Caracterización Neuropsicológica y Socioafectiva e Intervención Socio-Cognitiva de Excombatientes en el Conflicto Armado Colombiano

UNIVERSIDAD DE GRANADA

Tesis Doctoral Realizada por:

Sandra Patricia Trujillo Orrego

Director:

Alberto Acosta Mesas

Universidad de Granada
Programa de Doctorado en Psicología
Departamento de Psicología Experimental
Mayo 2020

TESIS DOCTORAL

Caracterización Neuropsicológica y Socioafectiva e Intervención Socio-Cognitiva de Excombatientes en el Conflicto Armado Colombiano

UNIVERSIDAD DE GRANADA

Doctoranda

Sandra Patricia Trujillo Orrego

Director

Alberto Acosta Mesas

Universidad de Granada
Programa de Doctorado de Psicología
Departamento de Psicología Experimental
Mayo 2020

Editor: Universidad de Granada. Tesis Doctorales
Autor: Sandra Patricia Trujillo Orrego
ISBN: 978-84-1306-560-1
URI: http://hdl.handle.net/10481/63313

A Max, a mi familia y a los compañeros de camino.

Agradecimientos

Agradezco a Dios y a la vida la oportunidad de continuar creciendo como persona y como profesional, aprendiendo cada día un poco más para contribuir con mi granito de arena a e crear herramientas para transformar el espacio que habitamos en un lugar mejor para vivir en paz.

A Paco Muñoz, y a todos aquellos ya no están para ver esta tesis terminada pero que tenían la confianza de que este proyecto se concretaría y finalmente sería una realidad.

A mi familia y amigos por la paciencia infinita en la cercanía y en la distancia.

A mis maestros y compañeros en este viaje de conocimiento; Alberto, Juanma, Natalia, Juan, Mauricio, José, Juan Esteban, Mario, Stella, Mónica, Diana y Jorge que tomaron el riesgo de seguir adelante con este proyecto, aun cuando la marea estuvo en contra muchas veces.

A las personas que participaron en todo el proceso de evaluación y tratamiento que se presenta en esta tesis, sin ustedes no hubiera sido posible.

A la AUIP, la Universidad de Antioquia, la Universidad de Granada, Colciencias y la ARN por su apoyo y confianza para construir todo este proyecto doctoral.

Y a Granada que me acogió como una Granadina más durante mis estancias a lo largo de estos años.

A todos muchas gracias.

Índice

Lista de figuras y tablas

Capítulo 1

Capítulo 2

Capítulo 3

Capítulo 4

Capítulo 5

Abreviaturas

Abreviatura	Definición
ACC	Accuracy
ACL	Análisis de Clúster de Clases Latentes
ACR	Agencia Colombiana para la Reintegración
ANTI-V	Attentional Network Test-Interactions-Vigilance
ARN	Agencia para la Reincorporación y la Normalización
CRG	Conventional Intervention Group
EC	Empathic Concern
EEG	Electroencephalography
EHS	Escala de Habilidades Sociales
EP	Emotional Processing
EQ	Empathy Quotient
ESC	Entrenamiento Socio-Cognitivo
ERP´s	Event Related Potentials
ERT	Emotional Recognition Task
DDR	Desarme, Desmovilización y Reintegración
F	Fantasy
FARC	Fuerzas Armadas Revolucionarias de Colombia
GSSS	Global Social Skills Score

ICA	Independent Component Analysis
IFS	INECO Frontal Screening
IIR	Infinite Impulse Response
IMA	Inventario de Motivos para la Agresión
IQ	Intellectual Coefficient
IRI	Interpersonal Reactivity Index
ISCA	Inventario de Situaciones y Comportamientos Agresivos
LCCA	Latent Class Cluster Analysis
PANAS	Negative Affect Schedule
PD	Personal Distress
PRE´s	Potenciales Relacionados a Eventos
PT	Perspective Taking
PTSD	Posttraumatic Stress Disorder
RT	Response Time
RUV	Registro Único de Víctimas
SCB	Social Cognition and Behavior
SCST	Social Categorization Switching Task
SCT	Social Cognitive Training
SCTIG	Social Cognitive Training Intervention Group
SS	Social Skills

TDAH	Trastorno por Déficit de Atención con Hiperactividad
TEPT	Trastorno de Estrés Postraumático
TMT A-B	Trail Making Test A and B
ToM	Theory of Mind
TRE	Tarea de Reconocimiento Emocional
WCST	Wisconsin Card Sorting Test
WAIS	Wechsler Adult Intelligence Scale

Resumen

Las guerras y conflictos armados pueden afectar la cognición y el afecto, así como la respuesta de las personas en su contexto social. A veces, ocasionan alteraciones psicológicas y sociales en las personas y comunidades que experimentaron una exposición directa o indirecta a estos eventos. Colombia ha vivido por más de medio siglo un conflicto armado interno de baja intensidad y de larga duración, donde la población ha desarrollado diferentes mecanismos para afrontar y adaptarse a las demandas e interacciones que se presentan día a día en su contexto social.

Uno de los propósitos de esta tesis fue la construcción de un protocolo de evaluación neuropsicológica y socio-afectiva para caracterizar las posibles alteraciones en el funcionamiento cognitivo-afectivo (atención, control inhibitorio, empatía y reconocimiento emocional) de víctimas, excombatientes y población general con diferentes niveles de exposición al conflicto armado en Colombia. Los resultados de esta caracterización sirvieron para el diseño de un *Entrenamiento Socio-Cognitivo* (ESC) que se aplicó a un grupo de excombatientes del conflicto armado colombiano en proceso de reintegración a la vida civil.

Se utilizaron instrumentos neuropsicológicos como *Trail Making Test* (TMT) en la forma A y B, el *Wisconsin Card Sorting Test* (WCST) y el INECO *Frontal Screening* (IFS) y tareas computarizadas como la *Attentional Network Test-Interactions-Vigilance* (ANTI-V), la *Social Categorization Switching Task* (SCST), tareas de tipo *Go-No-Go* y *Tareas de Reconocimiento Emocional* (TRE) sincronizadas con electroencefalografía. También se evalúó el procesamiento afectivo con pruebas como el *Interpersonal Reactivity Index* (IRI), la *Escala de Habilidades Sociales* (EHS) y el test de lectura de ojos (RMIE por sus siglas en Inglés), la TRE y el protocolo de procesamiento afectivo, en el que se incluyeron medidas de agresión como el *Inventario de Motivos para la Agresión* (IMA) y el *Inventario de Situaciones y Comportamientos Agresivos*

(ISCA). Algunas de estas medidas se utilizaron en la evaluación de los efectos pre-post del ESC recibido por un grupo de excombatientes en proceso de reintegración que se comparó con otro grupo de excombatientes que continuó con su ruta de reintegración convencional.

De manera general, los resultados evidenciaron un patrón diferencial en el funcionamiento cognitivo-afectivo de personas expuestas directamente al conflicto armado (i.e. víctimas y excombatientes) en comparación con civiles con baja exposición. En el estudio presentado en el Capítulo 2, las víctimas presentaron un mejor desempeño en el tiempo de respuesta en tareas atencionales (ANTI-V) en comparación con excombatientes y controles. Por otra parte, el Análisis de Clúster de Clases Latentes (ACL) presentado en el Capítulo 3 identificó 3 agrupaciones basándose en las puntuaciones de las dimensiones cognitivas y afectivas de la empatía presentadas en el IRI, evidenciándose en los excombatientes, una respuesta empática orientada al uso de repertorios cognitivos para el reconocimiento de las emociones y la interacción con otras personas. El estudio del Capítulo 4 evidenció en los excombatientes un patrón de funcionamiento atípico en la amplitud del componente N170, estas diferencias no se observaron en el grupo de controles con baja exposición al conflicto armado. Lo anterior sugiere una asociación entre desempeño de la respuesta cognitivo-afectiva y el nivel de exposición experimentado por estas poblaciones a lo largo de más de medio siglo de conflicto armado en Colombia.

Esto permitió contar con información basada en la evidencia para la construcción del ESC descrito en el Capítulo 5, en donde se observó en los excombatientes que participaron en el ESC, una modulación en los mecanismos cognitivo-afectivos para el reconocimiento emocional de rostros, así como una reducción de la agresión como estrategia para interactuar con otras personas de su entorno social, laboral y familiar.

Se discuten estos hallazgos contrastando los resultados con estudios previos en el tema, señalando los aportes al estado del conocimiento y las implicaciones de los mismos para el desarrollo de estrategias orientadas a mejorar la atención de víctimas y excombatientes. Finalmente, se señalan las limitaciones y perspectivas futuras alrededor de los procesos de evaluación y tratamiento psicológico en poblaciones expuestas al conflicto armado en Colombia.

Abstract

Wars and armed conflicts may affect the cognitive and affective process and social response. Sometimes, causing psycho-social affectations in individuals and communities that experimented direct or indirect exposure to these events. Colombia has lived a low intensity-chronic armed conflict for more than 50 years where the population has developed different strategies for adaptations to everyday demands of their social contexts

For that, one of the purposes of this thesis was to evaluate and characterize, through neuropsychological and socio-affective protocols, possible alterations in the affective and cognitive functioning (Attention, inhibitory control, empathy, emotional recognition) of victims, ex-combatants and general population with different levels of armed conflict exposure in Colombia. The results of this characterization permitted us to design a Social Cognitive Training (SCT) that was tested in a group of ex-combatants in their reintegration route to civil life.

We used neuropsychological instruments such as Trail Making Test A-B form (TMT), The Wisconsin Card Sorting Test (WCST), and the INECO Frontal Screening (IFS) and computerized task as the Attentional Network Test-Interactions-Vigilance (ANTI-V), Social Categorization Switching Task (SCST), Go-No-Go task and Emotional Recognition Task (ERT) synchronized with electroencephalographic records. Chapters 2 and 3 also evaluated affective processing using instruments such as the Interpersonal Reactivity Index (IRI), Social Skills Scale, and the Reading Mind in the Eyes (RMIE). ERT, and the affective processing protocol also included measures to evaluate motives and situations of aggressive behavior such as the *Inventory of Motives for Aggression* (IMA in the Spanish version) and the *Inventory of Situations and Aggressive Behaviors* (ISCA in the Spanish version). Some of these measures were used to evaluate the pre-post effects

of SCT receive by a group of ex-combatants in their reintegration process compared with another group of ex-combatants that kept their conventional reintegration route.

Results evidenced a differential pattern in the cognitive-affective functioning of individuals directly exposed to armed conflict (i.e. victims, ex-combatants) compare to civilians with low exposure. The study presented in Chapter 2, revealed that victims had a better performance in the Response Time (RT) in attentional tasks (i.e. ANTI-V) compared with ex-combatants and controls. In addition, a Latent Class Cluster Analisis (LCA) presented in Chapter 3 identified 3 groups based on the punctuations of cognitive and affective dimensions of empathy presented in the IRI Scale. Results evidenced that ex-combatants used an empathic response based on cognitive strategies to recognize emotions and interact with other persons. Chapter 4 evidenced in ex-combatants an atypical pattern in the amplitude of N170 component, these differences were not observed in the group of low exposure controls. This suggests an association between the performance of cognitive-affective response and the level of exposure to armed conflict experimented by the Colombian population for more than 50 years.

This allowed us to have evidence-based information for the construction of SCT presented in Chapter 5. In this study, ex-combatants that participated in the SCT modified their cognitive-affective mechanism to recognize emotional faces, as well as a reduction of aggressive behavior as a strategy to respond to other persons in different contexts (i.e. family, work, social situations).

We discuss these findings, contrasting the information with previous studies, focusing on the contributions to the state of knowledge and their implications to create interventions and treatments that enhance the attention of victims and ex-combatants. Finally, the chapter presents limitations and future directions related to psychological evaluation and treatment in populations exposed to the armed conflict in Colombia.

CAPÍTULO 1

INTRODUCCIÓN Y OBJETIVOS

Por más de medio siglo, Colombia se ha expuesto a un conflicto armado interno de baja intensidad, larga duración y alta complejidad en la que el gobierno ha tenido dificultades para atender a la población afectada por combates armados (Gallo, 2013). Consecuencias de él han sido, entre otras, el elevado número de bajas en combate de los diferentes actores involucrados en los enfrentamientos armados, que han llevado a la población civil a sufrir hechos violentos, masacres, desapariciones de seres queridos y desplazamientos forzados. En esta línea, estudios recientes describen que las comunidades expuestas crónicamente al conflicto se enfrentan a un mayor riesgo de vivir en contextos de pobreza, desigualdad social, deprivación sociocultural, desescolarización, convivencia en entornos familiares disfuncionales y, en muchos casos, a ser reclutados forzosamente a edades tempranas, para integrar las filas de grupos armados ilegales y/o pandillas, comúnmente conocidos en Colombia como "combos" (Chaux, Molano, & Podlesky 2009; Ibáñez & Velez, 2008). A esto se suma, la corrupción administrativa y el tráfico de drogas, como fuente de financiación de las estructuras criminales, que han contribuido al fortalecimiento y mantenimiento del conflicto armado en el territorio colombiano (Rosero, 2013).

En la búsqueda de soluciones a esta problemática social, en el año 2003 se inició el proceso de desmovilización, desarme y reintegración de los grupos paramilitares que operaban en diferentes regiones de Colombia y que se habían convertido, en su momento, en una alternativa de protección remunerada para las comunidades que eran atacadas frecuentemente por grupos de guerrilla.

Otro paso importante, que se desarrolló en paralelo a los procesos de reintegración en el país, fue la aprobación de la ley 1448 de 2011 mediante la cual se protegió y se proporcionó apoyo a las víctimas del conflicto. En esta ley se considera víctima aquella persona, sus parientes en primer grado de consanguinidad o compañeros permanentes y/o comunidades, que sufrieron daños a nivel individual o colectivo por eventos acontecidos desde 1985 hasta la fecha, y que, relacionados al

conflicto armado, violen el derecho internacional humanitario, tales como secuestro, desaparición forzada, masacres y asesinatos. Así mismo, esta ley describe los mecanismos de atención, asistencia y reparación integral a las víctimas del conflicto armado interno en Colombia.

Por su parte, en 2016, la firma del acuerdo de paz con las Fuerzas Armadas Revolucionarias de Colombia (FARC) plantea un gran desafío para el gobierno colombiano, principalmente, en la construcción de estrategias que conduzcan al país a una transición del escenario de conflicto armado hacia una paz estable y duradera (Kaplan & Nussio, 2016; Rodríguez, 2016; Ugarriza, 2013). Para el cumplimiento de este objetivo, el estado colombiano asume, a través de los decretos 128 de 2003 y 2767 de 2003, la normativa internacional para el Desarme, Desmovilización y Reintegración (DDR). En ese sentido, el artículo 2 del Decreto 128 de 2003, define a una persona desmovilizada como "aquel que por decisión individual abandone voluntariamente sus actividades como miembro de organizaciones armadas al margen de la ley, esto es, grupos guerrilleros y grupos de autodefensa, y se entregue a las autoridades de la república". Para esto, la persona seguirá su proceso de reintegración a la vida civil incorporándose a la ruta de reintegración que ofrece la Agencia Colombiana para la Reintegración (ACR) de la Presidencia de la República de Colombia, la cual, a la fecha de elaboración de este documento, cambió su nombre por Agencia para la Reincorporación y Normalización (ARN).

Las cifras oficiales sobre el número de personas que son atendidas en los programas de atención a víctimas y excombatientes en proceso de reintegración del gobierno colombiano revelan, de acuerdo con el Registro Único de Víctimas (RUV[1]), que el número oficial de víctimas del conflicto armado en Colombia para el año 2019 asciende a 8.847.047 personas, de las cuales 2.049.639

[1] Información oficial consultada en el segundo semestre de 2019 en la página https://www.unidadvictimas.gov.co/es/registro-unico-de-victimas-ruv/37394

registran eventos asociados al conflicto armado en el departamento de Antioquia (el 23 % de la población afectada). Sin embargo, menos del 1% del total nacional recibe algún tipo de atención y reparación establecida por la ley.

Por otra parte, en el caso de los excombatientes, en los informes publicados para el año 2019 por la ARN[2] se han reportado 60443 excombatientes que se encuentran en su proceso de reintegración en todo el territorio nacional, de los cuales 12322 residen en el departamento de Antioquia y el área metropolitana de la ciudad de Medellín. En la actualidad se encuentran activos en su proceso de reintegración 860 personas. En la Figura 1 se hace una descripción de los hechos y fechas relevantes del conflicto armado, así como los porcentajes derivados de las cifras oficiales de víctimas y excombatientes para Colombia y el departamento de Antioquia (Ver Figura 1). Los recursos para el funcionamiento de este programa provienen principalmente de fondos propios del gobierno Colombiano y organismos de cooperación internacional.

[2] Información oficial consultada en el segundo semestre de 2019 en la página: http://www.reincorporacion.gov.co/es

Figura 1. Infografía donde se describe el contexto del conflicto armado colombiano. En esta se indican los porcentajes para víctimas y excombatientes en Colombia y el departamento de Antioquia (región donde se realiza el estudio).

Generalmente, los estudios realizados en el tema de reintegración en excombatientes colombianos se enfocan en análisis socio-económicos y políticos de este proceso (Theidon, 2007). A ellos se han sumado recientemente investigaciones que estudian la efectividad de los tratamientos psicológicos, principalmente desde una perspectiva psicosocial, orientados al mejoramiento de habilidades en los excombatientes para su adaptación al entorno social, familiar y laboral (Gutiérrez, 2008; Montoya, 2008). En esta línea, los autores proponen que hay diferencias en los perfiles psicosociales de excombatientes de grupos de guerrilla y paramilitares, donde factores como los entornos socio familiares disfuncionales, la edad temprana de reclutamiento, las motivaciones para su vinculación al grupo armado ilegal (p.ej. forzada, voluntaria) y los niveles altos de predisposición a la agresión pueden influir en la interpretación de la información de su entorno (p.ej. reconocimiento de claves sociales), sesgando negativamente la respuesta socio afectiva de estas personas y su adaptación a la vida civil.

