression.*

4.4 Results

Variable descriptives for the total sample as well as the sample when participants in the upper quartile of PTSD symptom severity were excluded are presented in Table 4.1.

Table 4.1

Descriptives of total sample (N = 368) and after excluding the upper quartile of PTSD symptom severity (n = 280)

Variable	*N* = 368 *M* (*SD*) / No. (%)	*n* = 280 *M* (*SD*) / No. (%)
Age	36.02 (8.50)	36.74 (8.76)
Type of armed group		
Army	245 (67)	194 (69)
Rebel group	123 (33)	86 (31)
Age of entry into armed group	18.95 (4.20)	19.03 (4.10)
Years spent with armed group	11.51 (7.34)	12.05 (7.64)
Years since leaving armed group	5.51 (2.27)	5.65 (2.34)
Traumatic event types	13.62 (2.41)	13.26 (2.43)
Self-committed violent acts	9.41 (3.36)	9.13 (3.38)
PTSD symptom severity	13.70 (11.24)	8.53 (6.71)
Appetitive aggression	28.46 (14.63)	26.50 (14.19)

Note. *M*= mean, *SD* = standard derivation

4.4.1 Total sample

The first model included only the control variables *type of armed group, age of entry into armed group, years spent with armed group,* and *years since leaving armed group*. This model accounted for 6% of the variance of PTSD symptom severity (F (4, 362) = 6.75, p < .001, R^2 = .07). *Traumatic event types* and *self-committed violent acts* were entered in a second step as predictors. The resulting model accounted for 15% of the variance. The change in R^2 was significant (F (2, 360) = 20.86, p < .001, Δ R^2 = .10). However, only the number of *traumatic event types* was a significant predictor for *PTSD symptom severity* (see Table 4.2). The addition of *appetitive aggression* in a third step did not significantly increase the model (F (1, 359) = 1.14, p = .287, Δ R^2 < .01). Akaike Information Criterion (AIC, Bozdogan, 1987) as well as Bayesian Information Criterion (BIC, Schwarz, 1978) confirmed that adding *appetitive aggression* did not improve the model. Including the quadratic and cubic term of *appetitive aggression* in the model revealed no significant non-linear relationship between *PTSD symptom severity* and *appetitive aggression.*

Table 4.2

Sequential multiple regression analysis predicting PTSD symptom severity

	PTSD symptom severity			
	Total sample (N = 368)		Sample when PSS-I > 21 excluded (n = 280)	
Predictor variables	β	t	β	t
Step 1				
Type of armed group[a]	.02	0.26	.01	0.15
Age of entry into armed group	-.04	- 0.83	.04	0.74
Years spent with armed group	-.23	- 3.96***	-.24	- 3.71***
Years since leaving armed group	-.11	- 1.91	-.10	- 1.64
Step 2				
Type of armed group[a]	.02	0.27	.03	0.39
Age of entry into armed group	-.05	- 0.99	.03	0.49
Years spent with armed group	-.16	- 2.92**	-.20	- 3.05**
Years since leaving armed group	-.09	- 1.73	-.09	- 1.51
Traumatic event types	.33	5.67***	.25	3.63***
Self-committed violent acts	-.02	- 0.33	-.07	- 0.95

Step 3				
Type of armed group[a]	.01	0.21	.03	0.45
Age of entry into armed group	-.04	- 0.89	.02	0.33
Years spent with armed group	-.16	- 2.83**	-.21	- 3.26**
Years since leaving armed group	-.09	- 1.59	-.12	- 1.86
Traumatic event types	.32	5.33***	.29	4.06***
Self-committed violent acts	-.05	- 0.72	< -.01	- 0.03
Appetitive aggression	.07	1.07	-.17	-2.38*

Note. Asterisks indicate statistical significance *p < .05 **p <.01 ***p <.001. [a] army was used as the reference group.

Total sample: F (7, 359) = 10.40, p < .001, R^2_{adj} = .15.

Sample when PSS-I > 21 excluded: F (7, 271) = 6.21, p < .001, R^2_{adj} = .12.

4.4.2 Excluding ex-combatants in the upper quartile of PTSD symptom severity

The analysis was repeated after excluding all participants with a PSS-I sum score above 21. The model including only the control variables *type of armed group, age of entry into armed group, years spent with armed group,* and *years since leaving armed group* accounted for 6% of the variance of *PTSD symptom severity* (F (4, 274) = 5.35, p < .001, R^2 = .07). *Traumatic event types* and *self-committed violent acts* were entered in a second step as predictors. The resulting model accounted for 10% of the variance. Again, the change in R^2 was significant (F (2, 272) = 7.36, p = .001, Δ R^2 = .05). However, only the number of *traumatic event types* was a significant predictor for *PTSD symptom severity* (see Table 4.2). Adding *appetitive aggression* in a third step into the model resulted in a significant change in R^2 (F (1, 271) = 6.21, p = .018, Δ R^2 = .02). AIC and BIC confirmed the improvement of the model after including *appetitive aggression*. Also, the linear relationship was confirmed since including the quadratic and cubic term of *appetitive aggression* in the model revealed no significant non-linear effect. The final model accounted for 12% of the variance of *PTSD symptom severity*. *Appetitive aggression* negatively correlated with *PTSD symptom severity* (see Table 4.2). Thus, compared to the total group of ex-combatants, a protective influence of appetitive aggression on the development of PTSD symptoms could be found when excluding the participants with high trauma burden.

4.5 Discussion

Results of this study showed that the number of different traumatic event types predicted PTSD symptom severity and thus confirmed the building block effect (e.g., Kolassa et al., 2010; Neuner et al., 2004). The number of self-committed violent acts was not a significant predictor for PTSD symptom severity. This is also in line with other studies with comparable populations (Hecker et al., 2013; Weierstall et al., 2011), even though self-perpetrated violence was found to be traumatizing in other studies and therefore needs further attention to determine the significant circumstances under which committing violent acts add to the development of trauma symptoms (Hecker et al., 2013; Maguen et al., 2011).

The main objective of the present study was to investigate the relationship between appetitive aggression and PTSD symptom severity, expecting them to be negatively related and thus indicating a protective influence of appetitive aggression on the development on PTSD symptoms. In previous studies, this effect had already been demonstrated in populations of former combatants (Weierstall et al., 2011, Weierstall et al., 2012, Weierstall et al., 2012). In these studies, this effect could be shown for the total sample. In two other studies however (Hecker et al., 2013; Weierstall et al., 2013), the inverse relation between PTSD symptoms and appetitive aggression was only found after excluding the most severely traumatized cases (PSS-I sum score > 21). With this study, we aimed to confirm this particular threshold. A comparison of the levels of traumatization in the aforementioned studies showed that, in those studies where the negative relationship could be shown for the total sample, the average PSS-I sum score, ranging between 3.50 and 6.06, was apparently lower compared to an average PSS-I sum score between 9.14 and 15.79 in these studies where the inverse relationship was not found for the total sample. The same is true for the present study with an average PSS-I score of 13.70.

In line with Hecker et al. (2013) and Weierstall et al. (2013) we could not only replicate the inverse linear relationship between appetitive aggression and PTSD symptoms severity, but also confirm the threshold of PTSD symptom severity beyond which the inverse relationship can no longer be found. Apparently the threshold found in previous studies is not coincidental. Rather, it supports the assumption that the perception of violent cues as appetitive can counteract PTSD symptoms, but only up to a certain point (Elbert et al., 2010). Hence, appetitive aggression appears to be an adaptive mechanism in violent conflict but does not provide a perfect resilience against PTSD. This waning potential of appetitive aggression with increasing trauma burden can be explained by means of a network theory (Elbert et al., 2010; Foa & Kozak, 1986; Hecker et al., 2013; Weierstall et al. 2013). We postulate a "fear network" for the development and persistence of PTSD symptomatology (Elbert & Schauer, 2002): Cognitive representations and emotions related to traumatic events are associated with the sensory experiences during the trauma and integrated into a neural network. When cues of the trauma are activated, they trigger the same physical reaction – albeit often dampened – as those that occurred during the initial trauma exposure. The recurrent experience of trauma continuously extends this network, increasing the likelihood that different cues will activate a fear response by triggering elements from the network. Consequently PTSD symptoms occur.

Violence is generally viewed as a major source of traumatic stress. However, one has to distinguish not only between the victims' or the perpetrator's view of atrocities and cruelties but also take the processing of violent cues into account. When violent cues are perceived as appealing and exciting, they should not be integrated into the fear network and thus not provoke PTSD symptoms as a consequence. In our sample, participants overall reported a relatively high degree of appetitive aggression, indicating a positive connotation of violent cues. But since outbreaks of violence in a war scenario involve almost always the threat to one's own life, the borders between perpetrator and victim begin to vanish. The distinction between perceiving similar cues of cruelty and violence as either appealing or traumatizing no longer holds and the fear network expands. In severely traumatized individuals, even if they have perceived committing violence as exciting and appealing to a certain extent, the fear response will more easily be triggered through violent cues once the fear-network is predominately present in the brain. Even if appetitive aggression might be an advantageous and adaptive mechanism in violent environments, its risk reducing influence wanes when combatants are permanently exposed to diverse traumatic experiences.

With our explanatory model, we focus on the processing of violent and therefore potential traumatic events and take the network theory as a basis. Certainly, not only peri- trauma processing and the perception of violent events as horrifying or appealing determine the course and persistence of PTSD symptoms, but also the cognitive appraisal of these experiences (as victim and as perpetrator) in the sense of, for example, combat-related guilt and moral injury. These concepts are strongly associated with not only symptoms of PTSD but also depression and suicidal ideation (Hendin, & Haas, 1991; Maguen et al., 2011). Considering the fact that the ex-combatants left their armed group on average over 5 year ago, a long time has elapsed after the last armed conflict, when external influences and evaluation of the past experiences of war could have influenced symptoms of PTSD, appetitive aggression and thus also their interplay. Since traumatic events often entail not only symptoms of PTSD but also depression and suicidality future research should also address the role of appetitive aggression for these long-lasting trauma consequences. One would also postulate a buffering effect of appetitive aggression in the same manner that it was already found for similar concepts like militancy (Kira et al., 2011).

A methodological limitation of this study is the retrospective and correlational design. Thus, attributions about the direction of causality are limited. Potential bias due to subjective reports can never be excluded, as, with all self-report data, the interviews are affected by the participants' willingness to divulge personal information and experiences. This could especially play a role when reporting self-committed violence or appetitive aggression. Furthermore, the unique effect of appetitive aggression for the prediction of PTSD was small. However, we could validate it by means of cross-validation and additionally, findings of previous studies make the case for a robust effect.

4.6 Conclusion

In conclusion, appetitive aggression was found to be a factor that can lower the risk of developing PTSD symptoms. This finding replicated the results of previous studies. In accordance with these studies, this influence could only been shown if the level of traumatization did not exceed a certain threshold. Even if appetitive aggression seems to be a beneficial adaption on violent environments, it is no ultimate protection against PTSD. Being an advantage for combatants in violent circumstances, appetitive aggression can likewise be a problem when living again in a civil environment, challenging the build-up of a peaceful society (Hermenau et al., 2013). For a successful process of demobilization and reintegration of combatants into civil society it is indispensable to address mental health issues in reintegration programs. Psychological interventions should however not only focus on the already well-known mental health consequences such as PTSD but likewise deal with other phenomena of war scenarios like appetitive aggression. Therefore the complex dynamic between appetitive aggression and mental health has to be understood.

4.7 Acknowledgements

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5 Appetitive aggression and PTSD in soldiers: consequences of war exposure and predictors for the perpetration of violence during deployment

5.1 Abstract

Background: Exposure to war trauma increases the risk for PTSD symptoms, while committing violence fosters appetitive aggression, i.e. experiencing violence as fascinating and appealing. Both appetitive aggression and PTSD symptoms, especially from the hyperarousal cluster, are in turn potential predictors for violent behavior.

Objective: In a longitudinal design we aimed to predict violent acts committed by soldiers during deployment by their level of appetitive aggression and the severity of PTSD symptom clusters. Further, we examined factors that precede and maintain appetitive aggression and PTSD symptom severity, focusing on violent acts, trauma exposure and unit support.