Sin duda, la comprensión de las consecuencias del conflicto armado en Colombia, además de apoyarse en datos sociodemográficos y económicos, puede enriquecerse conociendo los perfiles psicológicos (i.e. disposicionales, cognitivos y comportamentales) de las personas afectadas negativamente por él de modo crónico. La manera en que procesan la información afectiva, los estilos de afrontamiento y las predisposiciones en la interacción social de víctimas y excombatientes expuestos al conflicto armado puede contribuir a la implementación y desarrollo de tratamientos psicológicos efectivos para el mejoramiento, entre otros, del funcionamiento afectivo y las habilidades sociales de víctimas y excombatientes que se encuentran en proceso de reintegración (García-Barrera et al., 2017; Tobón et al., 2015; Weierstall, Castellanos, Neuner, & Elbert, 2013).

Recientemente, se han publicado algunas investigaciones y propuestas psicoeducativas que pueden ubicarse en esta perspectiva. En ellas, se propone el desarrollo de intervenciones que tienen como objetivo la mejora de las habilidades sociales, así como el fortalecimiento de estrategias cognitivas y afectivas para el reconocimiento de emociones y el funcionamiento social asertivo. Un objetivo importante de ellas es la identificación adecuada de la información que proviene de su entorno y la respuesta apropiada al mismo para reducir la expresión de comportamientos violentos (Antai-Otong, 2016). En estas propuestas se facilitan los procesos de inclusión y reintegración del individuo a su entorno social e interpersonal, incorporando en este, un repertorio de comportamientos adaptativos y asertivos que favorezcan una interacción adecuada en sus diferentes contextos (social, educativo, familiar) (Ávila-Toscano, 2015; Meneses, Cardona, & Devia, 2010).

El objetivo final de los estudios incluidos en esta tesis es avanzar en el establecimiento de protocolos de evaluación y de entrenamiento psicológico que sean eficaces para facilitar los procesos de adaptación al contexto social en personas con diferentes niveles de exposición al conflicto armado en Colombia. Tanto la evaluación como la intervención se ocupan de aspectos cognitivos y afectivos. El protocolo de evaluación incluye pruebas neuropsicológicas y comportamentales. El entrenamiento socio-cognitivo --individual, de baja intensidad y corta duración-- tiene como objetivo el desarrollo de habilidades socio-afectivas básicas y complejas, orientadas al mejoramiento del reconocimiento emocional y de claves sociales necesarias para un adecuado proceso de reintegración social. En la evaluación se han incluido pruebas neuropsicológicas que se utilizan habitualmente con poblaciones similares como son el *Trail Making Test* (TMT) en la forma A y B, el *Wisconsin Card Sorting Test* (WCST) y el *INECO Frontal Screening* (IFS), así como tareas computarizadas para la evaluación de procesos cognitivos

y afectivos como la *Attentional Network Test for Interaction and Vigiliance* (ANTI-V), tareas de tipo *Go-No-Go, Social Categorization Switching Task* (SCST) y *Tareas de Reconocimiento Emocional* (TRE) de rostros y palabras. Adicionalmente, en algunas muestras se han obtenido medidas electrofisiológicas, además de las comportamentales. Así mismo, el *Entrenamiento Socio-Cognitivo* (ESC) utilizado con un grupo de excombatientes que se encuentran en proceso de reintegración a la vida civil, incluye fundamentalmente actividades para el aprendizaje y reconocimiento de emociones básicas, empatía y teoría de la mente, habilidades sociales y asertividad.

A partir de las medidas anteriores, se han explorado los patrones de funcionamiento cognitivo-afectivo de los grupos objeto de estudio en esta investigación (excombatientes, víctimas y controles no involucrados en el conflicto armado colombiano), y en excombatientes en ruta de reintegración, tras una intervención socio-cognitiva, se han evaluado los cambios en algunas de estas medidas previamente obtenidas.

Es importante mencionar que la información disponible sobre la asociación entre la exposición a un conflicto armado y el desempeño neuropsicológico en poblaciones no clínicas es limitada; por lo cual, este estudio se convierte en uno de los primeros referentes sobre el tema en Colombia. Se espera que esta información contribuya a la identificación de patrones de funcionamiento cognitivo en las poblaciones afectadas por esta problemática y brinde elementos para la creación e implementación de tratamientos psicológicos que favorezcan a estas poblaciones a adaptarse a las demandas de su entorno social. También, la intervención socio-cognitiva implementada debe considerarse una contribución novedosa en la difícil tarea de la reintegración social de los excombatientes.

A continuación, para contextualizar las investigaciones incluidas en la tesis, se delimitan algunos conceptos y temáticas psicológicas que han estado presentes en su desarrollo.

1.1. Evaluación Neuropsicológica

Desde su origen, uno de los principales objetivos de la evaluación neuropsicológica ha sido obtener información sobre procesos de atención, habilidades de planificación, toma de decisiones y reconocimiento de claves sociales (Strauss, Sherman, & Spreen, 2006; Lezak, Howieson, Loring, & Fischer, 2004). Con las baterías de evaluación clásicas, se han caracterizado alteraciones clínicas como, por ejemplo, los trastornos del estado de ánimo, de ansiedad, de estrés postraumático, así como alteraciones en el neurodesarrollo como autismo y Trastorno por Déficit de Atención con Hiperactividad (TDAH) (Aupperle, Melrose, Stein, & Paulus, 2011; Bourke et al., 2012; Elliott, 2003; Lezak et al., 2004; Polak, Witteveen, Reitsma & Olff, 2012; Porter, Bourke, & Gallagher, 2007).

Recientemente, con la aparición de nuevas tecnologías, se ha abierto la posibilidad de integrar tareas experimentales en la evaluación neuropsicológica, a través de dispositivos y desarrollos informáticos, que brindan información precisa y confiable del desempeño de aciertos y tiempos de respuesta de una persona en una tarea experimental, superando así algunas limitaciones de la evaluación clínica clásica y aportando un complemento para la caracterización de procesos cognitivos (i.e. atención). Un ejemplo de esto es el *Attention Networks Test for Interaction and Vigiliance* (ANTI-V; Roca, Castro, López-Ramón, & Lupiánez, 2011) el cual se encuentra disponible en internet (http://www.ugr.es/~anti/Download.html). Esta tarea permite obtener índices de funcionamiento de las redes atencionales de alerta, orientación y control, así como de

la vigilancia, a partir de medidas de tiempo de respuesta y de precisión. Además, junto con medidas psicofisiológicas y técnicas de neuroimagen, puede obtenerse información complementaria sobre la localización y la temporalidad de los patrones de activación cerebral relacionados con procesos cognitivos específicos como es el caso de la atención (Bauer et al., 2012). Estudios realizados en adultos jóvenes por Fan et al., (2009) y Posner, & Rothbart (2018), utilizando tareas computarizadas para la evaluación de redes las atencionales, informan sobre su interacción, aun cuando cada una de ellas es soportada y se modula a través de circuitos neuronales independientes (i.e. regiones fronto-parietales para la red de alerta, núcleo reticular del tálamo para la orientación, corteza cingulada anterior para el control ejecutivo).

También, otras tareas que informan de procesos de flexibilidad e inhibición (p.ej. el *WCST* y tareas comportamentales tipo *Go-No- Go*) (ver Figura 2), han mostrado su utilidad para caracterizar el procesamiento cognitivo en poblaciones con diagnósticos neurológicos y psicopatológicos confirmados, así como en miembros de grupos con alto riesgo, como es el caso de veteranos de guerra y excombatientes. Estos últimos, han sido evaluados desde inicios del siglo XX, con el propósito de valorar las consecuencias de orden cognitivo y adaptativo ocasionadas por lesiones neurológicas traumáticas, trastornos depresivos o de estrés postraumático (Brenner et al., 2010; Marx et al., 2009; Ryan, Zazeckis, French, & Harvey, 2006; Vasterling et al., 2012). Cabe anotar que este interés se mantiene en la actualidad, y además, se ha extendido desde la valoración de procesos y funciones cognitivas, al estudio de su rol en la percepción e interacción social (Tobón et al., 2016; Weierstall et al., 2013).

En ese sentido, los estudios presentados en esta tesis integran el uso de medidas neuropsicológicas clásicas, tareas computarizadas (p.ej. WCST, TMT A-B, ANTI-V) y medidas

de Potenciales Relacionados a Eventos (PRE´s) en poblaciones de víctimas, excombatientes y civiles expuestos al conflicto armado en Colombia.

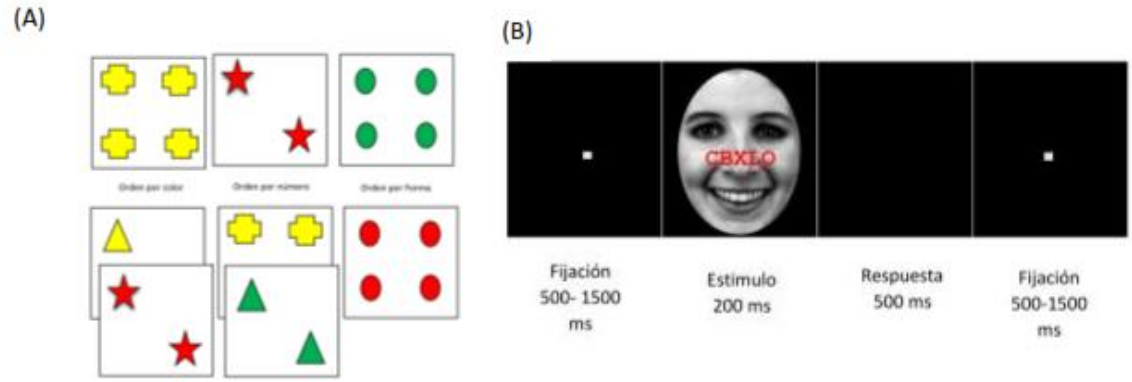


Figura 2. Ejemplos de las pruebas y tareas utilizadas para la evaluación de la población (i.e. víctimas, excombatientes y controles). a) Wisconsin Card Sorting Test (WCST) (Nelson, 1976), prueba neuropsicológica utilizada para la evaluación de la flexibilidad cognitiva. b) Presentación de la secuencia de la tarea Go-No-Go, en esta se presentan los parámetros del diseño de la tarea como intervalos de tiempo de presentación del estímulo y la respuesta

.

1.2. Procesamiento socio-afectivo

Como parte de la cognición social, el procesamiento afectivo está compuesto por elementos multidimensionales y dinámicos de orden neurobiológico que provienen de las experiencias previas del sujeto (Barnard, Duke, Byrne, & Davidson, 2007; Sebastian, Viding, Williams & Blakemore, 2010). Este juega un papel importante en la manera en que se percibe y reconoce la valencia emocional de las escenas cotidianas, se construyen las creencias y atribuciones relativamente permanentes sobre el contexto/personas y, en consecuencia, se determina el afrontamiento adaptativo a usar durante las relaciones interpersonales. Por otro lado, este procesamiento es central para comprender y gestionar la respuesta y regulación del comportamiento, pues media en la asignación de un valor (valencia) positivo o negativo, así como

el nivel de implicación personal (activación), alto o bajo, que se asigna a los contenidos de las situaciones que nos rodean en el día a día (Bernat, Cadwallader, Seo, Vizueta, & Patrick, 2011; Gerber et al., 2008).

En situaciones interpersonales, el procesamiento afectivo está relacionado con la percepción de intenciones en otros (teoría de la mente-ToM), la lectura de claves, roles y atributos sociales, así como la asignación de juicios de valor y el reconocimiento de normas de convivencia en favor del desarrollo de respuestas adecuadas a su contexto social (Adolphs, 2003; Brand et al., 2016; Duncan & Barrett, 2007; Kurtz & Richardson, 2011). Las dimensiones, afectiva y cognitiva, de la empatía forman parte de este procesamiento, en tanto se enfocan en la preocupación hacia otros, la toma de perspectiva y la comprensión de emociones e intenciones en sí mismos y en otras personas, en busca de anticipar/proyectar una respuesta social adaptativa (Davis, 1983; Decety & Jackson, 2006; Sebastian et al., 2012; Singer & Lamm, 2009).

El interés por el procesamiento socio-afectivo, tradicionalmente, ha estado presente en las neurociencias cognitivas y sociales cuando se estudian personas con trastorno del estado de ánimo y/o ansioso, individuos con diferentes lesiones cerebrales y, también, poblaciones no clínicas (Adolphs, 2003; Decety & Jackson, 2006; Krämer, Mohammadi, Doñamayor, Samii, & Münte, 2010; Lawrence et al., 2006). En estos estudios, se identificó que parte de ese procesamiento tiene un asiento anatómico-funcional en regiones cerebrales de la amígdala, la corteza sensorial y áreas ventromediales y mediales de la corteza prefrontal responsables de la integración de procesos automáticos y programados para la comprensión de pensamientos, intenciones y creencias de otras personas (Adolphs, 2009; Fazio, & Olson, 2003; Lieberman, 2007). En la Figura 3 se presentan los elementos que intervienen en el reconocimiento de estímulos externos, el procesamiento de los

mismos a nivel cognitivo-afectivo y la integración de estos para desencadenar una respuesta social adaptativa en el sujeto.

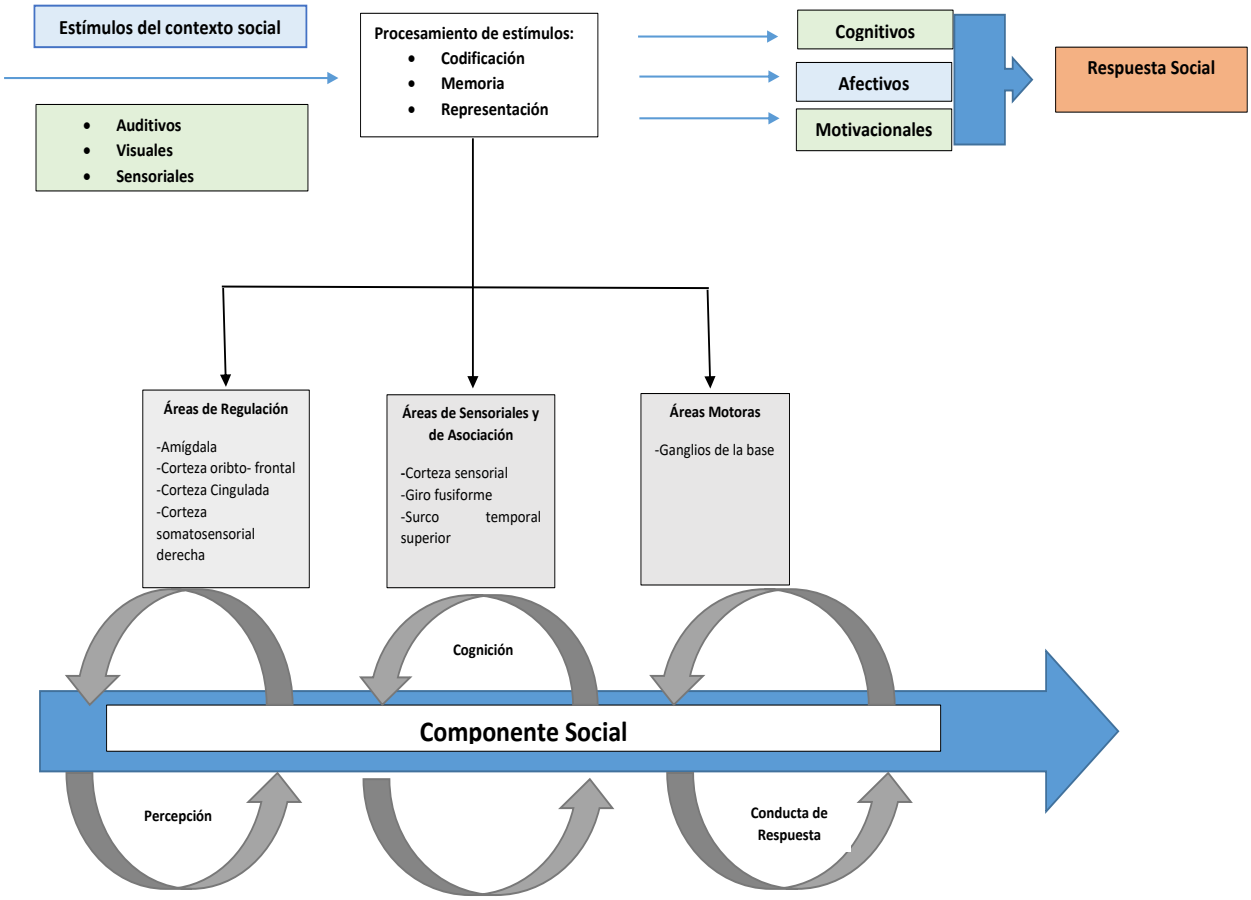


Figura 3. Ilustración de los elementos que intervienen en el procesamiento y desarrollo de la respuesta socio-afectiva del sujeto. En este modelo se presentan estímulos que provienen del contexto social, las principales vías cerebrales asociadas al procesamiento de los mismos y los posibles desenlaces (Cognitivos, afectivos y emocionales) que conducen a la respuesta social en el sujeto.