Method: Semi-structured interviews were conducted with 466 Burundian soldiers immediately prior to and after a 1-year deployment in Somalia. In order to predict violent acts during deployment (peri-deployment) as well as appetitive aggression and PTSD symptom (cluster) severity prior to (pre-deployment) and after deployment (post-deployment), separate regression analyses were used.

Results: Appetitive aggression pre-deployment was predicted by violent acts and trauma exposure pre-deployment, while the severity of all PTSD symptom clusters pre-deployment was predicted by trauma exposure pre-deployment. The number of violent acts peri-deployment was predicted by appetitive aggression and the severity of PTSD hyperarousal symptoms pre-deployment. In addition to its pre-deployment level, appetitive aggression post-deployment was positively associated with violent acts peri-deployment and unit support, while PTSD symptom severity was positively associated with PTSD avoidance symptom severity pre-deployment and negatively associated with unit support.

Conclusion: This prospective study reveals the importance of appetitive aggression and PTSD hyperarousal symptoms for violence during deployment, while simultaneously demonstrating how these phenomena develop in mutually reinforcing cycles in a war setting.

Keywords: violence, aggression, PTSD, trauma, soldiers, Burundi, deployment

5.2 Introduction

During war soldiers are frequently exposed to traumatic stressors and may also engage in extreme forms of violence. Presuming a building-block effect, cumulative trauma experiences continuously increase the risk of developing symptoms of post-traumatic stress disorder (PTSD) (Neuner et al., 2004), an effect also found amongst combatants and soldiers in East- Africa (Köbach et al., 2014; Nandi et al., 2015). It has been demonstrated that combat exposure, and organized interpersonal violence in particular, might lead to lasting chronicity of PTSD in soldiers (e.g., Prigerson et al., 2001; Schauer & Elbert, 2010). Resilience factors that may buffer the risk for PTSD include unit support and unit cohesion (Brailey et al., 2007; Pietrzak et al., 2010).

For soldiers, war is not confined to victimization, but also involves self-committed acts of violence usually accompanied by alarm (fight/flight) responses. This raises the question as to what degree self-perpetrated violence contributes to the development of PTSD symptoms: While previous research reported associations between self-committed violence and PTSD (MacNair, 2002; Maguen et al., 2010), others could not confirm this finding (Hecker et al., 2013; Köbach et al., 2014). A marked number of studies suggest that a traumatic processing of self-perpetrated violence does not inevitably have to be the case in all combatants. In fact, a significant proportion of combatants even describe perpetrating violence as being exciting, fascinating, appealing. Such a perception of violence seems to be a useful adaption to violent contexts as it buffers the development of PTSD symptoms (e.g., Hecker et al., 2012). In recent literature, the term *appetitive aggression* has been introduced to describe this phenomenon (Elbert et al., 2010). Accordingly, the perpetration of harm is related to approach motivation and the purpose of experiencing violence-related enjoyment. Such motivations pose a major risk of violence outbreak and escalation.

A number of studies found appetitive aggression to be closely associated with the perpetration of violence (e.g., Crombach & Elbert, 2014; Crombach et al., 2013; Hecker et al., 2012). However, these correlative associations were not able to disentangle a presumed reciprocal relationship between the perpetration of violence and the development of appetitive aggression.

Aside from appetitive aggression, symptoms of PTSD were also linked to violent behavior in past research with soldiers and veterans (MacManus et al., 2013; McFall et al., 1999; Stappenbeck et al., 2014). While most research examined PTSD as a single construct, some studies distinguished between the different symptom clusters and demonstrated evidence that the hyperarousal cluster was most strongly associated with the perpetration of violence (MacManus et al., 2013; Mc Fall et al., 1999; Savarese et al., 2001; Taft et al., 2007). Intrusion symptom severity was not linked to violent acts, while contradictory findings exist for the avoidance cluster, positively linked to violent behavior in one study but negatively linked in another (Mc Fall et al., 1999; Taft et al., 2007). While the previous studies investigated violent behavior after war and deployment, research on predictors of violent acts during deployment has been lacking.

The present study

During the Burundian civil war, which erupted in 1993 and lasted more than a decade, many Burundian soldiers survived long periods of combat and atrocities. Since the end of the civil war in 2006, a large number of these soldiers have been deployed to Somalia as part of the peacekeeping African Mission (AMISOM). In a longitudinal design, the present study investigated Burundian soldiers immediately prior to and after a 1-year deployment in Somalia. We examined appetitive aggression and PTSD symptom severity as factors preceding the perpetration of violence during deployment, i.e. in a setting where violent behavior is required but at the same time regimented. Simultaneously, we wanted to imbed the findings in a scientifically based model of the development and maintenance of appetitive aggression and PTSD symptoms. In order to do so, we not only focused on exposure to trauma and violence but also on unit support as a factor potentially influencing the perpetration of violence, appetitive aggression and PTSD symptom severity.

We hypothesized that: (1-pre-deployment) Based on previous studies with Burundian and other East-African combatants (e.g., Köbach et al., 2014), *appetitive aggression pre-deployment* is best predicted by *violent acts pre-deployment*, while the three clusters of *PTSD symptom severity pre-deployment* are best predicted by *trauma exposure pre-deployment*. (2-peri-deployment) *Violent acts peri-deployment* are independently predicted by *appetitive aggression* and *PTSD hyperarousal symptom severity pre-deployment*. (3-post-deployment) *Appetitive aggression* and *PTSD symptom severity post-deployment* are associated with their respective pre-deployment levels. *Appetitive aggression post-deployment* is additionally predicted by *violent acts peri-deployment* whilst *PTSD symptom severity post-deployment* is additionally predicted by *trauma exposure peri-deployment*. Since perceived cohesion and support among comrades might encourage violence against others and change the perception of it, *unit support peri-deployment* might be positively linked to *violent acts peri-deployment* and *appetitive aggression post-deployment*. Based on previous research (e.g., Pietrzak et al., 2010) *unit support* could on the other hand represents a resilience factor that is negatively linked to *PTSD symptom severity post-deployment*.

5.3 Method

5.3.1 Participants

We obtained data of 468 male soldiers prior to their deployment in Somalia (t0; November 2012 - January 2013) and one to three months after their return (t1; March – July 2014). On average, the length of the deployment was 13 months; only four soldiers stayed less than 9 months in Somalia. Soldiers were on average 35.04 (SD = 5.03) years old and 19.64 (SD = 3.80) years old when they joined an armed group[1]. Two participants were excluded from the first part of the analyses and another five participants for the second part of the analyses due to missing data in the crucial variables.

5.3.2 Procedure

The ethical committees (IRBs) of the University of Konstanz, Germany and of the University Lumière of Bujumbura, Burundi approved this study. Participation was voluntary and participants had to sign an informed consent prior to the clinical interviews. In case of illiteracy, oral informed consents were collected. With respect to the special vulnerability of the population, anonymity and confidentiality were ensured through the electronic coding and storage of the data, which fulfilled the highest and most secure data encryption standards

[1] Armed group refers to any armed group, even during the civil war as not all soldiers joined the regular Burundian army first but were incorporated after the end of the civil war.

(Schobel, Schickler, Pryss, Maier, & Reichert, 2014). Clinical psychologists and advanced students of clinical psychology from the University Lumière of Bujumbura, Burundi and the University of Konstanz, Germany carried out interviews either in Kirundi or with the help of professional interpreters respectively. Before their administration in the interview, all questionnaires had been translated into Kirundi using back and forth translations and were intensively discussed in a transcultural expert committee of clinical psychologists to guarantee a precise interpretation. All interviewer and interpreters received extensive training in the concepts of mental disorders and aggression prior to the data collection and received ongoing supervision to ensure data quality.

Interviews were conducted at military camps in the region of Bujumbura. On average, the interviews prior to the deployment lasted one and a half hours and interviews after the deployment two and a half hours. The soldiers received no incentive for their participation. In case of transportation costs, a financial compensation was paid as a reimbursement.

5.3.3 Measures

All instruments were applied as a semi-structured interview. In the interview pre-deployment (t0) we used the following instruments:

Trauma exposure pre-deployment. Lifetime exposure to different types of traumatic event types pre-deployment was assessed using a checklist of 19 potentially traumatic event types. The checklist was an adapted version of a checklist that has been used previously with populations affected by violent conflicts (Neuner et al., 2004), covering all events from the checklist of the Posttraumatic Stress Diagnostic Scale (Foa et al., 1997). Items were coded as yes (1) or no (0) and summed as a measure for trauma-load.

Violent acts pre-deployment. Self-committed violence over the life span was assessed using a checklist of 13 different types of violent acts (e.g., mutilation, rape, or killing) that has already been implemented in various different combatant populations (Weierstall & Elbert, 2011). Items were coded as yes (1) or no (0) and summed. Since we measured diverse types of violent acts that differ in the quality and level of cruelty, a higher sum score reflects at the same time a higher degree of cruelty.

Appetitive aggression pre-deployment. Appetitive aggression pre-deployment was assessed using the Appetitive Aggression Scale (AAS; Weierstall & Elbert, 2011). The AAS consists of 15 items (e.g., ‘‘Is it exciting for you if you make an opponent really suffer?’’ or ‘‘Once fighting has started do you get carried away by the violence?’’). Ratings were based on a 5-point Likert scale ranging from 0 (‘‘I totally disagree’’) to 4 (‘‘I totally agree’’). In the validation study, the AAS score showed a Cronbach's α of 0.85 and further analyses on its validity revealed that the AAS measures a distinct construct of human aggression (Weierstall & Elbert, 2011). In the present study Cronbach's α for the scale at the first point of data collection was .83. Items were summed, with a possible range from 0 to 60.

PTSD symptom severity pre-deployment. Symptoms of PTSD prior to the deployment were assessed using the PTSD symptom scale- Interview (PSS-I; Foa et al., 1993). The PSS-I is a semi-structured interview, which consists of 17 items and has proven its validity in comparable East-African samples (Ertl et al., 2010). The items correspond to the 17 symptoms of PTSD according to the DSM-IV, divided into the three clusters re-experiencing (5 items), avoidance (7 items) and hyperarousal (5 items). The assessment of symptom severity refers to the last two weeks and is based on a 4-point Likert scale ranging from 0 (not at all) to 3 (five or more times per week/almost always). The PSS-I comes with good psychometric properties with an internal consistency of Cronbach's α = .86 (Foa & Tolin, 2000). In the present study, Cronbach's α for the scale at the first point of data collection was .87. Items were summed, with a possible range from 0 to 51. For the prediction of *violent acts peri-deployment* and *PTSD symptom severity post-deployment* we split the total sum score of

PTSD symptom severity pre-deployment in three single sum scores according to the three clusters of PTSD in the DSM-IV: **intrusion symptom severity pre-deployment** (Cronbach's α = .84, possible range 0-15), **avoidance symptom severity pre-deployment** (Cronbach's α = .71, possible range 0-21), and **hyperarousal symptom severity pre-deployment** (Cronbach's α = .69, possible range 0-15), each of them representing an independent predictor variable.

In the interview post-deployment (t1) we used the following instruments:

Trauma exposure peri-deployment. Exposure to different types of traumatic events peri-deployment was assessed using a checklist of 43 events, which included the events from the checklist of the first point of data collection. Additionally, we included items of the Deployment Risk and Resilience Inventory-2 (DRRI-2), a set of 17 individual scales that assess key deployment-related risk and resilience factors with demonstrated implications for Veterans' post-deployment health (Vogt et al., 2013). We chose items of the combat experiences and post-battle experiences scale that were appropriate to the context of Burundian soldiers deployed in Somalia. Moreover potentially traumatic events were added to depict the specific situation in Somalia. Items were coded and summed in the same manner as t0.

Violent acts peri-deployment. To measure self-committed violence peri-deployment, we assessed 17 different types of violent acts including the same 13 items as point t0 and adding 4 items of the DRRI-2 combat experiences scale to mirror the specific context in Somalia. The items were coded and summed as was done for t0.

To control for potential influences of trauma exposure or violent acts in the weeks after the deployment on *appetitive aggression* and *PTSD symptom severity post-deployment*, we assessed **trauma exposure post-deployment** and **violent acts post-deployment** equivalently to the assessment of *trauma exposure* and *violent acts peri-deployment.*

Unit support peri-deployment. Unit support peri-deployment was measured on the basis of 5 items chosen from the DRRI-2 unit support scale that fit the Burundian context. Ratings were based on a 5-point Likert scale ranging from 0 (‘‘I totally disagree’’) to 4 (‘‘I totally agree’’) and summed, with a possible range from 0 to 20. In the present study, Cronbach's α for the scale was .78

Appetitive aggression post-deployment. Appetitive aggression post-deployment was assessed equivalently to the first point of data collection using the AAS. Cronbach's α for the scale at the second point of data collection was .82.

PTSD symptom severity post-deployment. PTSD symptom severity post-deployment was assessed equivalently to the first point of data collection using the PSS-I. Cronbach's α for the scale at the second point of data collection was .88.

5.3.4 Data Analysis

To acknowledge differences in the distributions of the outcome variables, separate regression analyses were calculated. Predicting *appetitive aggression pre- and post-deployment*, we conducted a multiple linear regression. The residuals met assumptions of normality, linearity, and homoscedasticity for the prediction of *appetitive aggression pre-deployment.* The assumptions were slightly violated for the prediction of *appetitive aggression post-deployment*. Hence we used bootstrapping. Predicting *violent acts peri-deployment* we conducted a Poisson regression, since it is a count variable that follows a Poisson distribution and assumptions for linear regression were not met. Further, we conducted negative binomial regressions for the prediction of *PTSD intrusion, avoidance* and *hyperarousal symptom severity pre-deployment* and *PTSD symptom severity post-deployment*. Robust estimators were used to correct for underestimation of the standard errors of the estimates. Multicollinearity could be neglected in all models since maximal variance inflation factor did not exceed 2.20.

In the first part of the analyses (1), we conducted regression analyses for *appetitive aggression pre-deployment* as well as *PTSD intrusion*, *avoidance* and *hyperarousal symptom severity pre-deployment* on *trauma exposure pre-deployment* and *violent acts pre-deployment.* In the second part (2), we conducted a regression analysis of *violent acts peri-deployment* on *appetitive aggression pre-deployment, PTSD intrusion, avoidance* and *hyperarousal symptom severity pre-deployment* and *unit support peri-deployment.* In the third part (3), we conducted a regression analysis of *appetitive aggression post-deployment* on *appetitive aggression pre-deployment, unit support peri-deployment, trauma exposure peri-deployment*, and *violent acts peri-deployment*. Furthermore, we conducted a regression analysis of *PTSD symptom severity post-deployment* on *PTSD intrusion, avoidance* and *hyperarousal symptom severity pre-deployment, unit support peri-deployment, trauma exposure peri-deployment*, and *violent acts peri-deployment. Trauma exposure post-deployment* and *violent acts post-deployment* were included as control variables in both regressions of the third part.

5.4 Results

Descriptive statistics of all relevant variables are presented in Table 5.1.

Table 5.1

Descriptive statistics

Variable	*N*	*Mdn*	*M* (*SD*) [range]
Violent acts pre- deployment	466	3	3.99 (3.15) [0-13]
Violent acts peri- deployment	466	0	0.45 (0.89) [0-8]
Trauma exposure pre- deployment	466	11	10.54 (3.23) [1-18]
Trauma exposure peri- deployment	466	5	5.87 (3.45) [0-22]
Unit support peri- deployment	466	15	15.67 (2.63) [1-20]
Appetitive aggression pre- deployment	466	18	19.47 (10.67) [0-46]
Appetitive aggression post- deployment	466	15	16.33 (8.78) [0-51]
PTSD symptom severity pre- deployment	466	1	2.99 (4.59) [0-32]
intrusion	466	0	0.88 (1.88) [0-11]
avoidance	466	0	1.19 (1.96) [0-13]
hyperarousal	466	0	0.93 (1.66) [0-10]
PTSD symptom severity post- deployment	461	1	3.55 (5.10) [0-41]

Note. *M*= mean, *SD* = standard derivation, *Mdn* = median

5.4.1 Appetitive aggression and PTSD cluster symptom severity pre-deployment

The section “pre-deployment” of Figure 5.1 illustrates the results of the following regression models predicting *appetitive aggression pre-deployment*, *PTSD intrusion symptom severity pre-deployment*, *PTSD avoidance symptom severity pre-deployment* and *PTSD hyperarousal symptom severity pre-deployment.*

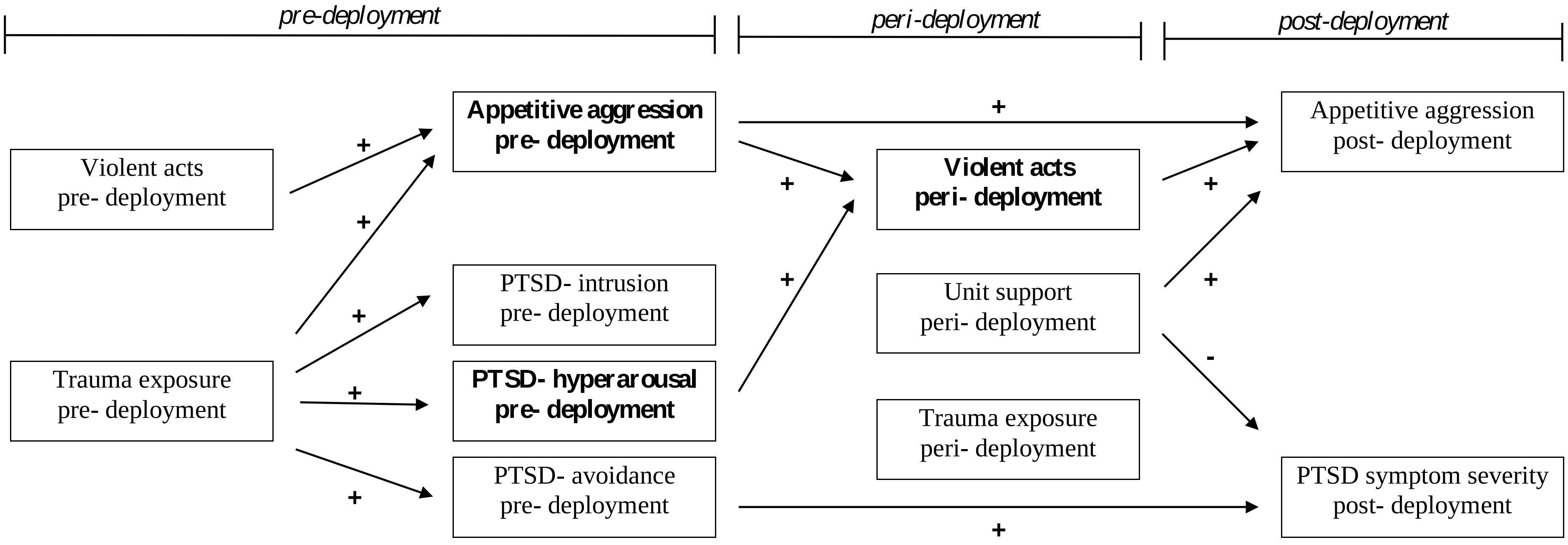

Figure 5.1 *Relationships between pre-, peri, and post-deployment variables*

Note. Only significant relationships between variables are displayed. **p* < .05 ***p* <. 01 ****p* ≤ .001

The linear regression predicting *appetitive aggression pre-deployment* revealed a significant positive effect for *violent acts pre-deployment* (β =. 42, *B* = 1.43, *SE(B)* = .15, $p \leq$ .001) and a significant positive effect for *trauma exposure pre-deployment* (β =. 15, *B* = .51, *SE(B)* = .15, $p \leq$ .001; R^2_{adj} = .26; *F* (2, 465) = 82.64, $p \leq$ .001, f^2 = .35).

The negative binomial regression predicting *PTSD intrusion symptom severity pre-deployment* revealed a significant positive effect for *trauma exposure pre-deployment* (β = .65, *B* = .20, *SE(B)* = .03, $p \leq$ .001). *Violent acts pre-deployment* did not reach significance (β = .10, *B* = .03, *SE(B)* = .03, *p* = .297; Omnibus test likelihood ratio $\chi 2$ (2) = 103.51, $p \leq$ .001, Deviance $\chi 2/df$ = 539.05/463 = 1.16, Pearson $\chi 2/df$ = 904.29/463 = 1.95).

The negative binomial regression predicting *PTSD avoidance symptom severity pre-deployment* revealed a significant positive effect for *trauma exposure pre-deployment* (β = .49, *B* = .15, *SE(B)* = .02, $p \leq$ .001). *Violent acts pre-deployment* did not reach significance (β = .15, *B* = .05, *SE(B)* = .02, *p* = .055; Omnibus test likelihood ratio $\chi 2$ (2) = 80.91, $p \leq$ .001, Deviance $\chi 2/df$ = 524.26/463 = 1.13, Pearson $\chi 2/df$ = 519.82/463 = 1.12).

The negative binomial regression predicting *PTSD hyperarousal symptom severity pre-deployment* revealed a significant positive effect for *trauma exposure pre-deployment* (β = .53, *B* = .17, *SE(B)* = .03, $p \leq$ .001; *Violent acts pre-deployment* did not reach significance (β = .10, *B* = .03, *SE(B)* = .03, *p* = .221; Omnibus test likelihood ratio $\chi 2$ (2) = 74.09, $p \leq$ .001, Deviance $\chi 2/df$ = 510.56/463 = 1.10, Pearson $\chi 2/df$ = 661.80/463 = 1.43).

5.4.2 Violent acts peri-deployment

As shown in Table 5.2 and illustrated in the section "peri-deployment" of Figure 5.1, the Poisson regression revealed significant positive effects for *appetitive aggression pre-deployment* and *hyperarousal symptom severity pre-deployment*. None of the other predictors reached significance.

Table 5.2

Poisson regression predicting violent acts peri-deployment (N = 466)

Predictor variables	β	*B*	*SE (B)*	$\chi 2$	*Exp (B) [95% CI]*
Appetitive aggression pre-deployment	.24	.02	.01	6.94**	1.02 [1.01,1.04]
Intrusion symptom severity pre-deployment	.08	.04	.05	.80	1.04 [.95,1.15]
Avoidance symptom severity pre-deployment	.03	.02	.04	.18	1.01 [.94,1.11]
Hyperarousal symptom severity pre-deployment	.17	.10	.04	5.74*	1.11 [1.02,1.21]
Unit support peri-deployment	.10	.04	.03	1.59	1.04 [.98,1.10]
Model statistics					
Deviance $\chi 2$/df = 533.19/460 = 1.16					
Pearson $\chi 2$/df = 708.40/460 = 1.54					
Omnibus test likelihood ratio $\chi 2$ (5) = 39.77***					

Note. β = standardized regression coefficient. *B* = unstandardized regression coefficient. *SE* = standard error. *Exp (B)* = exponent of the regression coefficient. *CI* = confidence intervall. *$p < .05$ **$p <. 01$ ***$p \leq .001$

5.4.3 Appetitive aggression and PTSD symptom severity post- deployment

The section “post-deployment” of Figure 5.1 illustrates the results of the following regression models predicting *appetitive aggression post-deployment*, and *PTSD symptom severity post-deployment.*

The bootstrapped linear regression predicting *appetitive aggression post- deployment* revealed a significant positive effect for *appetitive aggression pre-deployment* (β = .25, *B* = .20, *SE(B)* = .04, $p \leq .001$), a significant positive effect for *violent acts peri-deployment* (β =. 14, *B* = 1.41, *SE(B)* = .54, *p* =.004) and a significant positive effect for *unit support peri-deployment* (β =. 11, *B* = .36, *SE(B)* = .15, *p* = .013). *Trauma exposure peri-deployment* did not reach significance (β =. 09, *B* = .20, *SE(B)* = .14, *p* = .150; $R^2_{adj} = .14$; *F* (6, 464) = 13.75, $p \leq .001$, $f^2 = .18$).

The negative binomial regression predicting *PTSD symptom severity post-deployment* revealed a significant positive effect for *avoidance symptom severity pre-deployment* (β = .23, *B* = .11, *SE(B)* = .04, *p* = .004) and a significant negative effect for *unit support peri-deployment* (β = -.23, *B* = -.09, *SE(B)* = .02, $p \leq .001$). None of the other variables reached significance (*intrusion symptom severity pre-deployment:* β =. 01, *B* = .01, *SE(B)* = .04, *p* = .903; *hyperarousal symptom severity pre-deployment:* β =. 03, *B* = .02, *SE(B)* = .05, *p* = .657; *trauma exposure peri-deployment:* β = -.04, *B* = -.01, *SE(B)* = .02, *p* = .665); *violent acts peri-deployment:* β =. 03, *B* = .04, *SE(B)* = .06, *p* = .564; Omnibus test likelihood ratio $\chi 2$ (8) = 66.65, $p \leq .001$, Deviance $\chi 2/df$ = 748.73/452 = 1.66, Pearson $\chi 2/df$ = 631.79/452 = 1.40).