En los estudios citados previamente se han utilizado numerosas medidas para caracterizar el procesamiento afectivo, particularmente, algunas están relacionadas con rasgos y disposiciones

empáticas, como el *Interpersonal Reactivity Index* (IRI) o el *Empathy Quotient* (EQ), mientras otras informan del estado momentáneo de una persona, como es el caso del *Positive and Negative Affect Schedule* (PANAS;Robinson, & Bresin, 2014; Schwager, & Rothermund, 2013: Tobón et al., 2015; Yamada & Decety, 2009). Los autores, además, han combinado el uso de estas medidas y otras semejantes con la aplicación de tareas computarizadas sencillas de categorización de rostros y expresiones emocionales (Petroni et al., 2011; Rossion & Jacques, 2008), así como de reconocimiento/valoración emocional diseñadas a partir de inventarios de estímulos visuales y auditivos como los presentados en el *International Affective Picture System* (IAPS; Lang, Bradley, & Cuthbert, 1997) y el *International Affective Digitalized Sounds* (IADS;Bradley & Lang, 1999). Esta última estrategia, que incorpora tareas computarizadas, ha permitido evaluar el desempeño de un individuo, a partir de la valoración del porcentaje de aciertos y tiempos de respuesta que presentan para la identificación de la valencia (*positiva, negativa*) y el poder de activación (*arousal*) de estímulos visuales y auditivos, lo que permite caracterizar y clasificar los patrones de respuesta que pueden presentarse en estas personas. La combinación de estas medidas se ha utilizado previamente para el estudio de la influencia del procesamiento afectivo sobre la respuesta social, en personas adultas con esquizofrenia, muestras de estudiantes universitarios sin trastornos psicológicos y personas con psicopatía (Bate, Parris, Haslam & Kay, 2010; Shamay et al., 2007; Sundell, 2019).

En individuos crónicamente expuestos a escenarios de conflictos armados (i.e excombatientes y víctimas), se han establecido perfiles diferenciales en las dimensiones cognitivas y afectivas de la empatía, principalmente para el malestar personal y la preocupación hacia otras personas. Puntuaciones bajas en estas dimensiones implican, en algunos casos, la disminución de habilidades para el reconocimiento y valoración de situaciones sociales y afectivas (p.ej. trabajar en grupo,

contestar el teléfono, reconocer la tristeza o la alegría en una conversación) en ellos mismos y en otros. Esto afecta potencialmente sus acciones para reducir el estrés y para manifestar preocupación hacia otros. (Garcia-Barrera, Karr, Trujillo, Trujillo, & Pineda, 2017; Jolliffe & Farrington, 2004; Quintero-Zea et al., 2017; Pineda et al, 2013; Teten et al., 2008; Tobón et al., 2015).

Las tareas de valoración y reconocimiento emocional, además, se han sincronizado con el registro de potenciales relacionados a eventos (PRE´s) en diferentes poblaciones como estudiantes universitarios y pacientes con esquizofrenia, individuos con problemas de conducta disruptiva y pacientes con trastorno afectivo bipolar (Blau, Maurer, Tottenham & McCandliss, 2007; Ibanez et al., 2014; Rellecke, Palazova, Sommer, & Schacht, 2011, Vuilleumier & Pourtois, 2007). Particularmente, en estos estudios se estableció la modulación de la amplitud y del tiempo de respuesta electrofisiológico (latencia) de componentes tempranos como el N170. Este componente se ha relacionado con el reconocimiento de estímulos, principalmente de rostros, y el análisis de su valencia emocional, siendo considerado un precursor neural de la construcción de estrategias socio-afectivas orientadas al desarrollo de una respuesta adaptativa del sujeto para interactuar con otras personas (Hinojosa, Mercado & Carretié, 2015; Ibáñez et al., 2010).

Estudios en veteranos de guerra con lesión cerebral y poblaciones con problemas disruptivos de conducta (p. ej. población carcelaria) realizados por Khanna et al., (2017), Morey et al., (2008), Stark et al., (2015) y Siever (2008), señalan la utilidad del uso de neuroimágenes cerebrales y tareas experimentales de reconocimiento emocional de rostros y palabras y de tipo de stroop emocional para la evaluación del procesamiento afectivo. Esto ha permitido identificar variaciones en el procesamiento afectivo relacionado con personas expuestas a eventos violentos. Se ha encontrado, particularmente en grupos de veteranos de guerra y excombatientes con lesión

cerebral, una reducción de la activación cerebral en regiones orbitofrontales de la corteza prefrontal izquierda, así como alteraciones en el funcionamiento de los ganglios de la base y la amígdala, que se asocian con altos niveles de agresión y un menor desempeño para la identificación del miedo y la alerta en tareas de reconocimiento de rostros e imágenes emocionales (i.e. IAPS), influyendo negativamente en la respuesta adaptativa de los sujetos a su contexto social (Siever, 2008; Soloff, 2018).

Por otro lado, desde objetivos de diferenciación más generales, algunos estudios (Tobón et al., 2015), han utilizado las dimensiones de empatía del IRI (Davis, 1980), con medidas de función ejecutiva (INECO *Frontal Screening* (IFS)), en conjunto con una tarea de reconocimiento de valencia emocional (i.e. positiva, negativa y neutra) donde se presentaron imágenes del IAPS sincronizadas con PRE´s, con el fin de caracterizar el procesamiento cognitivo-emocional de excombatientes y civiles. Se identificó en los excombatientes la presencia de dos perfiles diferentes. El primer grupo alcanzó unos niveles de empatía similares a la población general, pero tenían dificultades para planificar y controlar impulsos. El segundo disponía de capacidad para comprender el dolor y los sentimientos de otros, sin que esto generase en ellos angustia o incomodidad. En ambos grupos se observó una mayor hiperreactividad en la amplitud del componente *Late Positive Potential* (LPP) y una respuesta cortical adecuada en el *Early Posterior Negativity* (EPN), frente a estímulos afectivos en comparación con controles sanos.

Uno de los objetivos de la tesis es ampliar el conocimiento sobre los patrones diferenciales del procesamiento afectivo en muestras de excombatientes, víctimas y controles (i.e. población civil). Esta información se convierte en un elemento clave en la evaluación y caracterización de múltiples poblaciones, particularmente, en el estudio de personas y comunidades que han estado expuestas crónicamente al conflicto armado en Colombia. Se espera que esta información, favorezca el

desarrollo de estrategias de intervención y tratamiento psicológico que podrían fortalecer los procesos de adaptación y reintegración a la vida civil de la población (Montoya et al., 2008; Gutiérrez, 2008).

1.3. Terapia Psicológica y Entrenamiento Socio-Cognitivo (ESC)

La terapia psicológica es un proceso en el que se valoran experiencias pasadas, presentes y se proyectan las futuras, favoreciendo la reducción del malestar experimentado por una persona. Tiene como objetivo el cambio de estrategias, reglas y esquemas derivados del pasado que no son adaptativos, y la construcción de habilidades para el mantenimiento del balance emocional para el futuro, en personas que presentan alteraciones en su salud mental, producto de trastornos clínicos de base, problemas emocionales y alteraciones producidas por la exposición a eventos traumáticos o violentos (Ecker, Ticic, & Hulley, 2012; Lane, Ryan, Nadel, & Greenberg, 2015). En este sentido, la psicología ha intentado responder a las demandas clínicas actuales de la población con alternativas terapéuticas y modelos basados en la evidencia (Lane et al., 2015).

Dentro de los modelos de intervención, la terapia cognitiva se considera una opción efectiva para la prevención y tratamiento de la depresión, las fobias y otros trastornos del espectro ansioso (Foa et al., 2005; Rachman, 2015), la esquizofrenia, la anorexia o la bulimia, así como el dolor crónico y los trastornos disruptivos de conducta (Butler, Chapman, Forman & Beck, 2006; Hofmann, Asnaani, Vonk, Sawyer, & Fang, 2012). Su propósito principal es reducir el estrés emocional que experimenta la persona, producto de respuestas emocionales negativas, creencias irracionales y pensamientos desadaptativos. Esto se logra a través de técnicas muy variadas que permiten evaluar e identificar, en un primer momento, los componentes cognitivo-afectivos que

mantienen el trastorno a través de pensamientos y comportamientos disfuncionales y, luego, a lo largo del tratamiento, se promueve la autonomía del paciente favoreciendo la construcción de pensamientos y afrontamientos "más" adaptativos que aportan estrategias para resignificar y enfrentar efectivamente las situaciones estresantes de su contexto social (Dobson, 2009; Hofmann, Asmundson, & Beck, 2013). Para esto, de acuerdo con Gross y John (2003), es importante la valoración que hace el sujeto de las claves emocionales internas y externas que intervienen en los procesos de activación/inhibición fisiológica, conductual y experiencial que vive el sujeto dentro de su contexto. El proceso terapéutico requiere reajustar los elementos cognitivo-afectivos que median el comportamiento desajustado, con el fin de mejorar las habilidades que tiene una persona, como puede ser el caso de un excombatiente, para adaptarse y responder adecuadamente a las demandas de su contexto social.

Estudios previos realizados por Rosen et al., (2016) y Steenkamp, Litz, Hoge, y Marmar (2015) revisan las diferentes intervenciones psicoterapéuticas realizadas en los últimos 35 años (1980-2015) para el tratamiento del Trastorno de Estrés Postraumático (TEPT) en veteranos de guerra, excombatientes y militares activos, encontrando que la terapia cognitivo-conductual y la terapia de exposición prolongada, son las de mayor uso. Sin embargo, parte de las limitaciones en la aplicación de estas intervenciones radica en la dificultad para transferir el marco de intervención a poblaciones sin diagnóstico clínico previo, que al igual que las personas con TEPT, han estado expuestas de manera prolongada a experiencias asociadas con la violencia armada.

Recientemente, como una alternativa a esta limitación, se ha propuesto el tratamiento psicológico conocido como *Entrenamiento Socio Cognitivo* (ESC), que mantiene elementos de la terapia cognitiva (p. ej. identificación de emociones en sí mismo y otros, reconocimiento de intenciones). El ESC incluye una serie ejercicios para evaluar y mejorar áreas de la cognición

social mediante el uso de estímulos visuales y auditivos, entre otros, el reconocimiento de rostros afectivos, percepción de claves sociales, teoría de la mente y atribuciones sociales para la valoración de estas habilidades (Kurtz & Richardson, 2011).

Este entrenamiento puede aplicarse de manera grupal e individual en personas con problemas de conducta agresiva (p.ej. trastorno oposicionista desafiante, trastorno antisocial de conducta, trastorno explosivo intermitente), pacientes institucionalizados, estudiantes de secundaria, personas con autismo y esquizofrenia, donde se reconoce su utilidad para mejorar habilidades cognitivas y sociales que intervienen en el reconocimiento de emociones, intenciones y la reducción de sesgos negativos de atribución social (Combs et al., 2007; Kurtz & Richardson, 2011; Manger, Eikeland, & Asbjørnsen, 2001; Penn et al., 2005; Peyroux & Franck, 2014; Roberts & Penn, 2009; Turner-Brown et al., 2008).

El ESC comprende actividades de percepción activa de señales afectivas y control ejecutivo, que evolucionan de lo básico a lo complejo en tres fases: la primera contribuye a superar las dificultades en la percepción emocional, a partir del reconocimiento de expresiones faciales y descripciones verbales de claves para distinguir emociones; la segunda promueve el desarrollo de habilidades para caracterizar intenciones, atribuciones y prejuicios, analizando la congruencia entre la respuesta del participante y las escenas cotidianas presentadas en la sesión de entrenamiento; finalmente, en la última fase, el participante integra las habilidades aprendidas en el entrenamiento a la solución de sus problemas cotidianos (Hooker et al., 2013). En la Figura 4 se presentan las fases, duración y contenidos del ESC.

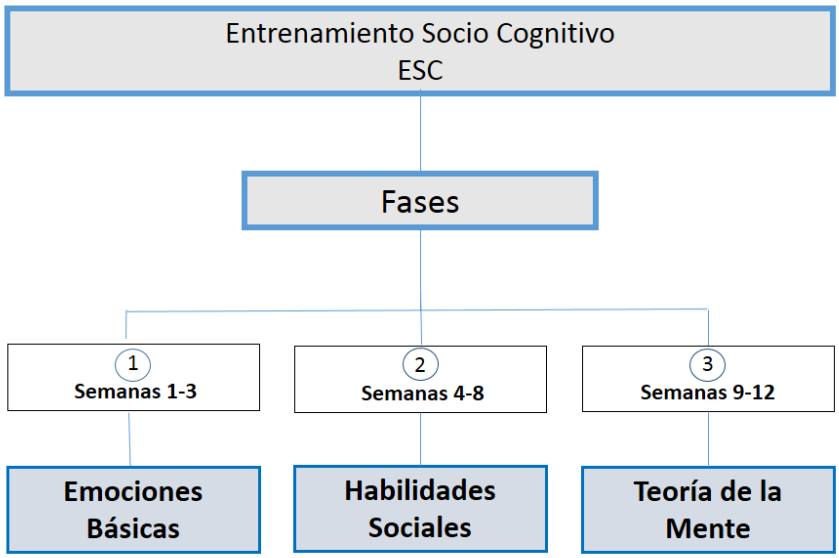


Figura 4. Descripción breve de las fases, tiempos y contenidos que se manejaron en el Entrenamiento Socio Cognitivo (ESC) realizado con los excombatientes en proceso de reintegración de la Agencia para la Reincorporación y Normalización (ARN)

Considerando lo anterior, los beneficios del ESC pueden ser de gran utilidad para su aplicación en el mejoramiento de habilidades socio-emocionales en veteranos de guerra y excombatientes de grupos armados ilegales que, por sus antecedentes, pueden experimentar dificultades importantes a nivel interpersonal para adaptarse a su contexto social (Cacioppo et al., 2015; Litz et al., 2009; Sutherland, Mott, Lanier, Williams, Ready, & Teng, 2012). Particularmente, en el caso colombiano, los estudios de casos-controles en excombatientes, realizados por Quintero-Zea et al., (2017) y Tobón et al., (2015), indican la presencia de alteraciones socio-afectivas asociadas con el reconocimiento de emociones en otras personas a partir del desempeño que presentan los participantes en tareas de reconocimiento emocional.

Un objetivo fundamental de las investigaciones incorporadas en esta tesis es proyectar y desarrollar un entrenamiento socio cognitivo en excombatientes del conflicto armado colombiano

y comprobar su eficacia. Anticipamos que sus características socioeducativas, en caso de ser eficaz, pueden aconsejar su uso más generalizado dentro de los programas de reintegración vigentes en nuestro país.

1.4. Objetivos y contenido de las investigaciones incluidas en la tesis

Como se ha ido anticipando, el propósito de este trabajo es realizar una caracterización de los patrones neuropsicológicos y socio-afectivos de personas expuestas crónicamente al conflicto armado colombiano, particularmente, en excombatientes a partir de protocolos de evaluación y entrenamiento psicológico (ESC) para favorecer los procesos de reintegración a la vida civil en esta población.

Las investigaciones que se describen en los capítulos siguientes, se realizaron con excombatientes colombianos en proceso de reintegración y reincorporación, que en el pasado militaron en grupos armados ilegales y con víctimas del conflicto armado que sufrieron, entre otros, secuestros, desapariciones de seres queridos, desplazamientos forzados, durante el desarrollo de las acciones armadas acontecidas en diferentes regiones de Colombia. Además, también se incluye población civil, que no experimentó una exposición directa a estos eventos a lo largo del tiempo.

En la tesis se describen cuatro estudios en capítulos independientes. Los incorporados en los capítulos 2 y 3 están publicados en el *Peace and Conflict: Journal of Peace Psychology*. Los estudios presentados en los capítulos 4 y 5 lo están en las revistas *Frontiers in Human Neuroscience,* y *Frontiers in Psychology*, respectivamente. A continuación, se describen los objetivos e ideas centrales que integran estos capítulos/articulo.

El primer artículo, que corresponde al capítulo 2, titulado *Executive and behavioral characterization of chronic exposure to armed conflict among war victims and veterans*, desarrolla la caracterización de personas expuestas crónicamente al conflicto armado en Colombia. Una muestra de víctimas, excombatientes y controles de la población civil completaron una serie de evaluaciones neuropsicológicas y tareas comportamentales que, de manera novedosa, fueron utilizadas con este tipo de participantes. Las tareas computarizadas fueron: *Attentional Network Test for Interaction and Vigilance* (ANTI-V; Roca et al., 2011), la versión adaptada de una tarea *Go-NoGo* (Pacheco-Unguetti, Acosta, Lupiáñez, Román, & Derakshan, 2012), y una versión del *Social Categorization Switching Task* (SCST; Marzecová et al., 2013). Entre los instrumentos tradicionales de evaluación neuropsicológica se usaron: el *Trial Making Test A-B* (TMT A-B; Partington & Leiter, 1949), y el *Wisconsin Card Sorting Test* (WCST; Nelson, 1976), validados para población colombiana por Henao-Arboleda et al., (2010), y el *INECO Frontal Screening* (IFS; Torralva, Roca, Gleichgerrcht, López, & Manes, 2009). Los resultados evidencian una mayor sensibilidad de las pruebas neuropsicológicas clásicas utilizadas para diferenciar los grupos. En el grupo de excombatientes se observó un menor desempeño en flexibilidad cognitiva, en comparación con el grupo de víctimas y controles. Así mismo, los análisis evidenciaron, interacciones de las redes atencionales por grupo en el tiempo de respuesta de la tarea ANTI-V, en donde las víctimas presentaron un menor tiempo de respuesta para el procesamiento de la información en comparación con los grupos de excombatientes y controles. Se discute la contribución de las pruebas en la identificación de patrones de funcionamiento cognitivo en poblaciones expuestas crónicamente al conflicto armado en Colombia.

El segundo artículo, que corresponde al capítulo 3, titulado *How Empathic Are War Veterans? An Examination of the Psychological Impacts of Combat Exposure*, publicado también en la revista

Peace and Conflict: Journal of Peace Psychology, recorre las dimensiones cognitivas y emocionales de la empatía en una muestra de excombatientes colombianos en proceso de reintegración, evaluados con la versión española del *Interpersonal Reactivity Index* (IRI; Mestre Escrivá et al., 2004). A través de un análisis de clúster de clases latentes, se identificaron 3 grupos en donde se presentan diferencias en las dimensiones cognitivas y afectivas de la empatía, generando diferentes perfiles empáticos entre los mismos excombatientes. Esto permite aportar nueva evidencia para el mejoramiento de las acciones políticas asociadas con el proceso de reintegración y el fortalecimiento de la ruta psicosocial que recibe esta población en Colombia.

El tercer artículo, que corresponde al capítulo 4, titulado *Atypical Modulations of N170 Component during Emotional Processing and Their Links to Social Behaviors in Ex-combatants,* publicado en la revista *Frontiers in Human Neuroscience*, avanza en la evaluación y comprensión de las alteraciones en el procesamiento afectivo que están presentes en las personas con exposición al conflicto armado. Con este objetivo se estudió una muestra de excombatientes en comparación con personas no expuestas directamente al conflicto armado. Estos completaron un cuestionario de empatía, pruebas sobre teoría de la mente y habilidades sociales. Además, realizaron una tarea de valoración emocional de caras y palabras sincronizadas con registro electroencefalográfico. El análisis reveló diferencias entre los grupos en el componente N170, relacionado con el reconocimiento de rostros y palabras con contenido emocional. De modo inesperado, en los resultados de la evaluación psicológica, los excombatientes mostraron un mejor desempeño en las habilidades sociales, principalmente en la dimensión que refleja las interacciones sociales y expresión de desacuerdos, comparados con el grupo de no expuestos. Este estudio contribuyó a la identificación patrones electrofisiológicos asociados al funcionamiento normal y atípico del procesamiento afectivo y en el establecimiento de su relación con habilidades necesarias para la

adaptación al contexto social en excombatientes, brindando evidencia para el desarrollo de estrategias de rehabilitación efectivas en esta población.

El cuarto artículo, que corresponde al capítulo 5, titulado *Social Cognitive Training Improves Emotional Processing and Reduces Aggressive Attitudes in Ex-combatants* publicado en la revista *Frontiers in Psychology*, evalúa la utilidad de un entrenamiento socio-cognitivo de baja intensidad y corta duración (12-14 semanas) en una muestra de excombatientes en proceso de reintegración. El entrenamiento fue adaptado para mejorar el desempeño en habilidades socio-cognitivas, comparado con el tratamiento psicológico convencional recibido en la ruta de reintegración. Para su aplicación y seguimiento, se hizo la evaluación de la muestra antes y después del entrenamiento con un protocolo que incluía pruebas psicológicas y cognitivas. Las personas que participaron en el entrenamiento socio-cognitivo mejoraron su desempeño para el procesamiento y reconocimiento de emociones, y experimentaron una reducción en las actitudes agresivas expresadas respecto a la interacción social con su entorno. Estos efectos no se observaron en el grupo de excombatientes que continuó con su ruta de reintegración psicosocial convencional. Este es el primer estudio en Colombia que logra estos resultados con la población, lo que permite contar con nueva evidencia para mejorar la efectividad de las estrategias de rehabilitación utilizadas en el proceso de reintegración social de los excombatientes a la vida civil.

En el capítulo 6, se discute de manera general los estudios presentados en este trabajo, señalando los aportes al conocimiento, limitaciones y perspectivas futuras para replicar y dar continuidad a los hallazgos derivados de la presente investigación. Los acontecimientos históricos, políticos y sociales que han impactado recientemente a la población colombiana requieren un esfuerzo de investigación particular desde disciplinas variadas (pedagogía, sociología, psicología, neurociencia, etc.). En ese contexto, los estudios incluidos en esta tesis deben considerarse una

aportación primordial para la reintegración social de los excombatientes. Este trabajo es uno de los primeros referentes para acercarnos a la comprensión de realidades tan complejas como las que se presentan en personas expuestas por más de medio siglo a la violencia armada en Colombia.

CAPÍTULO 2

EXECUTIVE AND BEHAVIORAL CHARACTERIZATION OF CHRONIC EXPOSURE TO ARMED CONFLICT AMONG WAR VICTIMS AND VETERANS

El contenido de este capítulo se encuentra publicado como Trujillo, S., Trujillo, N., Valencia, S., Ugarriza, J. E., & Acosta Mesas, A. (2019). Executive and behavioral characterization of chronic exposure to armed conflict among war victims and veterans. *Peace and Conflict: Journal of Peace Psychology*. DOI: 10.1037/pac0000408

2.1. Abstract

Executive and cognitive processes constitute an important mechanism to respond to different social demands that people experiment in everyday life. Neuropsychological approaches have evaluated these mechanisms in people with brain injury, mental and behavioral disorders, and recently, in nonclinical populations such as war/armed conflict ex-combatants. Particularly, the long history of Colombian armed conflict allows us to characterize how ex-combatants exposed to armed conflict events identify and learn from social cues to select adaptive and efficient responses. The present study characterizes behavioral and neuropsychological performance in 111 subjects, including victims, ex-combatants, and controls, who were chronically exposed to armed conflict in Colombia. We evaluated cognitive processes such as attention, social categorization, inhibitory control, and cognitive flexibility through computerized and neuropsychological instruments. Results revealed that: (a) ex-combatants had lower performance in cognitive scales compared with the other 2 groups; (b) victims described shorter RTs than ex-combatants and nonexposed controls in attentional task; and (c) nonexposed controls were faster to respond to cognitive flexibility tasks respect to the other 2 groups. We interpreted that differences in the response pattern of ex-combatants and victims are associated with their exposure to armed conflict experiences. We also consider that differential performed among the exposed group is associated with their role in the conflict. We expect in the future to enhance the comprehension of these patterns and contribute to design and implement evidence-based psychological therapies that improve their abilities to adapt to the demands of this social context and, consequently, build peace in those communities.

2.2. Introduction

For nearly six decades, Colombians have been exposed to a low-intensity armed conflict. This conflict has been characterized by massive displacements, the forced recruitment of children and adolescents, and violations of human rights (e.g., kidnappings, sexual abuse, and homicide) by both official and illegal forces (Dube & Vargas, 2013; Ibáñez & Velásquez, 2009). In 2003, as part of the massive demobilization of paramilitary groups, the Colombian government implemented an international policy of Disarmed, Demobilization, and Reintegration by creating a reintegration route. Such reintegration attempts to strengthen citizen- ship, financial resources, educational opportunities, psychosocial abilities, and occupational status in this population (Theidon, 2007). It has contributed to a 50% reduction of the engagement of ex-combatants in criminal activities (Nussio, 2009; Nussio, Massé, Negrete, & Ugarriza, 2011). However, to better stabilize the peace process, there is governmental interest in further reducing recidivism.

Moreover, for ex-combatants, the reintegration route implies integrative work in different areas (i.e., educational and psychosocial), in which one of the main goals is social adaptation to civilian life. Establishing psychological profiles (i.e., social cognition is represented by social skills scores, empathic response, emotional processing, and executive function such as emotional control) that may benefit the successful reintegration of those individuals is necessary. To date, few efforts have been made to characterize such processes, not only in ex-combatants but also in other victim populations in the postconflict era in Colombia. The dearth of such studies is attributable to a scarcity of human, institutional, and financial resources that are available to tend to the psychosocial demands of mental health (Rincón, 2018; Villa Gómez, Arroyave, Montoya, & Muñoz, 2017).

Previous studies of war veterans, ex-combatants, and refugees have used neuropsychological assessments to evaluate cognitive functions and mental health problems, such as anxiety disorders (e.g., posttraumatic stress disorder [PTSD]), depression, and social adaptation disorders. They found that the severity of the symptomatology is associated with larger impairments in the regulation of emotional processing. In addition, studies inform a reduction in attentional, inhibitory response, and cognitive flexibility during social information processing among war exposed individuals compared with non-ex-combatant populations (Aupperle, Melrose, Stein, & Paulus, 2012; Fiske & Taylor, 2013; Mar, 2011; Morey, Petty, Cooper, Labar, & McCarthy, 2008; Polak, Witteveen, Re- itsma, & Olff, 2012; Vasterling et al., 2012).

Recent evidence has described the utility of neuropsychological/ social cognition assessment to elucidate profiles among war exposed-populations through the characterization of their emotional recognition, empathic disposition, aggressive behavior, drugs use, and alcohol abuse. Specifically, authors have observed a reduction of moral thinking responses, lower scores in empathic concern and personal distress dispositions, and high levels of aggression (i.e., proactive aggression and aggressive attitudes). Additionally, atypical neural patterns to recognize face and word emotional valence, and a better representation of social situations (Baez et al., 2014; Tobón et al., 2016; Trujillo, Trujillo, Lopez, et al., 2017; Trujillo, Trujillo, Ugarriza, et al., 2017; Weierstall, Castellanos, Neuner, & Elbert, 2013).

The use of cognitive patterns derived from neuropsychological assessment has been also used for the evaluation and follow up of the implementation of psychological training treatments, such as Social Cognitive Training (SCT) among ex-combatants (Trujillo, Trujillo, Lopez, et al., 2017). The use of SCT allows improving in neutral face recognition, as well as, the reduction in aggressive drivers. Furthermore, the authors suggested that neuropsychological assessments are useful for

designing evidence-based interventions to reduce drivers of aggressive and antisocial behavior and enhance different areas of socioeconomic reintegration (e.g., family, work, and community interactions) in ex-combatants and other populations who are influenced by armed conflict, such as victims. Tobón et al. (2015) suggested that the evaluation of executive function might be useful for recognizing complex cognitive inter- actions that underlie the modulation of social cognition. After experiencing armed conflict, ex-combatants present reorganization of their behavior and social cognition that conditions their responses to interventions and everyday activities (Trujillo, Valencia, et al., 2017). Furthermore, recent evidence has suggested that comprehensively evaluating the executive process may provide clues to better understand social– cognitive and behavioral modulation in individuals who are exposed to armed conflict, and such knowledge may be applied to the development of assessment protocols to further evaluate victims and extending its reach inside of reintegration programs regularly used in ex-combatants.

The present study evaluated executive function (i.e., attention, inhibitory control, cognitive flexibility, and social categorization; Lezak, 2004; Strauss, Sherman, & Spreen, 2006; Tobón et al.,2016) in ex-combatants, victims, and nonexposed controls. We sought to (a) characterize executive processes as a strategy to complement previous studies of social cognition, (b) establish whether this process adequately describes different modulations in victims and ex-combatants compared with nonexposed subjects, and (c) identify possible significant interactions and relationships between neuropsychological variables of executive function test and behavioral indexes of computerized task.

Our hypothesis was that ex-combatants and victims will present a similar performance in executive function tasks (because of sharing exposure context) compared with nonexposed controls. This study will be testing this hypothesis in a Colombian sample. We expect to align and

expand previously reported influence of war context over cognitive function (Aupperle et al., 2012; Gilb- ertson, Gurvits, Lasko, Orr, & Pitman, 2001; McCrea et al., 2008; Polak et al., 2012). The results of this study will contribute to developing evaluations and in future evidence-based interventions that are useful for both ex-combatants and victims by integrating elements of clinical psychology, neurosciences, and experimental psychology (Martz, 2010; Moran, 2015; Trujillo, Trujillo, Lopez, et al., 2017; Vasterling et al., 2006). We discuss the possibility of implementing the results in Colombia and potential utility in other countries.

2.3. Materials and Method

The present study used an observational design and criterion- basing sample (Palinkas et al., 2015) to characterize 111 participants, including victims and ex-combatants who were exposed to armed conflict in Colombia using neuropsychological and computerized tasks. We systematically compared ex-combatants with victims and nonexposed controls. All of the subjects were asked by a trained psychologist about their history of major physical trauma (e.g., amputations) and neurological and psychiatric disorders that may limit their ability to complete the assessment protocol.

2.3.1. Participants and Procedure

Ex-combatants. This sample consisted of 49 Colombian ex-combatants from illegal armed groups in a proportion of 2:1 male to female (31 men and 18 women; mean age 34 years, SD 8.2 years; mean education 9 years, SD 3.5 years). They participated actively in the reintegration route that was provided by the Colombian Agency for Reintegration (Agencia Colombiana para la

Reintegración [ACR])[3]. Each participant was contacted by the professional who was in charge of the ACR to be evaluated in this study.

Victims. This sample consisted of 35 subjects (6 men and 29 women; average age 41.5 years, SD 13.6 years; mean education 10.7 years, SD 4 years). Victims status was defined according to Colombian laws, particularly Article 3rd of Law 1448 (de la República de Columbia, 2011): someone who suffered, from January 1, 1985, to the present date, individual or collective damage from events related to armed conflict (i.e., kidnapping, forced disappearance), including their permanent companions and first-degree relatives. This sample was collected in Santo Domingo, Antioquia, which was one of the most exposed towns to armed conflict in Colombia. An open invitation was made by local governmental entities to participate in the study.

Controls. This sample consisted of 27 subjects in a proportion of 1:2 male and female (8 men and 19 women; average age 31.6 years, SD 11.2 years; mean education 11.4 years, SD 3.5 years). This group did not expose to armed confrontations related to armed conflict in Colombia throughout their lives. They did not have a criminal record and were not involved in armed conflict. We made an open call to individuals who met these criteria in the eastern and central regions of Antioquia through direct contact by the researchers.

Before the evaluations, all of the participants were detailed informed about the purpose of the study and data management based on Helsinki international ethical standards. We individually informed to the participants the overall evaluation duration and about their possibility to interrupt the evaluation at any time no matter if they were in a computerized task or responding to a questionnaire. We included only subjects who voluntarily decided to participate in the study. They

[3] As of the date of this publication, this entity changed its name to the Agency for the Reincorporation and Normalization of the Colombian Government ARN.

signed an informed consent form that was approved by the Ethics Committee of the Faculty of Medicine, University of Antioquia, Medellín, Colombia. Subsequently, they underwent the neuropsychological evaluation with one of four blinded, trained psychologists. The classic and computerized neuropsychological evaluations were counterbalanced across subjects. The duration of the assessment was 2.5 hr per participant.

For victims and controls, data collection occurred in reserved classrooms in public schools. For ex-combatants, the evaluations occurred in reserved classrooms on the university campus. Both of the settings were equipped to apply together, the neuropsychological and computerized protocols.

Because of the extension of the evaluation, each participant had the possibility to take a break and snack at any time or around 1.5 hr from the beginning of the section. The snack was provided by the research project. At the end of the evaluation, all the participants received economic retribution equivalent to transportation cost.

2.3.2. Instruments

Trail Making Test A and B. The Trail Making Test A and B (TMT-A, TMT-B; Partington & Leiter, 1949) is a neuropsychological screening test that is used to evaluate neurological dysfunction with regard to attention, mental flexibility, sequencing, visual- motor skills, and cognitive processing speed (Burin, Drake, & Harris, 2007). This instrument was previously used to evaluate soldiers and individuals with attention-deficit-hyperactivity disorder (ADHD) and neurodegenerative conditions (Edwards & Par- sons, 2017; Henao-Arboleda et al., 2010; Leany, Benuto, & Thaler, 2013; Polak et al., 2012). The present study used the version of Henao-Arboleda et al. (2010) that was validated for Colombia.

Wisconsin Card Sorting Test. The Wisconsin Card Sorting Test (WCST) was created by Grant and Berg (1948) and modified by Nelson (1976). We used the latter version. The test consists of a series of 48 cards with different colors, shapes, and numbers. The instrument is widely used to evaluate cognitive flexibility and switching behavior. Indicators of performance on this test include hits, errors, perseverative errors, the percentage of perseverative errors, nonperseverative errors, and failures to sustain the principle of the category (Heaton, Chelune, Talley, Kay, & Curtiss, 1993; Henao-Arboleda et al., 2010).

INECO Frontal Screening. The INECO Frontal Screening (IFS) is using to evaluate executive function (Torralva, Roca, Gleichgerrcht, López, & Manes, 2009). This instrument includes eight subtests that measure executive components, such as motor programming, conflicting instructions, Go/No-Go responses, in- verse digit span, verbal working memory, spatial working mem- ory, the interpretation of aphorisms, and verbal inhibitory control. The instrument has two measures: total score (maximum score 30 points) and a working memory index (sum of scores on Item 4 and Item 6; maximum score 10 points). The instrument's authors reported sensitivity and specificity of 96.2 and 91.5%, respectively, and a Cronbach's of 0.8 (Torralva et al., 2009). The instrument is sufficiently sensitive to evaluate neuropsychiatric and neurodegenerative conditions in both the normal population (Baez et al., 2014; Gleichgerrcht, Roca, Manes, & Torralva, 2011; Torralva et al., 2009) and in Colombian ex-combatants (Tobón et al., 2016).

Intelligence assessment. The abbreviated protocol of the Wechsler Adult Intelligence Scale (WAIS-III; Donders & Axlerod, 2002) was used, including the vocabulary and matrix subscales. The WAIS-III was adapted to adults and different populations with different age ranges and occupations (Groth-Marnat, 2009). In the present study, we estimated the IQ based on Donders and Axlerod (2002).

Attentional Network Test-Interactions-Vigilance Task. The Attentional Network Test-Interactions-Vigilance Task (ANTI-V) is a computerized task that was adapted by Callejas, Lupiáñez, and Tudela (2004) and Roca, Castro, López-Ramón, and Lupiáñez (2011) from the original version of the Attentional Network Test (Fan, McCandliss, Sommer, Raz, & Posner, 2002). This instrument assesses orientation, executive control, and alerting network states. The ANTI-V also measures attentional vigilance by combining the functions of attention and executive networks in terms of solving conflicts within the framework of the test (Fan et al., 2007).