5.5 Discussion

In the first part of the study, we investigated predictors of appetitive aggression and PTSD prior to the deployment. In line with our hypotheses based on previous studies in post-conflict settings (e.g., Köbach et al., 2014; Nandi et al., 2015) lifetime self-committed violent acts were the strongest predictor for appetitive aggression prior to the deployment. Trauma exposure had an additional influence, presuming that appetitive aggression increases in adverse, violent environments as an adaptive self-defense mechanism (Crombach & Elbert, 2014; Weierstall & Elbert, 2011). In accordance with earlier research (e.g., Köbach et al., 2014; Nandi et al., 2015), lifetime trauma exposure predicted the severity of all PTSD symptom clusters prior to deployment, while self-committed violent acts were not associated with any of the three PTSD- clusters. This provides further confirmation for the hypothesis that the perpetration of violence must not necessarily be considered as a traumatic stressor (Hecker et al., 2013).

In the second part of the study, we predicted violent acts during deployment. In line with our hypotheses, both the level of appetitive aggression and the severity of PTSD hyperarousal symptoms prior to deployment were independent predictors, while none of the other PTSD clusters had an additional effect. Appetitive aggression showed a stronger association with the perpetration of violence during deployment than PTSD hyperarousal symptom severity. These results are in line with a study that demonstrated a strong relationship between appetitive aggression and recent violent acts in Burundian street children, while reactive aggression - for its part associated with PTSD - had a weaker effect (Crombach & Elbert, 2014). Reactive aggression represents a sort of aggression that underlies aversive emotions like anger, anxiety or fear (Anderson & Bushmann, 2002; Marsee, Weems, & Taylor, 2008).

These same emotions are linked to hyperarousal symptoms in PTSD (Elbogen, Wagner, Fuller, et al., 2010). In fact, irritability and outbursts of anger is a crucial symptom of the PTSD hyperarousal cluster. Also over-alertness and vigilance are classified as part of the hyperarousal cluster. This lowers the threshold for detecting threat and increases the probability of perceiving a situation as threatening, provoking a violent defense. The fact that hyperarousal symptoms alone, none of the other PTSD-clusters, preceded violent behavior corresponds to previous studies with veterans (e.g., MacManus et al., 2013). However, contradictory to veterans who had returned home from deployment, deployed soldiers usually face real life-danger in daily life. Borders between real danger and perceived threat are blurred. The typically low level of PTSD symptoms found in the present study underlines the fact that the soldiers investigated in the present study are not a clinical sample but represent a resilient group when compared to, for instance, Burundian demobilized combatants with the same past trauma-load (Nandi et al., 2015). Therefore hyperarousal symptoms should also be seen here as a factor enabling a rapid response to acute threat, increasing the chances of survival in life-threatening situations and not necessarily as an over-reaction to perceived threat. The findings indicate that reactive, as well as proactive, excitement and pleasure-driven components of violent behavior have to be considered in the setting of foreign deployment of soldiers where the perpetration of violence is required to a certain degree. Differences between individual soldiers in the extent of perpetrated violence still exist. Another explanation of the connection between appetitive aggression and violent acts during deployment could also be that soldiers perceiving violence as appealing might actively seek situations where violence is likely to occur.

Results of the third part of the study showed that the level of appetitive aggression immediately after the deployment was predicted by its baseline level prior to the deployment, but additionally by perpetrated violent acts during the deployment. Due to the prospective design of the study, this finding strongly supports the assumption of a reciprocal relationship between self-committed violence and appetitive aggression, continuously mutually reinforcing one another (Crombach et al., 2013). As expected, PTSD symptom severity after the deployment was predicted by the baseline level of PTSD symptom severity prior to the deployment. However only symptoms of the PTSD- avoidance cluster showed an effect. This reflects the crucial role of avoidance in the maintenance of chronic PTSD (e.g., Salters-Pedneault, Tull, & Roemer, 2004), which had also been found in war veterans (Marshall et al., 2006; Solomon, Horesh, & Ein-Dor, 2009). An avoidance of trauma-related cues, such as places and situations where traumatic events were experienced, or thoughts and feelings related to the traumata interfere with the extinction of learned emotional associations and, therefore, the traumatic response (e.g., Foa, Steketee, & Rothbaum, 1989). Contradictory to our hypothesis, trauma exposure during deployment was not associated with PTSD symptom severity after deployment. The rate of reported trauma exposure during deployment was low compared to lifetime trauma exposure, as was violent acts perpetrated during deployment, which still predicted the level of appetitive aggression after deployment. However, as previously discussed, the soldiers of the present study represent a rather resilient group, and newly experienced traumata might therefore not necessarily have to aggravate the average PTSD symptom severity.

In the past, the phenomenon of groupthink and group cohesion was discussed as a factor enhancing the participation in killings (Dutton, 2007). Based on this idea, we suggested that unit support might enhance the probability for violent acts during deployment. However, this hypothesis was not confirmed. A possible explanation could be that the concepts of unit support and group cohesion or groupthink probably differ substantially. That said, unit support was positively related to appetitive aggression immediately after deployment, thereby fostering a perception of violence as appealing and fascinating. Underlying appetitive and lustful emotions when inflicting harm might be encouraged and reinforced by in-group dynamics. Moreover, groupthink is associated with an illusion of invulnerability, which is also a component of appetitive aggression (Dutton, 2007). A causally opposite explanation - that soldiers high in appetitive aggression perceive and report more unit support - is also possible. While unit support during deployment was positively connected to appetitive aggression, it was negatively connected to PTSD symptom severity after deployment and thus might function in supporting resilience against PTSD. When taking into account that PTSD symptom severity did not increase substantially between pre- and post deployment, unit support might even lower pre-existing PTSD symptoms. This is in line with a study that showed different trajectory groups of PTSD symptomatology for deployed soldiers, inter alia a decrease in PTSD symptoms immediately after deployment (Berntsen, Johannessen, & Thomsen et al., 2012). The authors suggested that this group might have received more social support during deployment than at home.

We did not distinguish between violent acts that have been committed as an individual or as part of a group of soldiers; neither did we differentiate between violent acts during or outside of combat. However, appetitive aggression and PTSD hyperarousal symptoms could be especially important for violence perpetrated in excess of the soldiers' duty.

5.6 Conclusion

This study prospectively predicted violent acts of soldiers during deployment and enabled these acts to be embedded in an overall structure of the development and maintenance of appetitive aggression and PTSD symptoms in the war setting. Even when the perpetration of violence during deployment is required to a certain degree for every soldier, PTSD hyperarousal symptoms and an appeal for aggression, thus reactive and proactive mechanisms of violent behavior both independently contribute to violent behavior. The stable reciprocal relationship between committing violence and appetitive aggression highlights the decisive role of appetitive aggression in the recurrence and continuation of violence. Unit support seems to fuel this dynamic, while at the same time representing a protective factor against PTSD symptoms.

5.7 Acknowledgements

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6 Predicting domestic and community violence by soldiers living in a conflict region

6.1 Abstract

Past research revealed war trauma and PTSD symptoms as potential predictors for domestic and community violence in crisis regions and amongst soldiers in different armed conflicts. The impact of family violence and other adversities experienced in childhood as well as of a combat-enhanced appeal for aggressive behavior (appetitive aggression) remains to be specified. In the present study we separately predicted violence against children, intimate partner violence and community violence in 381 Burundian soldiers returning from foreign deployment and living in a post-conflict region. Using path analysis, we aimed to disentangle the independent contributions and pathways of the following variables: Exposure to war trauma and childhood familial violence, PTSD and depression symptom severity, and appetitive aggression. Childhood familial violence had an independent effect on all contexts of violence and was the only significant predictor for violence against the soldiers' own children. Intimate partner violence was additionally predicted by depression symptom severity, whilst community violence was additionally predicted by PTSD symptom severity and appetitive aggression. Besides war-related mental ill-health and appetitive aggression, violent experiences during development must not be overlooked as a factor fueling the cycle of violence in conflict regions.

6.2 Introduction

Violence in conflict regions can persist even after the end of hostilities, it can occur both at the family and the community level. The experience of recent war still appears to overshadow the society, inhibiting long-term stability. The traumatic stressors encountered in war can lead to chronic symptoms of post-traumatic stress disorder (PTSD) (e.g., Kolassa et al., 2010), which are often accompanied by comorbid depression (Jakupcak et al., 2010). Besides war trauma exposure, familial violence experienced as a child can have a detrimental impact on the mental health of war-affected civilians (Olema et al., 2014) as well as soldiers and combatants involved in different armed conflicts (e.g., Dohrenwend et al. 2013; Nandi et al., 2015).

In line with the cycle of violence hypothesis (for review see Elbert et al., 2006), an individual's history of childhood violence furthermore enhances the risk of violence perpetration against his or her own children (Conger, Place, & Neppl, 2012; Widom et al., 2015). In post-war Burundi, violence against children as well as intimate partner violence was strongly associated with the individual's own history of childhood maltreatment (Crombach & Bambonye, 2015). Similarly, in Rwandese genocide survivors (Rieder & Elbert, 2013) and war-affected male guardians in Northern-Uganda (Saile et al., 2014), self-reported violence against children was predicted by the participants' own experience of childhood familial violence, whereby the latter study also revealed PTSD symptoms as a decisive risk factor. However, these factors were not predictive for violence against the intimate partner in the same sample (Saile, Neuner, Ertl, & Catani, 2013). A study with active U.S. army soldiers demonstrated a direct link between experiences of child abuse and violence perpetration against their partners (Rosen, Kaminski, Parmley, Knudson, & Fancher, 2003), however this effect was not shown in a non-active group of U. S. veterans (Taft et al., 2005).

A large body of research has investigated correlates of intimate partner violence in veterans and soldiers of foreign deployments, focusing primarily on war-related mental health impairment. Above all, studies postulated PTSD to be a crucial risk factor (Orcutt et al., 2003; Teten et al., 2010). Several studies also found depression to heighten the risk for intimate partner violence (Rosen et al., 2003; Sherman, Sautter, Jackson, Lyons, & Han, 2006), whereas others could not find an independent effect of depression beyond PTSD and combat exposure (Taft et al., 2011). PTSD was also found to mediate the relationship between war violence exposure and intimate partner violence (Marshall et al., 2005; Orcutt et al., 2003). Beyond the context of domestic violence, war-related trauma and PTSD was also related to overall violent behavior and violence at the community level in soldiers and veterans returning from foreign deployment (MacManus et al., 2013; Stappenbeck et al., 2014).

Moreover, studies with either active or former combatants in a variety of different conflict regions revealed appetitive aggression to be strongly connected with violence perpetration (Crombach et al., 2013; Hecker et al., 2012; Köbach et al., 2014; Nandi et al., 2015). Appetitive aggression describes the perception of violence as fascinating, appealing and thrilling (Elbert et al., 2010; Weierstall & Elbert, 2011). The infliction of harm on a victim thus serves the purpose of experiencing violence-related enjoyment. Whilst the aforementioned studies focused on violence over the lifespan that was often war-related, a study with Burundian street children showed that appetitive aggression was the strongest predictor for recent violent behavior at the community level (Crombach & Elbert, 2014). Equally, appetitive aggression was the strongest predictor for violent behavior in refugee minors living in Europe (Mueller-Bamouh, Ruf-Leuschner, Dohrmann, Schauer, & Elbert, 2016). Exposure to familial violence but not exposure to organized violence had an additional impact in this study. The relationship between childhood familial violence and appetitive aggression remains hitherto unclear, even though there are early indications that they might be connected, in combination with self-committed violence later in life (Nandi et al., 2015).

The present study

During the Burundian civil war, which escalated in 1993 and lasted more than a decade, hundreds of thousands of civilians and combatants lost their lives (Uvin, 2009). Since the end of the civil war in 2006, a large number of veteran Burundian soldiers have been deployed to Somalia as part of the African Mission (AMISOM). In the present study, we aimed to predict violent behavior in Burundian soldiers who had returned from foreign deployment, living in a country still overshadowed by its recent war history.

We separately considered three contexts of violence: violence against children, intimate partner violence and violence against community members outside the core family. Based on previous research, we hypothesized that a history of childhood familial violence and war trauma exposure, the severity of PTSD and depression symptoms as well as appetitive aggression, are potential predictors for self-perpetrated violence. We aimed to disentangle the independent contributions and pathways of the predictors for violent behavior in all three contexts and to clarify the relative importance of the single predictors for each of the contexts. We were especially interested in whether the soldiers' own childhood experiences of familial violence independently predict violent behavior in war-affected soldiers, whereby we expected it to be particularly important in predicting violence against the children. PTSD symptom severity was expected to predict violence in all contexts, whereas appetitive aggression was expected to play a crucial role in predicting violence at the community level. War trauma exposure and depression symptom severity might additionally be associated with violence in all three contexts.

6.3 Method

6.3.1 Participants

We obtained data from 491 male Burundian soldiers 9 to 14 months after they had returned from deployment in Somalia. The mean duration of the deployment was 13 months; only four soldiers stayed less than 9 months in Somalia. On average, the soldiers were 35.64 years old (*SD* = 4.76) and they had attended school for 6.17 years (*SD* = 2.25). Almost 88% were married and they had on average two children. For the analyses, only participants that were married and had at least one child were included (*N* = 381).

6.3.2 Procedure

The ethical committees (IRBs) of the University of Konstanz, Germany and of the University Lumière of Bujumbura, Burundi approved this study. Participation was voluntary and participants had to sign an informed consent prior to the interview. If the participants were illiterate, oral informed consents were collected. With respect to the special vulnerability of the population, anonymity and confidentiality were ensured through the electronic coding and storage of the data, which fulfilled the highest and most secure data encryption standards (Schobel et al., 2014). Psychologists and advanced students of clinical psychology from the University Lumière of Bujumbura, Burundi conducted the interviews in Kirundi, permanently supervised by clinical psychologists from the University of Konstanz, Germany. Before the application in the interview, all questionnaires had been translated into Kirundi using back and forth translations and were intensively discussed with local experts to guarantee a precise interpretation. Interviews were conducted at military camps in the region of Bujumbura and lasted on average two hours. The soldiers received no payment for their participation. If necessary, financial compensation for transport costs was paid.

6.3.3 Measures

All instruments were applied as a semi-structured interview.

Childhood familial violence. Exposure to familial violence during childhood was assessed using a 30-item checklist (following Catani et al., 2009). The checklist included physical, psychological and sexual violence as well as neglect and witnessed violence. For each item, participants were asked if they had experienced the event at any time up until the age of 18. As an estimate of the exposure to childhood familial violence, items were dichotomously coded yes (1) or no (0) and summed.

War trauma exposure. Lifetime exposure to different types of traumatic war-related events was assessed using a checklist of 39 events, which included events from the checklist of the Posttraumatic Stress Diagnostic Scale (Foa et al., 1997) and was adapted to the Burundian cultural context. Additionally, we included items of the Deployment Risk and Resilience Inventory-2 (DRRI-2), a set of 17 individual scales that assess key deployment-related risk and resilience factors with demonstrated implications for Veterans' post-deployment health (Vogt et al., 2013). We chose items of the combat experiences and post-battle experiences scale that fitted the context of Burundian soldiers. Items were dichotomously coded yes (1) or no (0) and summed.

PTSD symptom severity. Symptoms of PTSD were investigated using the PTSD symptom scale- Interview (PSS-I; Foa et al., 1993). The PSS-I has proven its validity in comparable East-African samples (Ertl et al., 2010). The items of the original instrument correspond to the 17 symptoms of PTSD according to the DSM-IV. To measure PTSD symptom severity based on the DSM-V, the new symptoms that did not overlap with the DSM-IV items were integrated into the PSS-I. The additional items were created by using phrasing similar to that found in the criteria. The assessment of PTSD symptom severity refers to the last two weeks and is based on a 4-point Likert scale ranging from 0 (not at all) to 3 (five or more times per week/almost always). A sum score of all symptoms based on DSM-V was computed, with a possible range from 0 to 60. Correlation between PTSD symptom severity based on DSM-IV and DSM-V was $\rho = .99$. Cronbach's α for the scale in the present study was .93.

Depression symptom severity. Symptoms of depression were assessed with the PHQ-9, the depression module of the Patient Health Questionnaire (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 refers to depression symptoms experienced in the last two weeks and scores each of the nine DSM-IV depression criteria on a 4-point Likert scale as 0 (not at all) to 3 (nearly every day). For depression symptom severity, items were summed, with a possible range from 0 to 27. The PHQ-9 comes with very good validity and internal consistency (Cronbach's *α* = .89; Kroenke, et al., 2001). In the present study Cronbach's α was .88.

Appetitive aggression. To assess appetitive violence experiences we used the Appetitive Aggression Scale (AAS), a semi-structured interview that has also been used and validated in other comparable populations, summing to more than 1600 participants (Weierstall & Elbert, 2011). The AAS consists of 15 items (e. g., ''Is it exciting for you if you make an opponent really suffer?'' or ''Once fighting has started do you get carried away by the violence?''). Ratings are based on a 5-point Likert scale ranging from 0 (''I totally disagree'') to 4 (''I totally agree''). As a measure for the degree of appetitive aggression, items were summed, with a possible range from 0 to 60. In the validation study, the AAS score showed a Cronbach's α of 0.85 and further analyses of its validity revealed that the AAS measures a distinct construct of human aggression (Weierstall & Elbert, 2011). In the present study Cronbach's α for the scale was .79.

Domestic and community violence. Violence on the family and community level after returning home from deployment was assessed using the checklist for childhood familial violence but from the perpetrator's perspective. The checklist consisted largely of the same items. However, two were deleted and three other items added as an adaption to the perpetrator's perspective, resulting in 31 items. Assessment of the frequency of every type of violent act was based on a 4-point Likert scale ranging from 0 (not at all) to 3 (five or more times per week) referring to the periods the soldiers had spent in their communities of origin since their return from the deployment. To distinguish between the contexts of perpetrated violence, every item was evaluated separately for *violence against children*, *intimate partner violence* and *community violence*. As a measure for the level of perpetrated violence, items for each of the three contexts were summed, with a possible range from 0 to 93.

6.3.4 Data Analysis

Statistical analyses were performed using SPSS 21. Bivariate correlations between measures were assessed using Spearman's rho. To predict domestic and community violence in a single model and to investigate the independent contributions and pathways of the predictors, a bootstrapped path analysis was conducted using AMOS 21. We built the path model based on theoretical assumptions and excluded insignificant paths in a stepwise manner. The final model was selected according to Bayesian Information Criterion (BIC; Schwarz, 1978) and parsimonious fit indices. All analyses used a two-tailed $\alpha = .05$.

6.4 Results

6.4.1 Level and inter-correlations of violence and trauma exposure, mental health, and perpetrated violence

Only 5 of the 381 soldiers (1.3%) stated to have experienced no familial violence at all in their own childhood. The prevalence of exposure to different acts of childhood familial violence is displayed in Figure 6.1.

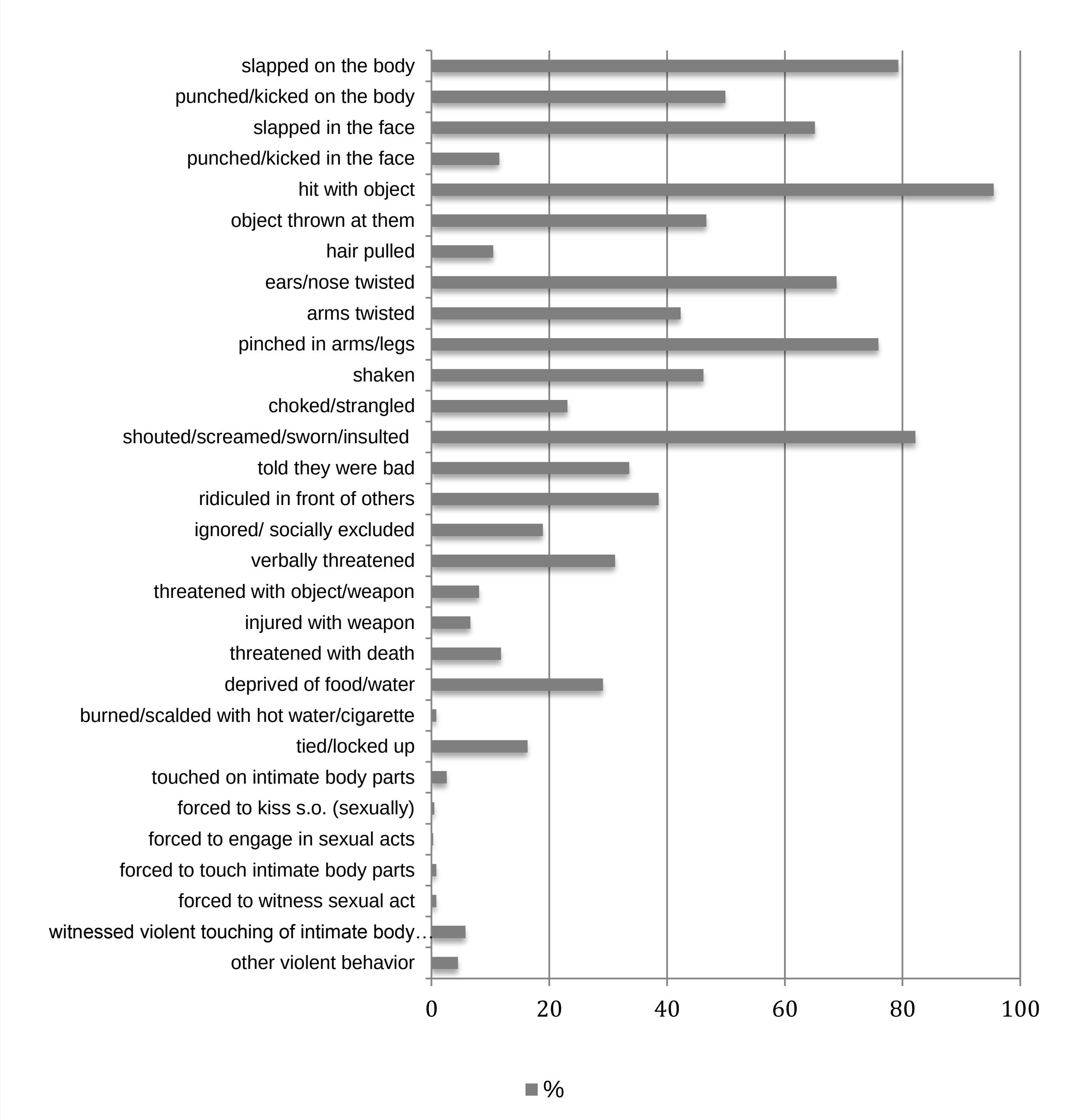

Figure 6.1

Prevalence (percentage) of exposure to different acts of childhood familial violence in Burundian soldiers

All participants were exposed to at least one traumatizing war event. The degree of PTSD and depression symptom severity was low, whereas the extent of appetitive aggression was medium. Sixty percent of the soldiers reported at least one violent act against their children, 36% reported at least one violent act against their intimate partner and 40% reported at least one violent act against a community member outside the core family within the last months. Detailed descriptive statistics and inter-correlations of all relevant variables are displayed in Table 6.1.

Table 6.1

Descriptive statistics and intercorrelations (spearman's Rho) of all relevant variables

Variable	*M* (*SD*) [range]	*Mdn*	1.	2.	3.	4.	5.	6.	7.	8.
1. Childhood familial violence	9.09 (4.63) [0-24]	9	1							
2. War trauma exposure	22.13 (6.82) [1-37]	23	.24***	1						
3. PTSD symptom severity	2.75 (5.60) [0-36]	0	.28***	.18**	1					
4. Depression symptom severity	2.06 (3.37) [0-21]	0	.41***	.21***	.43***	1				
5. Appetitive aggression	13.87 (7.83) [0-45]	14	.39***	.19***	.16**	.14**	1			
6. Violence against children	1.06 (2.07) [0-15]	1	.22***	.01	.16**	.11*	.08	1		
7. Intimate partner violence	0.69 (1.26) [0-9]	0	.22***	<-.01	.29***	.22***	.08	.28***	1	
8. Community violence	1.18 (2.17) [0-13]	0	.34***	.22***	.34***	.31***	.37***	.17**	.23***	1

Note. *M*= mean, *SD* = standard deviation, *Mdn* = median, *p < .05 **p <.01 ***p <.001.