Figure 1 describes the ANTI-V task. The participants were instructed to indicate the direction of the central arrow on the screen using the "C" key on the keyboard for the left direction and the "M" key for the right direction. The experiment consisted of four blocks of 64 trials each, 16 practice trials with corresponding feedback, and 256 test trials without feedback (192 standard trials and 64 vigilance trials).

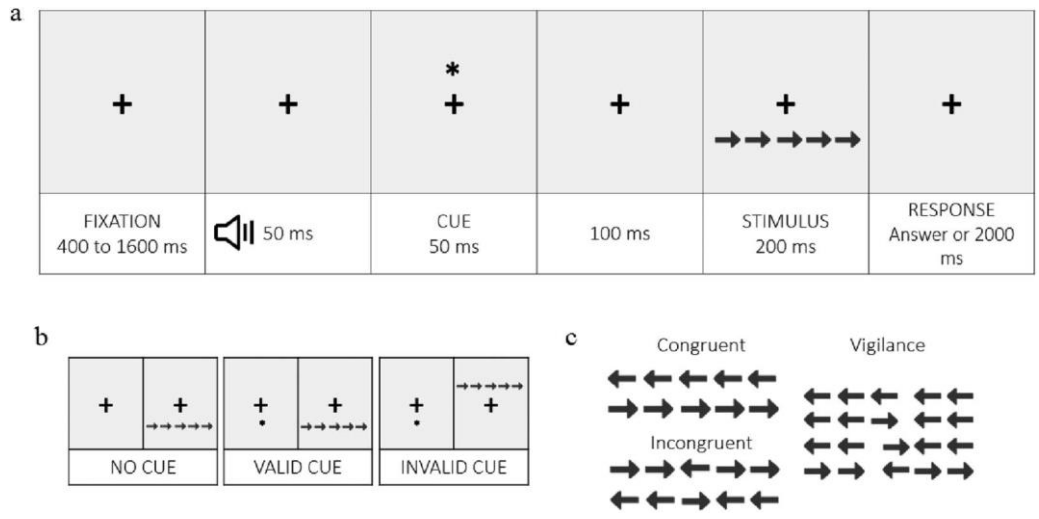


Figure 1. (a) The trial sequence of stimulus and conditions of Attentional Network Test-Interactions-Vigilance Task (ANTI-V) task; note two particular elements: (1) the second slide up to left represent the tone condition, 50% of trials presented this condition, (2) the third slide included an asterisk above or below of fixation cross before the presentation of visual stimulus; (b) Trial sequence of no cue and cue conditions for valid and invalid cue; (c) Trial sequence for congruent-incongruent flanker and vigilances conditions; note for the latter that a separated arrows represent nonvigilance condition, whereas displacement arrows represent vigilance condition.

Emotional Go/No-Go Task. The Emotional Go/No-Go Task is a response control measurement that was adapted by Pacheco- Unguetti, Acosta, Lupiáñez, Román, and Derakshan (2012) from the Go/No-Go paradigm of Nigg (2000). The experiment consisted of 360 trials with different loads (high and low) and emotional valence (negative, neutral, and positive). Figure 2 shows the design of the Go and No-Go conditions. The participants first completed a practice block of 20 trials with neutral faces. The participants received feedback on performance (accuracy and RT). The participants then responded to a random sequence of six blocks (60 trials each). The duration of each block was approximately 20 min. The participants had to press a yellow button ("B" key) when the letters "X" and "O" appeared; if these letters did not appear, then they did not press any key.

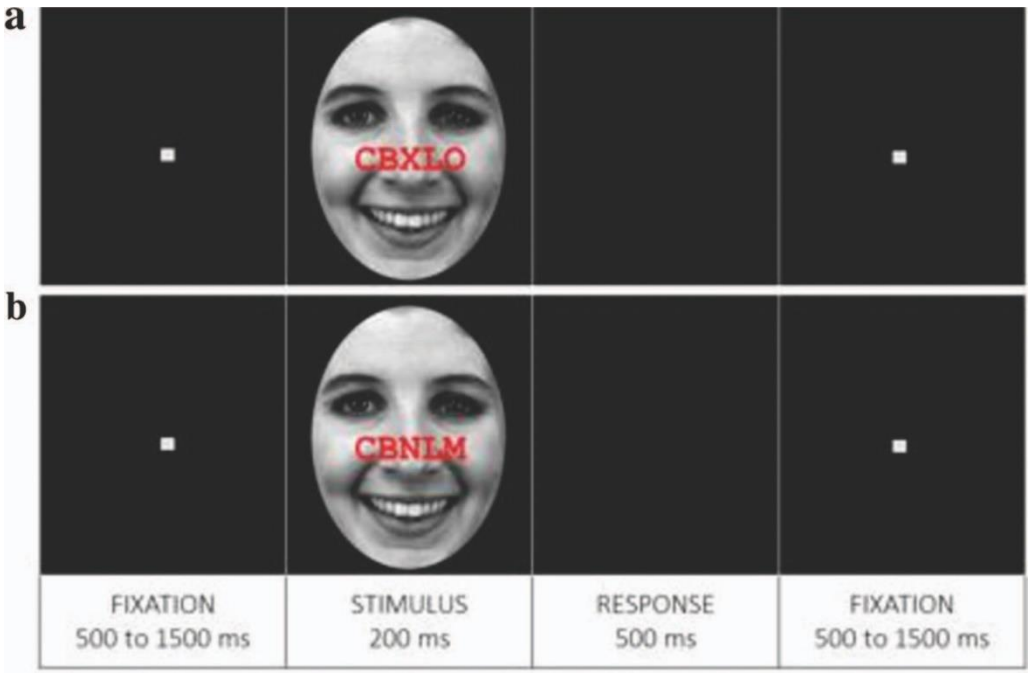


Figure 2. Trial sequence of Go/No-Go task for positive valence condition. (a) The first sequence illustrates "Go" condition. (b) The second sequence describes "No-Go" condition. Subjects were asked to respond or no according to the presentations of "X" or "O" letters, respectively. The image also showed picture BF07HAS from Karolinska Directed Emotional Faces (KDEF), Lundqvist, Flykt, and Öhman (1998). For more information of the KDEF see http://www.kdef.se/. See the online article for the color version of this figure.

Social Categorization Switching Task. The Social Categorization Switching Task (SCST) evaluates cognitive flexibility to change response options when the instruction and response categories vary according to gender and age. We used the version of the SCST that was adapted by Marzecová et al. (2013). Figure 3 describes the trial sequences of the experiment. The participants had to categorize images of human faces that conformed to gender (male vs. female) and age (young vs. old) in four black-and-white photographs. The SCST consisted of eight practice trials followed by four experimental blocks, with 80 random trials each.

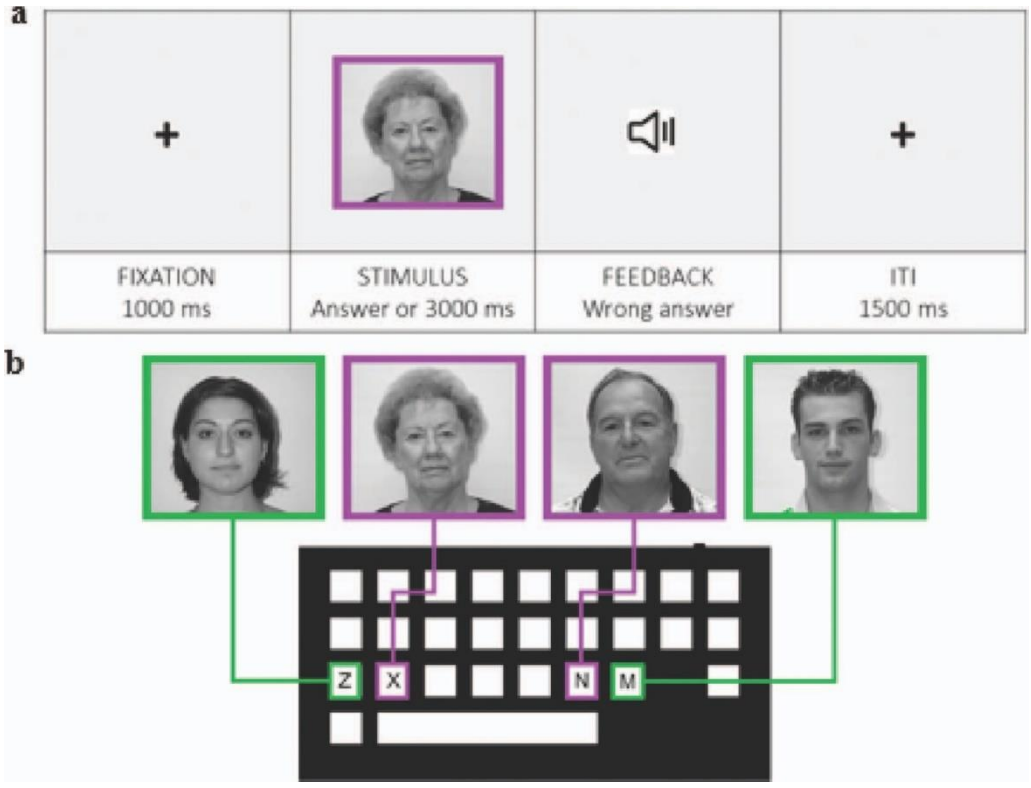


Figure 3. (a) Trial sequence for Social Categorization Switching Task (SCST). (b) Examples of the categorization assignment and responses key, images framed with green color represent "Age" category (Letters "Z" and "M"); the images framed with purple color represent "Gender" category (Letters "X" and "N"). The color frame

option and response key was counterbalanced on each application. Images taken from Minear and Park (2004). See the online article for the color version of this figure.

2.3.3. Statistical Analysis

Sample distribution across tasks is presented at Figure 4. To guarantee the data reliability, we included only participants who obtained performance (hits) that was ≥70%, and we also analyze gender effect on the performance of cognitive measures based on previous studies (Erceg-Hurn & Mirosevich, 2008; Sporer, Penrod, Read, & Cutler, 1995). For the computerized task data analysis, we followed methodology purposed by Bukowski, Asanowicz, Marzecová, and Lupiáñez (2015); Marzecová et al. (2013); Pacheco-Unguetti et al. (2012); and Roca et al. (2011).

We used analysis of variance (ANOVA) to analyze the neuro- psychological and behavioral data. For the neuropsychological evaluation, we used one-way ANOVA, with the neuropsychological results from each classic test as dependent variables and group as the independent variable. For the ANTI-V, we used a mixed ANOVA of accuracy and RT, with alert signal (no tone, tone), visual cue (invalid, no cue, and valid), congruency condition (congruent, incongruent), and vigilance index as within-factors. In the Go/No-Go task, we used a 3 x 2 mixed ANOVA of RTs, the perceptual sensitivity index (*d´*), and response bias (β), with face valence (negative, positive, and neutral) and load (high, low) as within-factors. In the SCST, we used a mixed ANOVA of accuracy and RT for each condition, with task (age, gender) and task-switch (switch, no switch) as within-subjects factors. For all the ANOVAs, we used group (victims, controls, and ex- combatants) as a between-factor. Overall, for main effects and the interaction we report effect size as informed by η^2 (0.1 = small, 0.24 = medium, and 0.31 = large). For post hoc analysis we implement Bonferroni correction and the effect size was calculated using the Cohen's *d* (Nule: $B \leq 0.1$, Small: $0.1 < B \leq 0.3$, Medium: $0.3 < B \leq 0.5$, Large: $B > 0.5$).

Finally, we performed a Pearson's correlation analysis to identify associations between assessment instrument scores. The variables that were included in the model were those that significantly distinguished between groups in the previous ANOVAs. For this analysis, we assumed a level of significance of $p \leq .01$.

To reduce the amount of data in the descriptive and correlational analyses, we calculated the behavioral indices of the computerized task. For the ANTI-V, we subtracted attentional networks and vigilance scores for each specific condition (i.e., Alert: Tone-No tone conditions); this process was also applied to the SCST indices. To evaluate performance on the Go/No-Go task, we extracted the *d´* and β indices from Signal Detection Theory (Stanislaw & Todorov, 1999).

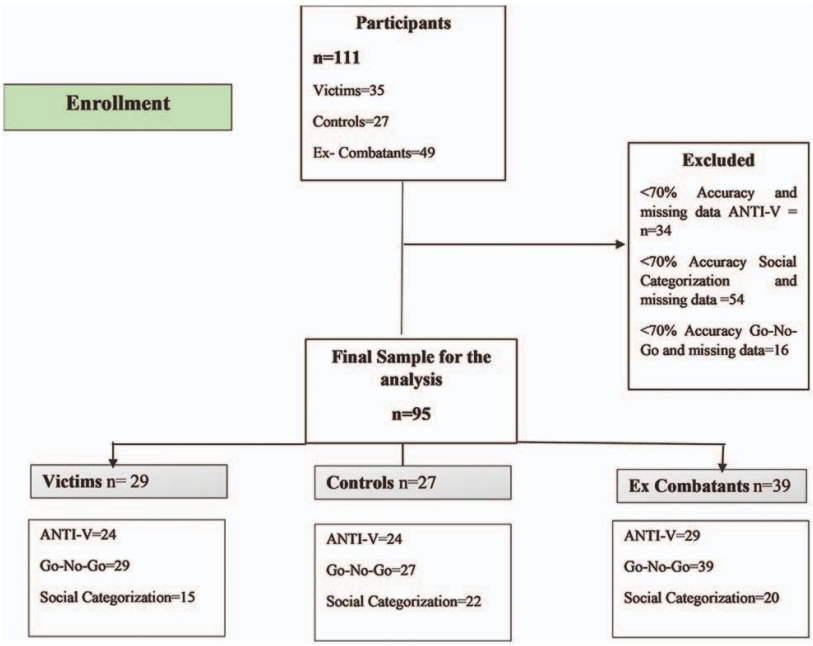


Figure 4. Flowchart that illustrates the steps for sample selection during the study

2.4. Results

2.4.1. Neuropsychological Test

Table 1 presents the values obtained in the descriptive analysis and one-way ANOVA. It also presents the effects size for post hoc comparisons for the full set of executive function test. Ex-combatants presented significant lower performance compared with victims and nonexposed controls, respectively, for all the neuropsychological instruments included. The three groups were different on the Brief IQ measures by showing large effect size for the comparisons. In addition, ex-combatants presented larger effect sizes in TMT Index of Time, TMT B Time, WCST Hits, and IFS Total, moderate effect sizes in TMT A-B Hits and TMT A Time and small effect sizes in TMT Hits Index compared with the nonexposed control group. On the other hand, victims presented larger effect sizes in TMT A Hits and IFS Total; moderate effects in WCST Hits and TMT Index of Time and small effects in TMT Hits Index, TMT A-B Time, and TMT B Hits compared with ex-combatants. Finally, victims presented medium effect size in TMT Hits and Time indexes, TMT B Hits and Time, and small effects in the other neuropsychological variables compared with the nonexposed control group. For the full set of Cohen's *d´* effect size values, see Table 1 of the supplementary material.

Table 1
Neuropsychological test descriptive results and comparisons across groups.

	Victims	**Controls**	**Ex-combatants**	**ANOVA**	**Groups differences**
	n=29	**n=27**	**n=36**		
	M (SD)	**M (SD)**	**M (SD)**	**F(p)**	
Brief IQ	86.67 (15.81)	95.78 (13.20)	77.46 (14.49)	6.30 (0.00)	V<C, C>E, V>E
TMT Hits	-0.79 (1.32)	0.00 (2.42)	-0.56 (1.61)	1.41 (0.25)	
TMT Index time	67.76 (72.50)	39.63 (38.06)	87.56 (51.71)	5.67 (0.00)	V>C, C<E, V<E
TMT A Hits	23.90 (1.41)	23.78 (2.42)	23.44 (3.03)	3.48 (0.04)	V>C, C>E, V>E
TMT A Time	59.28 (1.45)	53.70 (2.86)	62.81 (3.23)	0.98 (0.38)	

TMT B Hits	23.10 (1.29)	23.78 (2.42)	22.89 (3.09)	2.35 (0.10)	
TMT B Time	127.03 (1.81)	93.33 (2.89)	150.36 (3.08)	4.82 (0.01)	V>C, C>E, V<E
WCST Hits	24.90 (7.82)	27.11 (6.64)	21.97 (9.14)	3.22 (0.04)	V<C, C>E, V>E
IFS Total	19.55 (3.66)	20.28 (4.37)	17.49 (4.43)	3.69 (0.03)	V<C, C>E, V>E

Mean (M), Standard Deviation (SD) and One-way ANOVA (ANOVA) for neuropsychological variables that correspond to Abbreviated intellectual coefficient questionnaire (Brief IQ). Trail Making Test version A, numeric sequence (TMT A). Trail Making Test version B, alphanumeric sequence (TMT B). Wisconsin Card Sorting Test (WCST). INECO Frontal Screening (IFS).) In the item of Group, differences corresponds to Victims (V), Controls (C) and Ex-combatants (E).

2.4.2. Computerized Task

For computerized task, we reported, for the sake of brevity, only significant interactions between-subjects. Results of the ANTI-V present in Table 2 describe the percentage of accuracy (ACC) and RT for vigilance and alert, orientation, and executive control attentional indexes for victims, controls, and ex-combatants. ANOVA model found main effects in ACC for orientation, executive control, and vigilance indexes. On the other hand, RT in- formed significant main effects in all attentional and vigilance indexes. Furthermore, RT for attentional indexes was shorter for victims than ex-combatants and nonexposed controls. This pattern was not observed for the vigilance index, where nonexposed controls had better performance respect to victims and ex-combatants, respectively. See supplementary material Table 2 for the full set of comparisons.

Table 2
ANTI-V task descriptive and main effects for attentional networks and vigilance indexes across conditions.