6.4.2 Predictors and pathways for violence against children, intimate partner violence and community violence

Results of the path model are displayed in Figure 6.2. The final model fitted the data according to the following criteria for a good-fitting model: $\chi 2$ (10) = 12.73, p = .24, goodness-of-fit index (GFI): .99, comparative fit index (CFI) = .99, root-mean-square error of approximation (RMSEA) = .03.

The selected model revealed childhood familial violence and war trauma exposure as significant predictors for *PTSD symptom severity* (10% variance explanation) and *appetitive aggression* (16% variance explanation). *Depression symptom severity* was significantly predicted by PTSD symptom severity and additionally by childhood familial violence, but not directly by war trauma exposure (26% variance explanation).

Violence against children was significantly predicted by self-experienced childhood familial violence. The model revealed no other significant predictor for violence against children.

Intimate partner violence was significantly predicted by self-experienced childhood familial violence but to a greater extent by depression symptom severity. Neither war trauma exposure, nor PTSD symptom severity nor appetitive aggression showed an additional direct effect.

Community violence was significantly predicted by childhood familial violence, PTSD symptom severity and appetitive aggression. Depression symptom severity showed only a marginally significant effect, but model selection criteria had indicated that the predictive path should stay in the model. The model explained 6% of the variance of violence against children and intimate partner violence, respectively, and 19% of the variance of community violence.

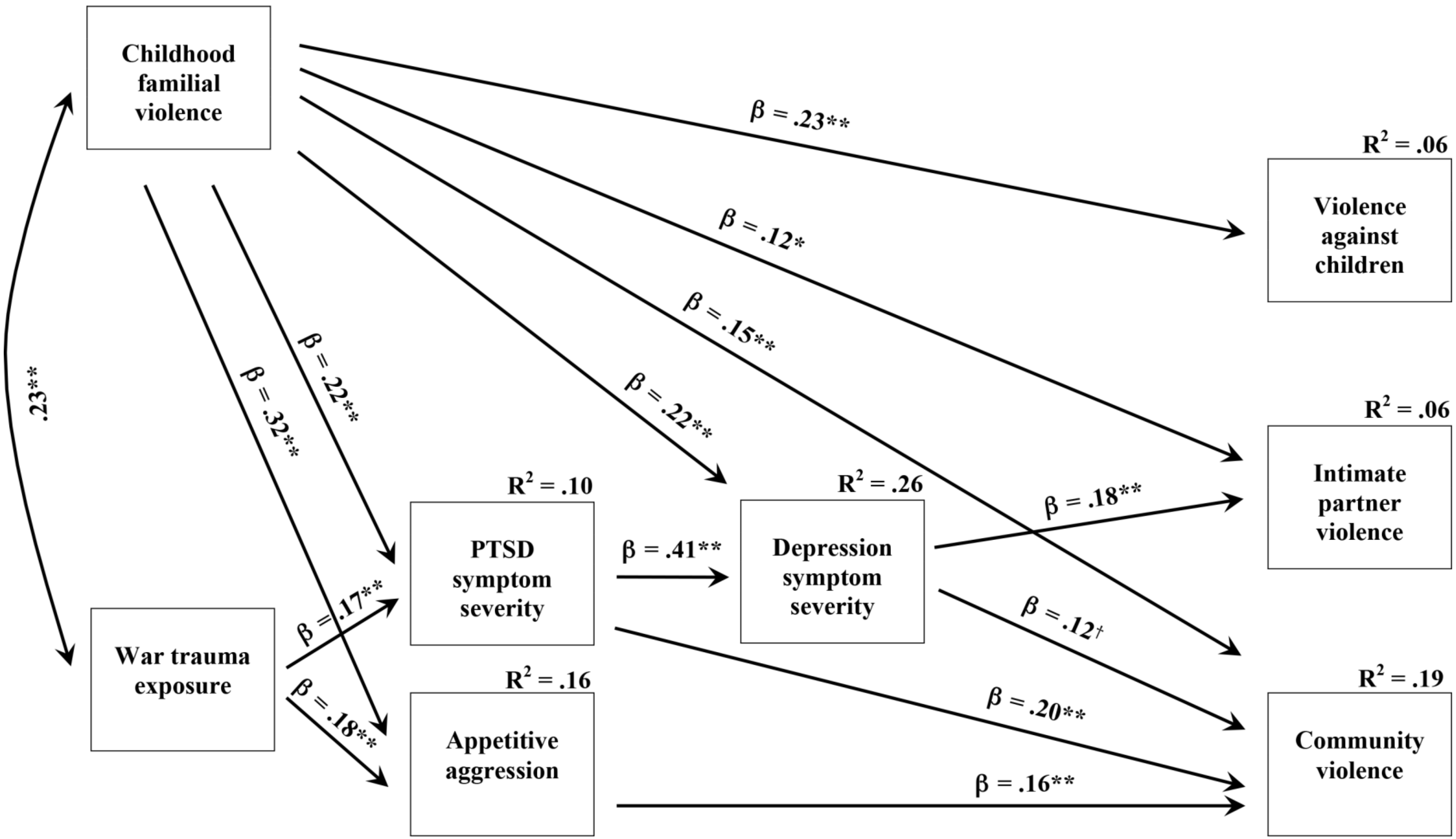

Figure 6.2 *Path-analytic model predicting domestic and community violence*

Note. β = standardized regression coefficient. **p* < .05 ***p* <.01 ****p* <.001 †*p* < .10 (marginally significant).

6.5 Discussion

The present study examined domestic and community violence in Burundian soldiers who had returned from foreign deployment. Specifically, we investigated pathways of distal and proximal predictors for violent behavior in the different contexts as well as their interrelations. For the prediction of violence perpetration, we not only considered mental-ill health but also focused on the role of childhood familial violence and appetitive aggression, factors that have been neglected in previous research.

Results of the study revealed that exposure to war trauma as well as to childhood familial violence was highly prevalent amongst Burundian soldiers. Almost 99% of the soldiers reported familial violence at some point during their own childhood. Being hit with an object, a typical child-rearing practice in Burundi (Sommers, 2013), was reported by 96% of the soldiers, but also more severe forms of physical abuse were prevalent, for instance being slapped in the face (65%) or being choked/strangled (23%). Reports of verbal abuse were frequent too, for instance being told they were bad (34%) or being threatened with death (12%). Despite the high trauma and violence load, the average level of PTSD and depression symptom severity was low, indicating that the investigated sample of active soldiers represented a relatively resilient group compared to, for instance, demobilized Burundian combatants (Nandi et al., 2015). Appetitive aggression was widespread, a factor that has been identified as an adaptation of survival within violent contexts helping individuals to remain functional by strengthening their resilience against the development of PTSD symptoms (Weierstall et al., 2011). In line with previous research with war-affected soldiers (Dohrenwend et al., 2013; Nandi et al., 2015), exposure to traumatic stressors as well as the extent of childhood familial violence were independently associated with PTSD symptom severity. Depression symptom severity appeared as a consequence of PTSD symptom severity, however it was additionally predicted by childhood familial violence. Appetitive aggression was not only linked to war trauma exposure but was also directly linked to childhood familial violence, suggesting that not only violence perpetration but also violence victimization early in life and within the family can increase appetitive aggression later in life.

The following discussion will treat violence in the three different contexts (violence against children; intimate partner violence; and community violence) separately for the sake of clarity, before drawing more general conclusions.

6.5.1 Violence against children

As expected, and in line with previous research (Rieder et al., 2013; Widom et al., 2015), our results showed once more that a person’s own history of childhood familial violence predicts self-committed violence against children. A reason for this relation could be mental health issues (for review see Catani, 2010). The zero-order correlation between the mental health symptoms and violence against children also supported this thesis. However, in the model as a whole, the mental health symptoms were out-weighted by childhood experiences themselves. Possibly, childhood maltreatment causes profound changes within the neurobiological stress response system that contribute to an increased risk for both, violent behavior and mental health symptoms (McCrory, De Brito, & Viding, 2010). Factors explaining why childhood experiences are reenacted upon one’s own children independently of mental health issues could be model learning (Bandura, 1977) or sociocultural conditions (Catani, 2010). In Burundi, many parents see physical violence as an essential child-rearing method that is thought not to affect their children. However, while severe harm is often not intended, Burundian children also describe fierce violence by their parents, which made them fear for their lives (Sommers, 2013).

6.5.2 Intimate partner violence

Concordant with previous studies (Crombach & Bambonye, 2015; Rosen et al., 2003), self-experienced childhood familial violence was also directly linked to intimate partner violence. However, in contrast to violence against children, here mental health variables of PTSD symptom severity and Depression symptoms also played complex partial mediating roles. If we begin with the zero-order correlations, intimate partner violence was most strongly associated with PTSD symptom severity, in keeping with previous research (e.g., Teten et al., 2010). and to a lesser extent with depression symptom severity and childhood familial violence. In the path model, depression symptom severity fully mediated PTSD symptoms, and partially mediated childhood familial violence.

Male depression is typically characterized by aggressiveness and hostility. Moreover, depression is accompanied by low self-esteem, frustration, helplessness, and affects sexual performance. Intimate partner violence could therefore additionally be understood as a mean of re-asserting their threatened manhood (Crombach & Bambonyé, 2015; Weaver, Vandello, Bosson, & Burnaford, 2010). Using such a coping mechanism might be reinforced by traditional ideas about masculinity held by Burundian men generally and soldiers in particular within the Burundian society. Daily life stressors such as changes of living arrangements and family conflicts, which can arise after returning from their one-year deployment, might trigger depression symptoms and herewith associated frustration within the soldiers. They may feel a strong need to re-establish their role as the head of the family. Since intimate partner violence perpetration and victimization are highly correlated and both associated with increases in depressive symptoms (Johnson, Giordano, Longmore, & Manning, 2014), we cannot exclude the possibility that violence perpetration is mutual and symptoms of depression have been exacerbated by a high conflict relationship.

6.5.3 Community violence

Childhood familial violence showed a direct independent effect relating to community violence as well as indirectly affecting community violence via PTSD and depression symptoms, and appetitive aggression. In line with previous research (MacManus et al., 2013; Stappenbeck et al., 2014), PTSD symptom severity mainly predicted violence against community members, whilst depression symptom severity had an additional but only marginal independent effect. War trauma exposure showed high zero-order correlations with community violence, which was not present in either domestic violence or violence against children. In the path model, this direct predictor disappears, suggesting an indirect path of past war-related trauma over PTSD symptom severity for community violence.

In line with past research (Crombach et al., 2014; Mueller-Bamouh et al., 2015), appetitive aggression was a further important factor for the prediction of community violence in the present study. It was the strongest zero-order correlate of community violence, and still showed a significant direct effect in the path model. Thus, a pleasure-driven component seems to be crucial for violent behavior at the community level, in actively seeking the opportunity for violence and acting out more violently and crueler as a feeling of threat or defense would justify.

Besides childhood familial violence, symptoms of PTSD and appetitive aggression independently contributed to the emergence of community violence in soldiers. Possibly, conflict situations at a community level outside the domestic setting resemble past war experiences and trigger both, survival mechanisms such as appetitive aggression and past trauma memories through common salient cues. Particularly within veteran Burundian soldiers who also fought in the civil war, the community environment might trigger war-related memories. Symptoms of re-experience could therefore elicit violent behavior. Furthermore, symptoms of hyperarousal are associated with over-alertness and vigilance, lowering the threshold for detecting threat and thereby increasing the probability of perceiving a situation as threatening and reacting violently. The fact that PTSD symptoms directly predicted community violence in our path model, but not domestic violence, would also be in line with this explanation.

6.5.4 Limitations

The relative importance of predictors differed depending on the context of the violence. This could also be due to varying types of violent acts perpetrated in the three contexts. Differences in the types of violence as a function of the setting and circumstances deserve a closer look in future research, as does the investigation of potential moderation effects.

The variance explained by the model was low for violence against children and intimate partner violence, indicating that other factors might be of additional importance, such as behavioral problems or trauma exposure in the children (Saile et al., 2014) and the partners' own mental health symptoms (Saile et al., 2013) or a history of violence in the partners' family of origin (Gage, 2005). Future research in the domain of domestic violence should therefore also include the children's and partners' perspective. Furthermore, including different sources of reporting is essential to validate the self-reported violence perpetration and eliminate potential report bias. Finally, in the present study, the underreporting of violence perpetration cannot be excluded, especially for particular types of violent acts (e. g., sexual violence against children).

6.6 Conclusion

Data offer a nuanced picture of different motivations for violence. Violence against children was primarily a function of one's own experiences of familial violence as a child; intimate partner violence was possibly motivated by depression; and community violence was triggered by PTSD symptomatology and appetitive aggression. What is remarkable is that all of these factors were underpinned by early experiences of childhood familial violence. This study thus illuminates the prominent role of childhood adversities, which is often forgotten in the context of the military and war: Firstly, as a factor that can impair mental health and heighten the risk for appetitive aggression, but furthermore as an independent contributor to violence perpetration over all contexts. Hence, even if exposure to familial violence experienced in childhood had no impact on mental health or appetitive aggression, it nevertheless contributes to the emergence of violence later in life. This is also true in societies where violent behavior against children is common. The inter-generational transmission of violence thus appears to be another factor, apart from PTSD, depression and appetitive aggression, maintaining the instability of conflict societies. The findings of the present study suggest that all these factors have to be addressed in any interventions that aim to resolve the recurrent and escalating violence in crisis regions.

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7 General discussion

The present thesis investigated the relation of childhood familial and war violence exposure to PTSD and appetitive aggression and their subsequent impact on self-perpetrated violence in various contexts in Burundian ex-combatants and soldiers.

The consequences of war trauma on mental health in soldiers and combatants have been thoroughly examined in past research. War-zone exposure and armed group affiliation can cause severe and chronic symptoms of PTSD (Gray, Bolton, & Litz, 2004; Pfeiffer & Elbert, 2011; Polusny et al., 2011). At the same time, appetitive aggression has been detected as a widespread phenomenon amongst combatants of various war settings (Hecker, et al., 2012; Köbach et al., 2014; Weierstall et al., 2013). PTSD and appetitive aggression have both been linked to aggressive behavior in past research. However, studies investigating the effect of PTSD on violent behavior are mainly confined to criminal offences and intimate partner violence in veterans having returned from deployment (Jakupcak et al., 2007; MacManus et al., 2012; Orcutt et al., 2003). Appetitive aggression was found to be related to war atrocities, particularly in civil wars and inner-country conflicts (Hecker, et al., 2012; Köbach et al., 2014) and predicted violent behavior in Burundian street children (Crombach & Elbert, 2014).

Childhood maltreatment and familial violence are often neglected in research with war-affected populations, although serious implications for maltreated children have been convincingly demonstrated in forms of mental ill-health (Catani et al., 2008; Margolin & Gordis, 2000), aggression and conduct problems (Connor, Doerfler, Volungis, Steingard, & Melloni, 2003; Hecker et al., 2014; Shields & Cicchetti, 1998). The effects can be seen throughout the lifespan. Child abuse is considered as a vulnerability factor for the development of PTSD in soldiers affected by combat (Dohrenwend et al., 2013) and is associated with violent behavior in adulthood (Widom, 2015).

The present thesis focused on the interplay between childhood familial and war violence, PTSD, appetitive aggression and self-perpetrated violence. Predictors of PTSD and appetitive aggression were examined, including the effect of childhood maltreatment. The influence of appetitive aggression on the development of PTSD symptoms was additionally explored. In turn, the thesis investigated the contribution of both PTSD symptoms as well as appetitive aggression for violent acts perpetrated during deployment. Finally, the independent contribution of childhood familial violence, mental health and appetitive aggression on domestic and community violence after returning from deployment were disentangled.

On the basis of the research questions outlined in section 1.5, the following sections will discuss the results derived from the presented articles.

7.1 Discussion of the results

7.1.1 Trauma exposure and violent perpetration as predictors for PTSD and appetitive aggression

The first article in this thesis revealed that ex-combatants as well as currently active soldiers reported a high prevalence of exposure and perpetration of violence. The extent of PTSD symptom severity, as well as appetitive aggression, was greater in the ex-combatants, who had also reported more traumatic exposure and violent perpetration. However, when controlling for predictors, ex-combatants presented with more severe PTSD symptoms, while appetitive aggression was more pronounced in currently active soldiers. The currently active soldiers, therefore, appear to represent a relatively resilient and functional group. At the same time, they seem to be more prone to developing an appetite for violence.

The first, second, third and fourth articles confirmed the „building-block-effect", demonstrating that the risk to develop PTSD symptoms cumulatively increases with the number of different types of experienced traumata (Neuner et al., 2004; Mollica, McInnes, Poole, & Tor, 1998). This result is furthermore in line with studies showing that war-zone and combat exposure in particular have been associated to PTSD symptomatology (e.g., Dohrendwend et al., 2006; Pietrzak, Whealin, Stotzer, Goldstein, & Southwick, 2011; Priebe et al., 2013). The fourth article also demonstrated an effect on all three DSM-IV clusters of PTSD.

PTSD symptom severity was not completely unrelated to self-committed violence in the second study. However, in the first, third and fourth articles, the relationship between PTSD symptom severity and self-committed violence did not reach significance. Findings of past research on the relation between committed violence and PTSD are contradictory: While killing in combat was associated with elevated levels of PTSD symptoms even after accounting for combat exposure in some studies (Maguen et al., 2010; Van Winkle & Safer, 2011), perpetrated violence only led to PTSD symptoms in forcibly recruited combatants, however not in combatants who voluntarily joined armed groups, as was demonstrated in a study with Congolese ex-combatants (Hecker et al., 2013).

Apparently, perpetrating violence can be processed as either traumatizing or appealing, depending on the circumstances and previous experiences. Studies that investigated the link between the perpetration of violence, such as killing another person, and traumatic potentiality did so by studying veterans hailing from industrialized nations experiencing long periods of uninterrupted peace as they returned home from deployment on foreign soil. The soldiers and veterans participating in these studies experienced combat as adults after having been raised during a time of peace. Combatants in conflict and post-conflict regions, on the other hand, often grew up faced with an environment shaped by organized violence. Indeed, a previous study found appetitive aggression to be elevated when combatants were recruited for participation in armed groups at the ages of 16 and 17, indicating sensitive periods for the development of appetitive aggression during adolescence (Köbach & Elbert, 2015).

The first, second and fourth articles demonstrated that appetitive aggression was best predicted by the sum of perpetrated violent acts. This finding is concordant with prior studies (Hecker et al., 2012; Schaal et al., 2014; Weierstall et al., 2011, Weierstall et al., 2012) and suggests a „building-block-effect" for appetitive aggression. Appetitive aggression, and thus the intrinsically motivated desire to torture or kill, is assumed to be an evolutionary disposition that enables individuals to adapt as much as possible to the necessity of killing. However, this disposition seems to be latent unless violent environments trigger its development (Elbert et al., 2010). In line with this idea, perpetrating violence reveals and intensifies the appetite for aggression, therefore representing a reciprocal relationship. The results of the first and second articles of this thesis are correlative and do not allow specific conclusions about the kind of relationship between the perpetration of violence and appetitive aggression. The longitudinal design of the fourth article, however, could confirm this assumption by showing that appetitive aggression is related to past committed violence, but at the same time predicts the number of violent acts exercised during deployment. The extent of committed violence in turn predicted the level of appetitive aggression immediately following deployment. This result reflects the vicious cycle of appetitive aggression.

In the first, second, and fourth articles, appetitive aggression was also related to traumatic experiences, albeit to a lesser degree. Appetitive aggression apparently also increases when surrounded by a dangerous environment, independently from self-committed violence, as an adaptive mechanism to cope with the experience of violence and atrocities (Crombach & Elbert, 2014; Weierstall, Haer, Banholzer, & Elbert, 2013). Appetitive aggression can help to regain a feeling of control and safety in an insecure, unpredictable environment.

7.1.2 Appetitive aggression and its relation to PTSD

As already mentioned in the previous section, violence can be processed as either traumatizing or appealing and exciting. Appetitive aggression is assumed to determine the perception and processing of violence. Therefore, in individuals with high levels of appetitive aggression, violent cues represent the elements of a hunting network rather than expanding the fear network and leading to symptoms of PTSD. Because of this negative relationship between appetitive aggression and PTSD symptom severity, it can be understood that appetitive aggression functions to counteract the development of PTSD. This buffering effect of appetitive aggression on PTSD has been shown in several previous studies. In the third article, we confirmed this hypothesis. In line with Hecker et al. (2013) and Weierstall et al., (2013), the negative correlation could only be found when excluding combatants with the highest PTSD symptom severity. The hunting and fear network might overlap when the trauma burden becomes too great, since violent situations, irrespective of having been experienced as victim or perpetrator, share many common cues. When the fear network is repeatedly activate and expanded, the protective effect of appetitive aggression begins to wane. The third article thus supports the idea of Elbert et al. (2010), who stated that appetitive aggression is no ultimate defense against PSTD.

7.1.3 Mental health and appetitive aggression as predictors for violent behavior

Previous studies that investigated the relation between violent offending and appetitive aggression were all correlative and could only suggest a reciprocal relationship (Hecker et al., 2012; Weierstall et al., 2011) As previously discussed, the longitudinal study described in the fourth article revealed that appetitive aggression predicts committed violence during deployment. PTSD symptoms as well were predictive for violent behavior, however only symptoms out of the hyperarousal cluster. Past research with veterans investigating the specific effect of hyperarousal symptoms support this result (MacManus et al., 2013;

Savarese et al., 2001; Taft et al., 2007). Both PTSD symptoms and appetitive aggression, and thus reactive and proactive motivations, prospectively predicted violent behavior.

Moreover the fourth article revealed the importance of unit support. Consistent with previous research (Pietrzak et al., 2010), PTSD symptom severity was weakened by unit support. Appetitive aggression, however, was enhanced. Hence, social group factors seem to influence the cycle of violence in different ways. Unit support might be a crucial factor that reflects social inclusion with comrades and thus helps to cope with mental health symptoms. On the other hand, unit support involves the recognition by comrades and military leaders and might reflect the backing of the unit when acting violently in combat. As a result, an increased appetite for violence might be associated with social status in the group.

In the fifth article, the relevance of PTSD symptoms and appetitive aggression was also demonstrated for violence perpetrated within the community after the deployment. Here again, PTSD and appetitive aggression predicted, independently from one another, violent behavior. Exposure to war trauma was indirectly connected to violent behavior through PTSD and appetitive aggression. Therefore, PTSD and appetitive aggression are crucial for perpetrated violence during but also after deployment. It is conceivable that soldiers having returned from deployment return smoothly to the „aggressor mode" (Elbert et al., 2010) or „soldier mode" (Nandi, Weierstall, Huth, Knecht, & Elbert, 2013), especially when in environments resembling war and combat situations that contain similar cues. Since Burundi was the scene of a civil war just a decade ago, switching back in the „aggressor mode" might be further fostered. This “soldier” or “aggressor” mode can also possibly be characterized by an appetite for aggression presenting alongside hyperarousal symptoms that do not reach the threshold for disease diagnosis.

Appetitive aggression did not predict intimate partner violence, and the influence of PTSD symptoms was fully mediated by symptoms of depression. Other studies that researched intimate partner violence have consistently pointed solely to the role of PTSD (Orcutt et al., 2003; Teten et al., 2010; Rodrigues, Funderburk, Keating, & Maisto, 2014). Only some studies included depression in their analyses and came to inconsistent conclusions as to whether depression symptoms pose an additional risk for violence against the partner (Rosen et al., 2003; Sherman et al., 2006; Taft et al., 2011). The mediator effect of depression indicates that, as opposed to community violence, comorbid depression might be more relevant than the underlying PTSD symptoms for violence against the intimate partner. The situation at home does not resemble past war experiences, hence the violent behavior could be triggered by factors such as low self-esteem and frustration instead of a perceived threat.