	Victims **n=24** **M (SD)**	**Controls** **n=24** **M (SD)**	**Ex-combatants** **n=29** **M (SD)**	**ANOVA** **F(p) , ŋ2, β**
ACC (%)				
Alert	0.00 (0.08)	0.00 (0.07)	0.03 (0.09)	2.34 (0.13), 0.18, 0.33
Orienting	-0.07 (0.13)	-0.01 (0.11)	-0.02 (0.11)	5.58 (0.00), 0.26, 0.85
Executive Control	-0.04 (0.12)	0.11 (0.13)	0.16 (0.13)	118.35 (0.00), 0.78, 1.00
Vigilance	-0.65 (0.20)	-0.46 (0.25)	-0.60 (0.31)	366.85 (0.00), 0.91, 1.00
RT (ms)				

Alert	-34.75 (67.71)	-36.44 (74.37)	-23.54 (62.84)	31.18 (0.00), 0.54, 1.00
Orienting	16.19 (61.78)	25.40 (79.36)	27.95 (53.31)	25.03 (0.00), 0.50, 2.00
Executive Control	-94.04 (77.78)	-87.61 (92.14)	-87.42 (83.75)	298.99 (0.00), 0.90, 1.00
Vigilance	203.68 (199.27)	176.26 (126.65)	256.87 (205.67)	1.00 (0.00), 0.77, 85.19

ANTI-V descriptive for Mean (M) and Standard Deviation (SD) of correct trails for Accuracy (ACC) and Response time (RT) and ANOVA main effects conditions (ANOVA). Attentional Network Indexes were derivate by subtraction of conditions: Alert= Tone-No Tone Conditions, Orientation= Valid Cue-Non Valid Cue conditions, Executive Control= Congruent-Incongruent conditions and Vigilance=Vigilance-Non-Vigilance conditions.

For RT on the ANTI-V, a significant Alert x Orientation x Executive Control x Group interaction was found ($F(4, 148) = 2.54$, $p = .04$, $\eta^2 = 0.8$, $\beta = 0.71$). In this interaction, we observed differences among victims and ex-combatants, particularly effects of alert and orientation on RTs. Victims had shorter RTs when they were presented with auditory and visual cues, such as with the tone and asterisk that were presented throughout execution of the task. Ex-combatants had longer RTs under the same conditions. Figure 5 shows the Alert x Orientation x Executive Control interaction in victims ($F(2, 46) = 3.38$, $p = .04$) and controls ($F(2,46) = 4.68$, $p = .01$), but this interaction was not observed in ex-combatants ($F(2, 56) = 1.24$, $p = .30$). We also found that victims responded faster in tone trials compared with no-tone trials, and this effect was maintained in the valid condition com- pared with the invalid condition and congruent trials. Furthermore, the congruent condition works in the same way by the presence of tone/no-tone condition and cue/no-cue condition. In the incongruent condition, the subjects' performance was affected by the presence/absence of stimuli that were associated with alert and orientation compared with the incongruent condition. However, the differences between the congruent and incongruent conditions were not increased by the presence of tones and cues stimuli. Participants, particularly ex-combatants, appeared to be more "in sensitive" to respond faster to the requirements to detect and combined different target conditions.

For accuracy, we also observed a marginal Alert x Orientation x Group interaction (F (4,148) = 2.29, p = .06, η2 = 0.24, β = 0.66). For vigilance as an independent index, we found a two-way Vigilance x Group interaction (F(2, 74) = 3.71, *p* = .03, , η2 = 0.95, β = 0.66). In this interaction, both victims and ex-combatants were less accurate than controls. Victims had lower performance compared with controls (MS = 0.21, *p* < .01, 95% confidence interval, CI [0.04 to 0.39]) and ex-combatants (MS = 0.16, *p* = .06, 95% CI [-0.01 to 0.32]). For more information about other interactions in this attentional task, see supplementary material Table 2.

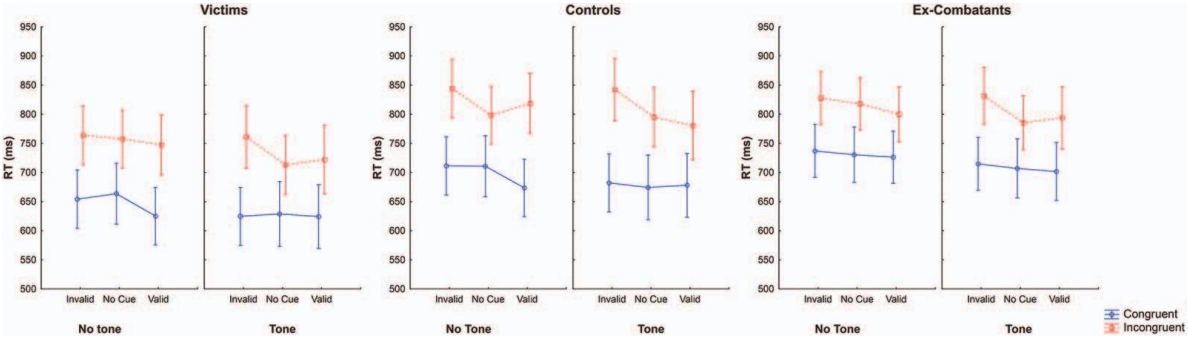


Figure 5. Results of the Four-way interaction by group from Attentional Network Test Interactions –Vigilance Task (ANTI-V) in the 2x3x2 model of repeated- measures ANOVA for Response Time (RT). The figure presents the results of the interaction of attentional networks (Alert, orientation and control) for each group (Victims, controls, and ex-combatants).

Table 3 shows descriptive analysis and main effects in the ANOVA for ACC and RT for SCST and for RT, the index of perceptual sensitivity (*d´*) and response bias (β) for Go/No-Go task for victims, nonexposed controls, and ex-combatants. In SCST, we observed significant main effects in ACC for task index and in RT for task switch index. For both main effects, the effect size (η^2) is < 0.6, indicating medium and large effects. For Go/No-Go task significant main effects were found for d= and RT for the emotional valence conditions. Nevertheless, the effect size (η^2) was

small for both models. No other significant interactions, including between-subjects factor interactions, were found in these tasks, for additional information see supplementary material Table 3.

Table 3
Social Categorization Switching Task (SCST) and Go-No-Go task descriptive and main effects by conditions and indexes.

SCST	**Victims n= 15 M (SD)**	**Controls n=22 M (SD)**	**Ex-combatants n= 20 M (SD)**	**ANOVA F(p) , ŋ2, β**
ACC (%)				
Task				37.56 (0.00), 0.64, 1.00
Age	0.88 (0.08)	0.92 (0.06)	0.86 (0.11)	
Gender	0.90 (0.08)	0.91 (0.08)	0.90 (0.08)	
Task switch				2.97 (0.09), 0.23, 0.39
Age	0.82 (0.10)	0.90 (0.09)	0.83 (0.11)	
Gender	0.87 (0.08)	0.89 (0.09)	0.87 (0.09)	
RT (ms)				
Task				0.19 (0.66), 0.06, 0.07
Age	1211.60 (206.49)	1027.37 (131.88)	1043.05 (143.67)	
Gender	1244.68 (197.44)	1072.05 (176.82)	1120.44 (213.90)	
Task switch				139.93 (0.00), 0.85, 1.00
Age	1383.96 (233.91)	1212.88 (201.76)	1248.68 (229.14)	
Gender	1350.64 (238.87)	1183.21 (220.56)	1194.82 (224.28)	
Go-No-Go	**n= 29**	**n= 27**	**n= 39**	
Perceptual Sensitivity (*d´*)				4.68 (0.01), 0.22, 0.78
Negative	2.92 (1.87)	4.31 (1.65)	2.94 (1.97)	
Neutral	3.13 (2.04)	4.57 (1.74)	3.10 (1.88)	
Positive	3.05 (2.10)	4.51 (1.75)	3.03 (1.85)	
Response Bias (β)				0.84 (0.43), 0.10, 0.19
Negative	1.09 (1.17)	0.93 (1.06)	1.72 (1.85)	
Neutral	1.06 (0.87)	1.05 (1.07)	1.90 (2.53)	
Positive	2.12 (3.43)	0.77 (0.58)	1.79 (3.03)	
RT (ms)				5.04 (0.01), 0.23, 0.81
Negative	775.85 (158.44)	849.33 (112.90)	889.14 (224.16)	
Neutral	773.39 (142.42)	834.50 (111.89)	882.87 (220.88)	
Positive	764.01 (144.96)	834.16 (116.89)	834.16 (116.89)	

Mean (M), Standard Deviation (SD) by groups and ANOVA main effects by conditions and indexes (ANOVA) for Social Categorization Switching Task (SCST) and Go-No-Go. Indexes for SCST were derivate by the subtraction of switch and no switch conditions for gender and age. In the case of Go-No-Go task, indexes were generated by the average of high and load emotional values for *d´* and β indexes. Accuracy (ACC) and Response time (RT).

2.4.3. Correlational Analysis

Correlation coefficients were analyzed to determine whether the experimental measures in the computerized task were associated with the neuropsychological tests. The behavioral indices of the ANTI-V (alert, orientation, and executive control) and vigilance were entered in the analysis with significant variables from the neuropsychological measures. Positive correlations were found between vigilance index and WCST hits (r = -0.39, $p \leq .01$). In addition, vigilance index had a negative relationship between TMT Index of time, r = 0.31, $p \leq .01$ and TMT B time, r = -0.32, $p \leq .01$. No correlations with RT were found.

Results for Go/No-Go task evidenced positive associations be- tween three emotional conditions (negative, neutral, and positive) of perceptual sensitivity (d') index and Brief IQ, WCST Hits and IFS Total and negative correlations with TMT Index of time and TMT B Time. For more information about r values and p values of these relations see Table 4. No other significant associations were found for Go/No-Go task and SCST.

Table 4
Correlational analysis between neuropsychological measures and significant ANTI-V, Go-No-Go and Social Categorization Task (SCST) variables.

	Brief IQ	**TMT Hits**	**TMT Index time**	**TMT A Hits**	**TMT B Time**	**WCST Hits**	**IFS Total**
ANTI-V							
ACC (%)							
Alert	-0.20	-0.05	0.12	-0.03	0.12	-0.24*	-0.29*
Orientation	0.26	-0.12	-0.12	-0.06	-0.13	0.09	0.04
Control	-0.15	0.05	0.19	-0.27*	0.24*	-0.15	0.01
Vigilance	0.36*	0.12	-0.31**	0.00	-0.32**	0.39**	0.24
Go-No-Go							
Perceptual Sensitivity (d')							
Negative	0.44**	0.10	-0.37**	0.21*	-0.43**	0.42**	0.44**
Neutral	0.42**	0.06	-0.34**	0.25*	-0.40**	0.37**	0.41**
Positive	0.35**	0.12	-0.31**	0.19	-0.38**	0.42**	0.43**
Response Bias (β)							

Negative	-0.12	0.05	0.21*	-0.13	0.23*	-0.20	-0.12
Neutral	-0.03	-0.02	0.09	-0.10	0.14	-0.15	-0.07
Positive	0.13	0.08	0.06	-0.08	0.05	0.00	-0.06
RT (ms)							
Negative	0.09	0.05	0.16	-0.09	0.16	0.02	0.03
Neutral	0.06	0.06	0.14	-0.11	0.15	0.02	0.05
Positive	0.11	0.04	0.13	-0.08	0.14	0.04	0.07
SCST							
ACC (%)							
Age Switch	0.11	0.04	-0.23	0.01	-0.22	0.19	0.10
Gender Switch	0.19	-0.13	-0.12	0.15	-0.16	0.11	0.20
RT (ms)							
Age Switch	-0.07	-0.18	0.21	0.09	0.19	-0.21	-0.14
Gender Switch	0.10	-0.08	-0.02	-0.12	-0.06	0.16	0.12

Correlational analysis Anti-V, Go-No-Go and Social Categorization Task (SCST); Values with two asterisks (**) correspond to *p* significant value of 0.01. Values with one asterisk (*) correspond to *p* significant value of 0.05. Abbreviated intellectual coefficient questionnaire (Brief IQ). Trail Making Test version A, numeric sequence (TMT A). Trail Making Test version B, alphanumeric sequence (TMT B). Total hits Wisconsin Card Sorting Test (WCST). Total score of INECO Frontal Screening (IFS).

2.5. Discussion

The present study characterized and compared executive function performance as a strategy to complement previous social cognition findings in subjects who had different exposures to Colombian armed conflict. We also investigated whether we could distinguish social-cognitive and behavioral modulation between victims and ex-combatants of armed conflict and nonexposed controls. Furthermore, we identified relationships between significant results of the executive function assessments and the computerized task.

We observed different executive function profiles between groups. Particularly, categorization performance evaluated with WCST was better in the group of victims compared with ex-combatants. This suggests that since both groups had different levels of exposure to armed conflict, the victims better retained their cognitive function with regard to planning and following sequences compared with ex-combatants. Furthermore, nonexposed controls were faster in the execution time in cognitive flexibility (i.e., TMT A-B). Specifically, controls had lower values in TMT Index time

compared with the group of victims and ex-combatants. These patterns were also observed for TMT B Time condition. Controls presented a better performance compared with victims and ex-combatants. Note, that victims presented a lower time of execution of TMT B test than ex-combatants did. This could be interpreted as a more effective time administration during simple and demanding categorization and sequencing task for controls and victim's, respectively. This finding provides new evidence to better understand different cognitive pro- files in people who are exposed to armed conflict, such as in Colombia. This is important when we consider that few studies have evaluated executive function in different roles in the Colombian conflict (Baez et al., 2014; Tobón et al., 2015).

On the other hand, TMT A Hits scores comparisons revealed that victims were more accurate in sequences with low cognitive demand, followed by the control group. In this case, ex-combatants had a lower performance compared with the other groups, as we observed in Table 1. This suggests that ex-combatants have larger failures to responses to complex cognitive processes. In that sense, Polak et al. (2012) found differences in performance in people who were exposed to traumatic experiences compared with nonexposed controls. These differences appeared to be related to the vigilance process. In this sense, our study showed a negative correlation where lower scores in vigilance index were associated with larger scores in TMT Time Index, TMT B Time, and WCST Hits. Together, evidence showed that TMT and WCST were a key neuropsychological variable when comparing groups and behavioral information that is derived from a computerized task.

We also observed lower total scores on the IFS and Brief IQ in ex-combatants compared with controls and victims, respectively. These findings imply that ex-combatants had lower performance that was related to general cognitive processes that are associated with attention,

flexibility, and behavioral regulation. This suggests that these abilities might be affected more in ex-combatants than in victims or nonexposed controls. For ex-combatants, the affection of this domain could also impair other cognitive domains that influence social interactions in everyday contexts. Similar results were reported in Colombian ex-combatants (Tobón et al., 2016) and people with antisocial personality disorder (Dolan, 2012; Dolan & Anderson, 2002).

The results for the victims on the IFS and TMT-A and -B indicated that they were more accurate and faster compared with ex-combatants. Ex-combatants spent more time following instructions and completing the test. Other studies in this area observed differences in performance in similar groups of participants and in subjects with clinical conditions, such as anxiety disorders, affective disorders, and brain injury, compared with healthy controls (Alvarez & Emory, 2006; Aupperle et al., 2012; Diamond, 2013; Miyake et al., 2000). However, more investigations need to be conducted to refine neuropsychological characterizations and pro- files in people who are chronically exposed to violence. Such studies should go beyond clinical and psychopathological parameters of cognitive dysfunction, brain damage, and PTSD that are traditionally used to assess ex-combatants, war veterans, and victims.

Results derivate of our study have suggested a differential response pattern in victims and ex-combatants that indicates an influence of the chronic exposure to 50 years of armed conflict and its effects on the cognitive processes in these groups, regardless of the roles assumed in the armed conflict (Tobón et al., 2015; Vasterling et al., 2012).

In the computerized ANTI-V, we observed a four-way interaction between attentional networks (alert, orientation, executive control, and group) with regard to RT. Although victims and ex-combatants had greater exposure to armed conflict, victims presented the effective utilization of attentional resources, allowing them to respond quickly to both simple and complex demands

without necessarily giving the correct answer. In the case of ex-combatants, the pattern of slow responding did not influence their ability to respond correctly in the task. The relevance of these findings to everyday life suggests that victims have a higher level of attention that allows them to be more alert in the face of conflict situations that may arise in their environment. This specific response pattern was not observed in the group of ex-combatants. That complements the studies of Baez et al. (2014), Moran (2015), and Weierstall et al. (2013), suggesting that the responses observed in victims and ex-combatants might be influenced by exposure to a violent context in terms of the efficiency of time to anticipate and respond to an external stimulus, regardless of whether the stimuli are auditory or visual. Such abilities involve attentional network function and cognitive, executive, and social skills that are adapted to a particular context (e.g., family, work, and school).

In the present study, similar effects in vigilance attentional index were found in the control group as reported previously by Roca et al. (2011). This suggests limitations in the latter two groups (victims and ex-combatants) in accurately recognizing the perceptual conflict that was presented in the task and detecting various changes in the stim- ulus array. Limitations in coping with perceptual conflict might cause distractibility during everyday life to recruit attentional resources to respond to ambiguous demands (Duncan & Owen, 2000). Similar findings were reported in patients with anxiety disorders, university students, and car drivers (Bukowski et al., 2015; Callejas et al., 2004; Roca et al., 2011).

Our study replicated results trends for the main effects for the negative valence condition across all groups for the Go/No-Go Task similar to the evidence reported by Pacheco-Unguetti et al. (2012). Authors found in university students that the task is sensitive to evaluate the recognition of emotional faces and inhibitory control among variables associated with the attentional valence

response as distractive conditions in subjects with different states of anxiety. In addition, contrary as we expected, Table 3 victims spent overall less RT compared with ex-combatants and controls, being the ex-combatants the group who spent more time to respond to distracter faces with negative valence.

For ANTI-V task victims were faster to respond to vigilance and attentional network indexes than controls and ex-combatants, respectively. Similar results were informed by Nigg (2000), Morey et al. (2008), and Pacheco-Unguetti et al. (2012) indicating that anxiety and stressful situations like wars or traumatic events can modulate the pattern to respond and recognize different stimulus and valences (i.e., emotional faces). Furthermore, it might be possible to say that victims exposed to traumatic events may share a common cognitive performance characterized by faster alerting response, even in absence of a full spectrum of anxiety disorder. The results of SCST for significant main effects for RT and accuracy on cognitive flexibility conditions showed a particular pattern. Thus, regardless of whether the participants had an overall slow response pattern, this response did not influence accuracy for either category (gender or age). Mean response accuracy reached 80% for recognizing and categorizing the stimuli for both gender and age. Such a response pattern was consistent with a previous study in bilingual adults by Marzecová et al. (2013). In this study, the authors describe that university students have accuracies up to 80% with shorter responses time that the one observed in our sample. This seems to suggest that our participants organized their behavioral performance to respond accurately as a cognitive re- source toward promoting their social adaptation even though they spend more time to get the objective.

The correlation analysis showed strong associations between behavioral indexes of attention, such as vigilance and time on the TMT (see Table 4). This suggests that cognitive flexibility and processing speed can influence the efficiency of correctly recognizing stimuli that are potentially

threatening through alert and vigilance indexes. Previous studies that involved participants with brain damage and other psychopathological conditions found an association between executive function components (e.g., cognitive flexibility and categorization) and several domains of intelligence (Albert, Moss, Tanzi, & Jones, 2001; Feldberg et al., 2016).

The present study demonstrated the utility and the sensitivity of different neuropsychological and behavioral instruments in different populations that are affected by armed conflict in Colombia. We evaluated cognitive and executive processes (e.g., attentional net- works, cognitive flexibility, emotional recognition, and inhibitory control). Specifically, results suggest that attentional response (i.e., shorter RT for victims) might influence individual adjustment to their environment (i.e., shorter cognitive flexibility in RT). On this sense, psychological field could integrate such knowledge to: (a) Contribute to reintegration programs through the identification of different cognitive profiles guided by scientific evidence; (b) adapt and design evidence-based training/psychotherapies that respond to cognitive necessities of populations exposed to armed conflicts such as ex- combatants and victims. Thus, the training of attentional abilities could reduce the searching of anxiety triggers and could improve adaptive coping strategies. In addition, psychological intervention that results been effective might be transferred to the communities through implementation programs. We expect our findings could be discussed with authorities and stakeholders.

2.6. Limitations and Future Directions

Our sample size was relatively small but similar to previous studies of active soldiers and war veterans (Ten Dam, 2015; Trujillo, Trujillo, Lopez, et al., 2017; Weierstall et al., 2013). Future

studies should replicate and complement these findings within larger samples. On the other hand, we used criteria that keep individuals with accuracy 70%. These criteria constrain the number of individuals included in our sample, allowing comparing our results with previous research. Nevertheless, in the future, authors should evaluate alternative thresholding methods to tailor a strategy for the use of experimental task among individuals exposed to conflict. Finally, further work is required to complement and analyze our findings and integrate them into public policies and evidence-based mental health and rehabilitation pro- grams to assist people who are affected by armed conflict in both, Colombia, and around the world.

We consider that our results encourage the implementation of evidence-based strategies to attend and adapt effective evaluations and interventions. The strategy could promote enhancing the characterization of these processes in both, nonclinical and clinical populations of victims, ex-combatants, and people with different levels of exposure to armed conflict in its natural contexts (e.g., school, society, and work; Gawerc, 2006; Miller & Rasmussen, 2010; Vasterling et al., 2006). Together, we expect in the future to promote the use of experimental psychology task to contribute to the strategies of psychological assessment, training and, peace-building.

CAPÍTULO 3

HOW EMPATHIC ARE WAR VETERANS? AN EXAMINATION OF THE PSYCHOLOGICAL IMPACTS OF COMBAT EXPOSURE

El contenido de este capítulo se encuentra publicado como Trujillo, S. P., Trujillo, N., Ugarriza, J. E., Uribe, L. H., Pineda, D. A., Aguirre-Acevedo, D. C., ... & Garcia-Barrera, M. A. (2017). How empathic are war veterans? An examination of the psychological impacts of combat exposure. *Peace and conflict: journal of peace psychology*, *23*(4), 422. DOI: 10.1037/pac000025

3.1. Abstract

How empathic are battle-experienced war veterans and demobilized ex-combatants? Individuals who have participated in war-related violence tend to show an increased risk of mental health problems, which makes their readaptation to postconflict civilian life much more difficult. This study is the first systematic attempt to evaluate whether war experiences are potentially related to empathic deficit among veterans. Based on a sample of 624 demobilized ex-guerrillas and ex-paramilitaries from the Colombian armed conflict, we identify 3 clearly distinct empathic profiles, suggesting that, while lack of empathy is not generalized among ex-combatants, there is an important subgroup of veterans who present such a dispositional profile. Identification of this critical subgroup will be crucial to policies aimed at assisting postconflict reintegration efforts.

3.2. Public Significance Statement

Empathy is a social dimension that plays a crucial role in the process of understanding other people's misfortunes, as well as in the generation of concern feelings toward counterparts. Subjects with limited levels of empathy tend to show atypical social behavior such as aggression. We suggest that the effect of exposure to war experiences actually has an impact on the empathic profiles of former combatants. Our study shows that ex-combatants' abilities to evaluate feelings of displeasure, associated with observing or hearing stories of others in unfortunate experiences, show low scorings in 70% of the sample. These results suggest a potential causal relation between combat exposure and diminishing empathic levels, which demands a systematic evaluation in further studies.

3.3. Introduction

Evidence has been accumulating regarding the psychological impact of combat experience on war veterans. Among the different disorders observed after war, most works report high levels of posttraumatic stress disorder, depression, aggressive behavior, and diminishing empathic disposition. This array of psychological disorders and behaviors has been observed among veterans of international wars such as the Second World War and among ex-combatants of internal armed conflicts such as the one in Colombia. For instance, Tobón et al. (2015) found in a Colombian sample of former combatants evidence linking neurological mechanisms with varying empathy levels. Furthermore, distinguishing empathy levels among ex-combatants offers a promising avenue to enlighten the potential neurocognitive effects of war.

The Interpersonal Reactivity Index (Davis, 1980) is used to assess affective and cognitive empathic dispositions. Results using this instrument found that diminishing in the affective component of empathy may promote antisocial behavior and misinterpretation of social situations (Perez-Albeniz & de Paul, 2004). Complementarily, brain areas involved in affective processing describe hyperactivity in subjects with strong political interests (Gozzi, Zamboni, Krueger, & Grafman, 2010). Together, we suggest that the combination of reduction in the affective empathic component and the presence of radical political objectives might generate abnormal responses to social contingencies in ex-combatants.

Exploring the ways in which war experiences may affect emotional processing, such as empathic response at a psychological level, and discussing its theoretical association with neural functioning, this study examines individual profiles of the affective and cognitive components of empathy within a sample of ex-combatants from Colombian illegal armed groups. Using latent class cluster analysis (LCCA), we classified individuals into different groups according to

empathic dispositions, while controlling for variability within the sample. We expect to find varying levels of empathic dispositions among ex-combatants.

3.4. Method

3.4.1. Participants

Ex-combatants from Colombian illegal armed groups who are actively involved in the official reintegration program were recruited for this study. Our sample was comprised of ex-combatants with two main types of former affiliations: 38.3% came from Marxist–Leninist guerrilla groups mainly recruited from rural areas, and 60.1% of them were ex-paramilitaries who serve as a private security army for the protection of the land and inhabitants of regions controlled by guerrillas. No information about group affiliation was obtained from 10 subjects (1.6%). Other selection criteria included (a) answering a sociodemographic interview confirming their previous participation in Colombian illegal armed groups; (b) demonstrating at least 3 years of basic education; and (c) voluntary acceptance to participate in the study, by signing an informed consent according to the Declaration of Helsinki. Sociodemographic characteristics of the final sample are summarized in Table 1.

The enrollment process took place between February and July 2011, and a total of 624 subjects completed a Spanish version of the Interpersonal Reactivity Index (IRI; Mestre-Escrivá et al., 2004). Although this instrument follows a self-report format, a pilot study revealed that item complexity affects the performance of subjects with low education levels. To deal with this situation and to guarantee data collection quality, nearly 10% of the information was gathered via

individual semistructured interviews. The data collection instrument was applied in a classroom during psychosocial therapy.

3.4.2. Instrument

The Interpersonal Reactivity Index (Davis, 1980) consists of four subscales, each measuring a different aspect of empathy: perspective taking (PT), empathic concern (EC), fantasy (F), and personal distress (PD). The questionnaire uses a multidimensional approach to evaluate dispositional empathy, underlying cognitive and affective constructs. The short version includes 28 items, divided into four 7-item subscales. Fantasy (F) evaluates the ability to share personal aspects or to identify oneself with characters from a book, a novel, a movie or an imaginary situation. Perspective taking (PT) evaluates the ability to understand and adopt other perspectives and to recognize the position or feelings of others. Empathic concern (EC) evaluates the response to feelings such as compassion, sympathy, or concern for others during difficult situations. Personal distress (PD) evaluates feelings of displeasure associated with observing or hearing stories of others in unfortunate experiences. Using a Likert-type rating scale, participants rate each item with five response options, from “does not describe me well” to “describe me very well.” The total score ranges from 0 to 112 and from 0 to 28 for each subscale. Reliability analysis reports Cronbach’s alpha coefficients ranging from 0.7 to 0.78 (Davis, 1980). The Spanish version has reported internal validity values ranging from 0.64 to 0.70 (Mestre-Escrivá et al., 2004).

3.4.3. Statistical Analysis

Descriptive statistics were calculated to depict the sample's characteristics. Comparisons were made with analyses of variance, using Bonferroni's post hoc pair group comparisons. Contingency tables with chi square distribution were developed to compare categorical variables. LCCA models for the scores on the four dimensions of the IRI were developed. By using the Latent GOLD 4.0 software (Statistical Innovations, Belmont, MA), we selected the best-fitting class out of 10 classes provided by the LCCA analysis, with no prior hypothesis. Latent GOLD uses both expectation/maximization (EM) and Newton-Raphson algorithms to find the maximum likelihood of each model after estimating model parameters. To avoid ending up with local solutions (a well-known problem in LCCA), we used multiple sets of starting values, which were automatically implemented in Latent GOLD. Because we were dealing with sparse contingency tables, we estimated p values associated with L2 statistics by means of parametric bootstraps (500 replications) rather than relying on asymptotic p values. According to the latent class model, no interactions between variables were initially considered. Local independence of the standard latent class model was supported by progressively controlling the bivariate residuals (BVRs), until the variable–variable and covariate–variable associations were fairly close to 1 or less. Latent GOLD calculates bivariate variable–variable and variable–covariate residuals that can be used to detect which pairs of observed variables are more associated, generating local dependence effects. Successive LCCAs were conducted until elimination of all variable–variable and variable–covariate was completed, and residuals were greater than 1.5. Gender, age, and education level were explored as active and inactive covariables. The profiles almost collapsed at these points in all the explored models, and these demographic variables were excluded from the final LCCA. The final best model was selected by using the model fit L2 or LL, the lowest Bayesian information

criteria (BIC), the number of parameters (Npar), the bootstrap p value of =.05, the BVRs, and the highest proportion Npar/sample size (n). The BVRs corresponded to a Pearson chi-squared test divided by the degrees of freedom. The chi-squared test was computed on the observed counts in a two-way table using the estimated expected counts obtained from the estimated model. If the model were true, BVRs would not be substantially larger than 1 and the Npar/n proportion must be over 5 (see Magidson & Vermunt, 2004).

3.5. Results

The LCCA of the IRI's four dimension scores (F, PT, EC, PD), after determining likelihood goodness-of-fit indexes, the n/Npar relation, and the residual control, yielded a model of three clusters as the best-adjusted model (LL = 1,692.29; BIC = 3474,68; Akaike information criterion = 3,412.61; Npar = 14). Cluster 1 included 284 participants (46%), Cluster 2 was made up of 202 participants (32%), and Cluster 3 of 137 participants (22%).

The profiles showed that Cluster 1 described low probabilities of obtaining high scores on F, PT, EC, and PD, which indicates a group of individuals with low cognitive and affective empathy. Cluster 2 showed high probabilities to score high on PT and EC, which correspond to the cognitive empathy dimensions. On the emotional F dimension, this Cluster describes similar scores to the global median, which means that participants informed a similar probability to show high or low median scores. Also, both Clusters 1 and 2 presented low PD scores, which could be interpreted as an indicator of low social stress about others' misfortunes (see Figure 1). Cluster 3 presented high probabilities of obtaining mid to high scores on the three of the four dimensions of the IRI–

Spanish version, while EC presented a higher probability to attain lower median scores in this cluster. The median obtained for each group in the four scales of the IRI are shown in Figure 1.

Table 1.
Demographic and Social Characteristics of the Three Latent-Class Clusters of IRI–Spanish Version, answered by 624 Colombian Ex-Combatants From Illegal Armed Groups

	All together		Cluster 1 (*n = 284)*		Cluster 2 (*n = 202)*		Cluster 3 (*n = 137)*		
Variable	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*P*
Gender[a]									0.000[b]
Male	517	82.9	257	90.5	159	78.7	101	73.7	
Female	106	16.6	27	9.5	43	21.3	36	26.3	
Illegal group									0.104
Guerrilla	239	38.3	93	32.7	88.0	43.6	58.0	42.3	
Paramilitary	375	60.1	186	65.5	111.0	55.0	78.0	56.9	
No infromation	10	1.6	5	1.8	4.0	2.0	1.0	0.7	
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	
Age (years)	31.9	8	32.0	7.3	31.8	6.9	32.0	7.2	0.869
Level of education (years)	8	3.8	7.8	3.8	8.5	4.0	7.5	3.5	0.029[c]

Note. IRI = Interpersonal Reactivity Index.
One missing case. b Clusters 1 and 2 (*p* _ .00) and between Clusters 1 and 3 (*p* _ .00), and no difference was found between Cluster 2 and Cluster 3 in terms of gender distribution (*p* _ .29). c Difference between Cluster 2 vs. Cluster 3 (*p* _ .05), post hoc test Bonferroni. No other difference was found.

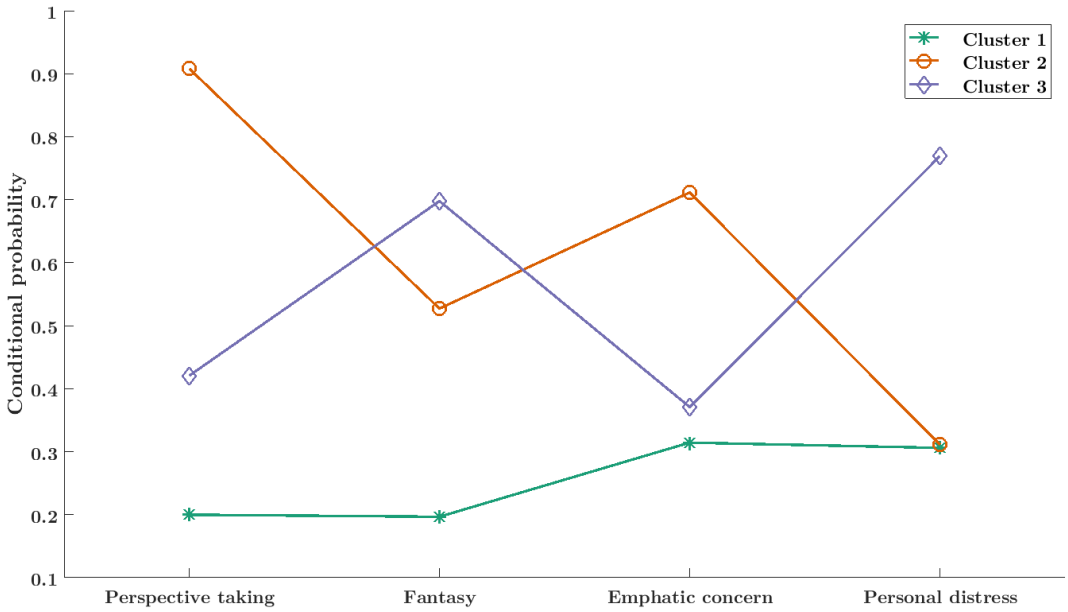


Figure 1. Interpersonal Reactivity Index (IRI) Spanish version dimensions. Axis Y corresponds to conditional probability scores of obtaining the IRI dimension scores higher than the median. Axis X shows the four IRI dimensions. See the online article for the color version of this figure.

Figure 1 Interpersonal Reactivity Index (IRI) Spanish version dimensions. Axis Y corresponds to conditional probability scores of obtaining the IRI dimension scores higher than the median. Axis X shows the four IRI dimensions. See the online article for the color version of this figure.

Table 1 summarizes the characteristics of each cluster. Cluster 2 displays a larger difference on educational level in comparison with Cluster 3 (p = .05). Gender showed a significant difference across groups. Males were significantly predominant in all the clusters, which corresponds with the general characteristics of the overall ex-combatant population. A contingency table of 3 = 2 cells showed statistically significant differences for gender between Clusters 1 and 2 (p = .001) and between Clusters 1 and 3 (p = .001), and no difference was found between Cluster 2 and

Cluster 3 in terms of gender distribution (p = .29). No other differences were observed for other demographic variables such as education or age.

3.6. Discussion

The purpose of this study was to examine and describe the profiles of the affective and cognitive components of empathy in a sample of ex-combatants from Colombian illegal armed groups; this was achieved using a LCCA. Results indicated that three groups could clearly be identified from IRI scores. Interestingly, the selected individuals were similar in variables such as illegal group affiliation, age, education, and gender distribution. These results are essential for showing that people involved in illegal armed conflicts have different empathic profiles, which may indicate particular forms of affectively and cognitively consider their opponents.