Interestingly, violence against one's own children was also connected with mental health problems, but the effect was outweighed by a history of self-experienced child abuse. This result indicates that exposure to maltreatment within the family, especially during development, might not be negligible in highly war-affected populations. In the next section, the unique effect of childhood maltreatment will be discussed.

7.1.4 The role of childhood maltreatment for mental health, appetitive aggression and violent behavior

In the first article, childhood maltreatment was considered as a further potential predictor for PTSD symptoms and appetitive aggression beyond traumatic war experiences and self-committed violence, respectively. Results revealed that childhood maltreatment was associated with PTSD symptom severity as an additionally independent predictor beyond trauma events and modulated the relationship between trauma events and PTSD symptoms furthermore. Exposure to both, childhood maltreatment and war trauma hence potentiated the risk of PTSD symptoms. This interaction effect suggests that childhood maltreatment does not only cumulatively contribute to the development of PTSD but also constitutes a vulnerability factor for PTSD when exposed to subsequent war trauma. This finding supports previous research with soldiers and veterans returning home from the deployment which consistently demonstrated that the risk for PTSD was heightened for soldiers with a history of child abuse and neglect (Dohrenwend et al., 2013; LeardMann et al., 2010; Van Voorhees et al., 2012; Zaidi & Foy, 1994). Indeed, child abuse exacerbated the effect of combat exposure (Iversen et al., 2007; Zaidi & Foy, 1994).

The heightened vulnerability for a psychopathological reaction after war trauma might be explained by the effect of adverse experiences during childhood on an individual's psychobiology. Childhood is a critical period of cognitive and emotional development as well as the development of the stress system (Elbert et al., 2006). Abuse during early development may entail a persistent sensitization of the central nervous system (Heim, & Nemeroff, 2001) and may alter overall arousal and the ability to react appropriately to stress (Margolin & Gordis, 2000). Hypervigilance may be functional during acute stress, but chronic stress exposure, as is generally the case for an abusive childhood, may lead to a dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, the major stress-regulating system. Consequently, symptoms of PTSD can develop in children, even though the criteria for a PTSD diagnosis might not (yet) be fulfilled (De Bellis & Putnam 1994; Emery & Laumann-Billings, 1998). Moreover, while war trauma during deployment was related to PTSD onset in a past study with soldiers, child abuse determined far-reaching persistence of symptoms (Dohrenwend et al., 2013). Another perspective of previous research focuses on the role of social support: Childhood maltreatment was directly predictive of decreased social support, and social support partially mediated the relationship between maltreatment and adult PTSD symptoms (Vranceanu, Hobfoll, & Johnson, 2007). In particular avoidance symptoms related to childhood trauma might compromise support through a social network in adulthood (Van Voorhees et al., 2012).

As the first study showed, the extent of childhood maltreatment and traumatic experiences is not unrelated to each other. The assumption of a "double-hit" (Iversen et al., 2007) presumes that childhood maltreatment not only directly predicts PTSD but also has an indirect effect, because being maltreated as child might enhance the probability for further traumatic experiences. In general, exposure to violence from different sources rarely occurs independently from one another. The stressful experience of violence within the family may corrupt coping with war and community violence, while the latter in turn may provoke family violence. Victimization in one setting thus increases the risk of victimization in another.

The fifth article revealed that familial violence experienced as a child was associated with PTSD symptom severity, here even stronger than war trauma. Moreover, childhood familial violence directly predicted symptoms of depression, while war trauma was only indirectly related to depression over PTSD symptoms. Another study with Ugandan child soldiers who reported a high load of war traumata accordingly demonstrated the impact of domestic violence exposure on symptoms of depression besides PTSD (Klasen et al., 2010). In particular uncontrollable punishment and parental rejection found in an abusive home environment may entail typical attributes of depression such as learned helplessness and negative self-perceptions alongside psychobiological alterations (Margolin & Gordis, 2000; Kazdin, Moser, Colbus, & Bell, 1985).

The first and the fifth articles additionally examined the relation of childhood maltreatment to appetitive aggression. In the first article, no main effect of childhood maltreatment on the development of appetitive aggression was found. However, childhood maltreatment modulated the relation between self-committed violence and appetitive aggression and thus might foster the development of an appealing and exciting perception when recurrently committing violence. In the fifth article, a direct positive relation between childhood familial violence and appetitive aggression could be found. In this article, however, moderation effects were not analyzed. Furthermore, compared to the study described in the first article, here violence in childhood were measured more in detail, covering several different types of physical, sexual, and psychological forms of maltreatment as well as neglect. The comparability of the results of the two articles is therefore limited. Nevertheless, both articles provide strong evidence that violence experienced during development by caregivers induce a higher risk for developing mental health symptoms on the one hand and appetitive aggression on the other. The powerful and exciting feelings that accompany the perpetration of violence may be an attempt to overcome the perceived helplessness while being abused by caregivers as a child when defense was not possible. The manner in which childhood maltreatment predisposes one for either mental health impairment or appetitive aggression might also depend on the age and circumstances of entry into an armed group.

Beyond the impact of childhood familial violence on mental health and appetitive aggression, the fifth article examined its impact on self-committed violence and distinguished here between different contexts. As already mentioned in section 7.1.3., familial violence experienced as a child was the only direct predictor of violence against one's own children amongst the soldiers, whereas neither mental health problems nor appetitive aggression had an additional effect. This result strongly supports the cycle of violence hypothesis (Widom et al., 2015) and is in line with other studies, revealing the relevance of the own experience of child abuse for abusive behavior against children even in war-affected populations (Crombach & Bambonye, 2015; Saile et al., 2014).

Childhood familial violence showed a direct effect beyond mental health and appetitive aggression for intimate partner violence as well as community violence. This finding is in line with a study showing that an abusive childhood was directly linked to intimate partner violence (Rosen et al., 2003). Past studies that examined correlates of violent behavior in soldiers and veterans against the partner and community members however almost exclusively focused on the role of PTSD.

In sum, maltreatment in childhood can lead to PTSD, depression and/or foster the development of appetitive aggression in soldiers. All these factors were found to be associated with later enactments of violence in different settings. Noteworthy however is the fact that also beyond mental health and appetitive aggression, soldiers with a history of child abuse are more prone to resort to violence. Neuroendocrine, structural, and functional changes in the brain development, also below a psychopathological level and an altered threat perception or information-processing biases could explain some parts of the link (McCrory et al., 2015; Teicher et al., 2003) while other factors might be socialization, model learning and aggressor identification (MacEwen, 1994) as well as cultural norms. In Burundi, large parts of the population see even severe physical punishment as an educational method (Sommers, 2013).

7.2 Implications for future research and practice

The present thesis supported the hypothesis of a buffering effect of appetitive aggression on PTSD, as it was demonstrated in several previous studies (Weierstall et al., 2011, 2012). Furthermore, the findings confirmed the presence of a threshold for the protective mechanism when the trauma burden gets too high, which was previously found in two studies (Hecker et al., 2013; Weierstall et al., 2013). Hitherto, the relationship between PTSD symptom severity and appetitive aggression has only been examined in correlation design. Longitudinal studies would be useful in order to better understand better the buffering mechanisms of appetitive aggression as well as the robustness of this relationship over time.

The thesis pointed out that both PTSD (and here especially hyperarousal) and appetitive aggression, i.e. defense and approach mechanisms, are relevant for the perpetration of violence in war and community settings. The dynamics between these two mechanisms should be investigated in more detail. Future research needs to separately assess different types of violence (reactive vs. appetitive) and consider the range of emotions that were present when the violence was enacted. This would also be essential when further investigating the question of the trauma potential of violence perpetration, since the thesis showed that soldiers and combatants perceive the active perpetration of violence not necessarily as traumatic and it should therefore not be strictly valued only as a traumatizing experience.

Results of the thesis demonstrated the link between appetitive aggression and violent offending in a correlative and longitudinal design. The idea of a reciprocal relationship where committing violence fosters appetitive aggression, which, in turn, enhances the risk for further violence, could be supported. However, the roots of the development of an appeal to violence remain still unclear. Results of the thesis provided evidence to suggest that familial violence during childhood fosters appetitive aggression. One could hypothesize that abuse during early development, also within the family, might set the course for aggressive behavior already during childhood. This process then fosters the development of appetitive aggression and further violence perpetration ranging to atrocities of the utmost cruelty.

Future studies need to investigate the link and pathways between childhood maltreatment and appetitive aggression also including the "side effects" of growing up in an adverse environment. Child abuse and neglect is accompanied by a lack of secure attachment relationship. This compromises the children's ability to acquire a number of essential developmental capacities which may protect against the development of antisocial behavior, inter alia self-control, emotion regulation, empathy, moral judgment, perspective-taking, social understanding, or interpersonal problem-solving (Cicchetti & Toth, 2005; Kerig & Becker, 2015).

The thesis highlighted furthermore the significant role of child abuse for mental health. However, this is still often overlooked in war-affected populations. Studies that investigate the sequelae of organized violence in post-conflict countries or the consequences of deployment and combat should also include prior experiences of violence, especially in early developmental stages. Moreover, the differential effect of diverse types of childhood maltreatment should be focused on, also including psychological abuse and neglect.

Childhood familial violence also predicted depression symptoms. Comorbidities of PTSD, in relation to adverse childhood experiences prior to war trauma, should be focused on, assuming that a history of child abuse induces a more complex pattern of psychopathological symptoms after subsequent traumatization.

The manner in which childhood maltreatment predisposes one to appetitive aggression and/or mental health impairment needs further investigation, particularly with consideration for sensitive periods, the different types of child abuse, and the following differential physical and psychological reactions. While past studies found psychological abuse, in particular, to be related to severe mental health impairment, physical abuse showed more consistent links with aggressive behavior than other types of abuse (Margolin & Gordis, 2000). However, different types of abuse often co-occur and the effect of combined abuse has yet to be disentangled.

The thesis revealed that familial violence experienced in childhood was associated with community violence, both directly and indirectly, through mental health and appetitive aggression. The direct link also became visible for violence against partners and children. Indeed, it was the only predictor of violence against one's own children, indicating a trans-generational mechanism that exceeds the effect of mental health problems. Further factors contributing to violence against children, such as model learning and cultural norms should also be considered in future research.

In sum, the present thesis provides strong evidence that several factors foster violent behavior in the post-conflict society. In interventions at the individual level aiming to prevent recurrent violence and restore stability, both PTSD and appetitive aggression should be addressed. FORNET (Narrative exposure therapy for forensic offender rehabilitation) is an approach dealing with both and could reveal promising initial results (Hecker, Hermenau, Crombach, & Elbert, 2015). Considering the prominent role of child abuse, however, it should also be addressed in interventions - first in dealing with one's personally experienced abuse and secondly in preventing abuse perpetrated against one's own children. Skills in positive parenting reducing the risk for child abuse victimization in the next generation would be necessary to hinder trans-generational violence. Supportive parenting was furthermore found to moderate the impact of mass trauma on internalizing behavior problems (Sriskandarajah, Neuner, & Catani, 2015) and of military violence exposure on aggressive behavior, also aggression-enjoyment, of children living in war-torn regions (Qouta et al., 2008). In light of these findings, prevention efforts addressing abusive parenting might help to break the cycle of violence from several angles.

7.3 Overall conclusions

Conflict regions are consistently overshadowed by violence even after the end of conflict. Soldiers were exposed to long-lasting periods of war in the past and continue to serve in new deployments. War trauma and resulting symptoms of PTSD may foster violent behavior. This recurrent violence provokes new trauma, and the cycle of violence continues to be maintained. The results of the present thesis underlined the role of appetitive aggression in buffering the development of PTSD on the one hand, and that, on the other hand, appetitive aggression is strongly related to violent behavior prior to, during and following deployment. Hence, appetitive aggression is another factor decisively fueling the cycle of violence.

The present thesis highlighted furthermore the role of abusive experiences during childhood. Childhood maltreatment appears to be of great significance for the development of PTSD symptoms and appetitive aggression in war-torn populations. A self-history of child abuse entails abusive parenting as well as intimate partner and community violence in the post-conflict society. The consequences of childhood maltreatment for the soldiers' psyches and behavior must not be overlooked, also considering the impact on the next generation.

Childhood maltreatment constitutes a crucial factor for maintaining the cycle of violence in post-conflict countries and constitutes an enduring burden on society. Parenting programs combined with targeted psychological intervention programs dealing with trauma and aggression are essential to curb violence in the long-term.

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