In particular, Cluster 1 showed high probabilities of poor performance across the four dimensions of IRI. Thus, they exhibit a greater probability to display dispositional difficulties in recognizing and evaluating other people's feelings. These participants are prone to either manifest poor understandings of others' emotional states, or to take the perspective of others. In both cases, their emotional reactions do not reflect personal distress. Regarding war contexts, individuals with poor dispositional empathy are supposed to be more aggressive and unemotional in situations (such as torture and massacres) and tend to assume a more active role in armed confrontations (Nordgren, McDonnell, & Loewenstein, 2011).

Further research is needed to explore the role of other motivational drives and psychopathological disorders on this cluster and its relation to politically oriented violence.

A recent study in ex-combatants showed a negative correlation between scores on empathy and neurobiological response suggested that, the worse empathy impairments were, the greater the reactivity to emotional saliency observed in the neurobiological response (Tobón et al., 2015). The relation between atypical emotional processing with larger aggressive expression, has been reported recently among ex-combatants (Quintero-Zea et al., 2017). The presence of this combined traits usually tends to be accompanied with an increased social skill profile.

Cluster 2 shows different cognitive and emotional processing patterns than those observed in Cluster 1. Participants from Cluster 2 have a high probability of scoring high in three of the IRI dimensions: F, PT, and EC. These results reveal an adequate ability to rationally understand displeasure or misfortune involving others in real or imaginary situations in comparison with the other clusters. Nevertheless, these individuals are less able to express anxiety or discomfort regarding negative situations experienced by others, which indicates some kind of incongruence between cognitive and emotional processing, as well as in comprehension and adaptive reactions. Limited empathic discomfort when observing others' negative feelings may result in indifferent reactions to their light and less motivation to help (Decety & Ickes, 2009).

Behavioral evidence suggests that personal distress is alleviated by the performance of altruism, and cooperation; thus, it is possible to suggest that stress is one of the core mechanisms to promote compensatory or caring behavior (Decety & Ickes, 2009). Furthermore, the distress response is crucial for the inhibition of aggression due to the observation of distress in the victim. Failures in this type of empathy processing observed in the participants comprising Cluster 2 might suggest the presence of an impairment in prosocial functioning or the expression of disruptive behavior (de Wied et al., 2010).

The cognitive (PT and FS) and affective (PD) empathy scores observed in Cluster 3 were comparable to those of typical individuals in Spanish sample (Mestre-Escrivá et al., 2004). This is not an unexpected result, given that even in the presence of violent behavior, it is possible to observe appropriate dispositional empathy (Decety & Ickes, 2009). Similarly, a classic study with Vietnam veterans concluded that subjects with an adequate disposition to empathy could develop altruistic feelings for others, even after war involvement (Kishon-Barash, Midlarsky, & Johnson, 1999).

EC, meanwhile, was the only dimension with a high probability of returning lower median scores in this sample. Interestingly, a recent study showed that a second-order factor derived from confirmatory factor analysis has a strong association with the latent empathic concern dimension as measured in ex-combatants (Garcia-Barrera, Karr, Trujillo-Orrego, Trujillo-Orrego, & Pineda, 2017). These authors suggested that it is necessary to evaluate the hypothesis that a low level of EC may be associated with an adaptive ability to personalize others' situations, allowing these ex-combatants to perpetrate violent actions against others in the war context. Particularly, military training appears to adjust reactions, diminish stress responses to confrontations and aggression against others, or both (Morgan et al., 2000).

In summary, the results of Cluster 3 support the hypothesis that recognition, evaluation, and reaction to other people's emotions are associated with social functioning. In addition, this group's scores suggest conservation of the regulating emotional response of goal directed actions and of the adaptive role of empathy (Decety & Ickes, 2009). The results observed for EC could also suggest an adaptive mechanism necessary to survive war. However, these data also suggest the need to consider military training as an element that may bias decisions and consequently modulate empathic reactions.

To our knowledge, this is one of the first articles to report individual dispositions among Colombian ex-combatants. Further studies should be taken into account in the following areas:

1. The inclusion of implicit measures of empathy due to limited social desirability derived from the implementation of direct interviews.

2. Future studies should also assess the possible relationship between individual differences in measures of empathy and violent behavior.

3. The inclusion of neuropsychiatric and cognitive measures aiming to complement the interpretation of the findings.

4. Our findings should be evaluated against studies considering anthropological and contextual backgrounds, underlying involvement in the group's activities, roles played in the group, and the configuration of political stereotypes.

This study on dispositional empathy among Colombian ex-combatants demonstrated that there is not a unique empathic profile among this population. We observed the conformation of three latent class clusters of ex-combatants that only differ in terms of cognitive and affective empathy configurations. For instance, Cluster 3 shows adequate cognitive and affective empathy, except for a diminished capacity for empathic concern; in contrast, Cluster 1 presents the opposite characterization, in which cognitive and affective empathy returned the lowest value in the sample. Finally, Cluster 2 shows limited stress response, which may limit adaptive behavior in social contexts. Low scores in the personal distress dimension are shared by Clusters 1 and 2. Further research is needed to explore the relation of this dimension and aggression in social contexts.

CAPÍTULO 4

ATYPICAL MODULATIONS OF N170 COMPONENT DURING EMOTIONAL PROCESSING AND THEIR LINKS TO SOCIAL BEHAVIORS IN EX-COMBATANTS

El contenido de este capítulo se encuentra publicado como Trujillo, S. P., Valencia, S., Trujillo, N., Ugarriza, J. E., Rodríguez, M. V., Rendón, J., ... & Parra, M. A. (2017). Atypical modulations of N170 component during emotional processing and their links to social behaviors in ex-combatants. *Frontiers in human neuroscience*, *11*, 244. DOI: 10.3389/fnhum.2017.00244

4.1. Abstract

Emotional processing (EP) is crucial for the elaboration and implementation of adaptive social strategies. EP is also necessary for the expression of social cognition and behavior (SCB) patterns. It is well known that war contexts induce socio-emotional atypical functioning, in particular for those who participate in combats. Thus, ex-combatants represent an ideal non-clinical population to explore EP modulation and to evaluate its relation with SCB. The aim of this study was to explore EP and its relation with SCB dimensions such as empathy, theory of mind and social skills in a sample of 50 subjects, of which 30 were ex-combatants from illegally armed groups in Colombia, and 20 controls without combat experience. We adapted an Emotional Recognition Task (ERT) for faces and words and synchronized it with electroencephalographic recording. Ex-combatants presented with higher assertion skills and showed more pronounced brain responses to faces than Controls. They did not show the bias towards anger observed in control participants whereby the latter group was more likely to misclassify neutral faces as angry. However, ex-combatants showed an atypical word valence processing. That is, words with different emotions yielded no differences in N170 modulations. SCB variables were successfully predicted by neurocognitive variables. Our results suggest that in ex-combatants the links between EP and SCB functions are reorganized. This may reflect neurocognitive modulations associated to chronic exposure to war experiences.

4.2. Introduction

Emotional processing (EP) relies on fast neural mechanisms which are crucial for promoting adaptive survival strategies (Plutchik, 2001; Adolphs, 2003; Brown et al., 2010; Barratt and Bundensen, 2012; LoBue and Rakison, 2013). Facial expressions allow individuals to quickly identify other people's emotional status (Ekman and Oster, 1979; Batty and Taylor, 2003; Eimer and Holmes, 2007; Luo et al., 2010; Recio et al., 2011; Weymar et al., 2011; Sawada et al., 2014). Similarly, a fast categorization has also been observed when emotional content is conveyed by words (Kanske and Kotz, 2007; Ibanez et al., 2011; Rohr and Rahman, 2015). The early identification of emotional information provides clues which are necessary for social interactions e.g., to anticipate potential threats.

Recent studies have shown that early neural markers of EP can predict critical dimensions of social cognition and behavior (SCB) (Hurtado et al., 2009; Ibanez et al., 2014; Kawamoto et al., 2014; Dozolme et al., 2015; Zinchenko et al., 2015). For instance, Petroni et al., (2011) reported in healthy university students associations of the electrophysiological marker N170, sensitive to emotional valence, and SCB dimensions informing on theory of mind and executive functions. Ibanez et al., (2014) reported atypical Event Related Potentials (ERP) modulations during the analysis of the Stimulus Type Effect (i.e., greater amplitudes during face relative to word processing over the right hemisphere) in patients with schizophrenia. These patients show a reduced cortical activation over the right hemisphere during face processing in comparison with words. Although it should be noted that such a differential increase in N170 amplitude seen in patients with schizophrenia might be contingent upon the contrasted stimuli as others have found the opposite pattern when faces are contrasted to buildings rather than words (Herrmann, Ellgring, & Fallgatter, 2004). Ibanez et al., (2014) also suggested that modulations of the N170 component

during EP of faces are a sensitive predictor of social and cognitive performance in healthy participants as well as in patients with schizophrenia, attentional-deficit/hyperactivity disorder and bipolar disorders. Taken together, such evidence suggests an association between early cortical markers of EP and SCB. It follows that subjects with aberrant behavioral and neural markers of EP would present with impaired SCB (Hall et al., 2004).

In support to this proposal, it has been found that impairments during the processing of faces conveying emotional expressions are associated with atypical social responses in individuals with brain damage (Adolphs et al., 2002), autism (Adolphs et al., 2001), schizophrenia (Hooker and Park, 2002), and psychopathy (Decety et al., 2014). An important population to investigate this hypothesis is that of ex-combatants as it represents a non-clinical group with well-documented impairments in EP (Quintero-Zea et al., 2017; Tobón et al., 2015; Trujillo et al., 2017). Ex-combatants typically present with diminished empathic expressions (McCarroll et al., 2010; Slep et al., 2010), increased levels of aggression and violence (Jakupcak et al., 2007; Taft et al., 2007; Gallaway et al., 2012), high proportion of a wide variety of mental disorders (Taft et al., 2007; Kaplan and Nussio, 2015, 2016; Weierstall et al., 2013) as well as high emotional reactivity reflected via emotion related ERP components (IAPS; Lang et al., 1988) (Tobón et al., 2015).

A chronic exposure to war experiences may lead to a gradual implementation of adaptive mechanisms which may render EP in these individual atypical as compared to controls. Our main hypothesis is that ex-combatants' SCB have undergone reorganization due to their war experiences and such reorganization could be accounted for by associations between atypical modulations of emotion related ERP components (i.e., N170; Ibanez et al., 2014) and EP responses such as poorer behavioral performance during emotional recognition tasks. Moreover, we hypothesized that ERP

markers of EP would be associated with SCB in both groups, and would account for lower EP performance in ex-combatants.

The decision to focus on the N170 component was entirely theory-driven. Although the role of N170 as a pure physiological measure of EP remains controversial, evidence has accrued suggesting that in the context of emotional recognition paradigms as the one used in our study, it does index the neural responses to the emotional valence of faces and words (Schacht & Sommer, 2009; Petroni et al., 2011; Ibanez et al., 2014). N170 provides a sensitive marker of EP during both semantic (Luo et al., 2010; Ibanez et al., 2011; Ibanez et al., 2014; Zhang et al., 2014; Chen et al., 2015) and facial processing (Batty and Taylor, 2003; Lou et al., 2010; Meaux et al., 2014). There is evidence that EP forms part of the repository of functions supporting SCB components such as empathy, ToM, and social skills (Petroni et al., 2011; Melloni, Lopez, & Ibanez, 2014; Quintero-Zea et al., 2017; Trujillo et al., 2017). Social cognition is known to rely on perceptual integration which subserves the interpretation of human interactions (Andreou et al., 2015) such as inference of emotional stages, intentions, beliefs and reasoning of others (Adolphs, 2001; Petroni et al., 2011; Stanley and Adolphs, 2013; Bora et al., 2016; Kalin et al., 2015). For the purpose of the present study, and in line with previous reports (Quintero-Zea et al., 2017; Trujillo et al., 2017), we decided to included 3 measures of social cognition indexing theory of mind and empathy (i.e., The Interpersonal Reactivity Index-IRI, Davis, 1983; the Read the Mind in the Eyes, Baron-Cohen et al., 2001; and the Hinting task, Gil et al., 2012). We also included measures of social behaviors which are sensitive to explore ecological patterns of interactions during daily social contacts. We included self-report measures (Gismero, 2000) which incorporate multidimensional constructs of social skills. In this study, we interpret SCB as a construct derived from the estimation of cognitive resources used during social interactions and the evaluation of explicit social responses. Thus, we

considered SCB a multidimensional domain assessed with measures of ToM, empathy and social interactions. This framework was used to investigate the extent to which modulations of the N170 component during a word and face emotional categorization task would serve as a marker of EP and if so, whether they would predict SCB patterns in Colombian ex-combatants and controls.

4.3. Methods

4.3.1. Participants

The sample consisted of fifty four participants. Of these, thirty four were ex-combatants from illegal groups of the Colombian armed conflict who, by the time of the study, were enrolled in the reintegration program offered by "Agencia Colombiana para la Reintegración" (http://www.reintegracion.gov.co/en). A trained psychologist (NT) performed an initial short individual interview who collected the history of psychiatric and neurological disorders that had required medical care. Those requiring such care were excluded from the study. We also excluded individuals that were not able to perform the task. The decision about excluding participants was made by the research group after careful consideration of the outcomes from the interview and before the EEG session. We exclude 4 ex-combatants due to substance dependence (2), history of cerebrovascular disease (1) and active pharmacological treatment for depression (1). The final sample consisted of 20 Controls and 30 Ex-combatants. Both groups were matched according to age, gender, and years of education (Table 1). Ex-combatants were mainly men (28 men and 28 were right-handed), their ages ranged from 27 to 57, and had an average education of 10.23 years (SD=3.03). The control group consisted of 20 volunteers (18 men, 19 right handed) with ages ranging between 24 and 55 years and a mean education of 11.05 years (SD=2.14). All the participants read and signed the informed consent before starting the study. The study procedures

and informed consent was approved by Ethics Committee of the Faculty of Medicine Universidad de Antioquia, Medellin, Colombia.

Table 1.
Mean data and statistical analysis for group comparisons using demographic and social cognition dimension variables from ex-combatants and controls

	Ex-combatants (n=30) M(SD)	Controls (n=20) M(SD)	t/Chi^2 (P)
Demographic			
Age	37.50 (8.22)	36.1 (9.17)	0.54 (0.59)
Gender (F:M)	2:28	2:18	0.41 (0.52)
School level	10.23 (3.03)	11.05 (2.14)	-1.12 (0.27)
Laterality (L:R)	3:27	1:19	0.18 (0.67)
Social cognition			
IRI PT	16.90 (4.91)	15.60 (4.08)	1.00 (0.34)
IRI FS	13.30 (4.68)	13.25 (5.10)	0.03 (0.97)
IRI EC	19.13 (4.66)	18.45 (2.82)	0.59 (0.56)
IRI PD	11.23 (5.10)	13.50 (4.78)	-1.58 (0.12)
Hinting task	17.77 (2.20)	16.68 (4.78)	0.93 (0.29)
RMIE	19.76 (5.80)	19.89 (4.24)	-0.08 (0.94)
GSSS	68.10 (15.86)	80.40 (25.56)	***-2.10 (0.04)***
SS1	15.60 (5.67)	18.00 (7.94)	-1.25 (0.22)
SS2	10.43 (3.07)	10.60 (4.61)	-0.15 (0.88)
SS3	10.33 (2.89)	11.55 (3.85)	-1.27 (0.21)
SS4	11.47 (4.12)	16.20 (5.67)	***-3.42 (0.00)***
SS5	9.30 (3.45)	10.85 (4.07)	-1.45 (0.15)
SS6	10.97 (3.44)	13.20 (4.07)	***-2.9 (0.04)***

IRI PT, perspective taken; IRI FS, fantasy; IRI EC, empathic concern; IRI PD, personal distress; RMIE, Reading the mind in the eyes; GSSS, Global social skills score; SS1, auto-expression in social situations; SS2, defense of the rights as consumer; SS3, anger or unconformity expression; SS4, to say not and to cut interactions; SS5, make petitions; SS6, initiate interactions with opposed sex. Bold and italic represent significant effects.

4.3.2. Assessment of cognition and social behavior

Theory of mind

We used the revised version of the Reading the Mind in the Eyes task (Baron-Cohen et al., 2001). The task consists of 36 photos of the eyes area (males and females) portraying different emotional expressions. Each image was surrounded by five possible answers of which only one

was correct and the others were distractors. Participants had to indicate, by selecting the appropriate option, the emotion they saw in the image of the eyes.

The Hinting task, created by Corcoran et al., (1995) evaluated the inference of social intentions. It consists of 10 short stories that represent the interaction between two characters. At the end of each story, one of the characters provides an obvious hint. Subjects were asked to evaluate what the hint really meant within the story context.

Empathy

The Spanish version of the empathy scale Interpersonal Reactivity Index (IRI) of Davis (1983) was used (Escrivá et al., 2004). This scale evaluates dispositional cognitive and emotional empathic dimensions. The scale has 28 self-report items of which 19 are redacted in a positive sense and 9 in a negative sense. Responses are entered using a 5-point Likert scale (1 = it does not describe me well to 5 = it describes me very well). The scale is divided into 4 dimensions: Perspective Taking (PT), Empathic Concern (EC), Fantasy (FS), and Personal Distress (PD). PT evaluates the ability to consider other´s points of view. EC assesses the response to feelings of compassion or sympathy through recognizing others misfortunes. FS explores the ability to self-identify as a fictional character in a story such as novels, books or movies. PD measures self-oriented negative arousal in response to stressors, attitudes, and experiences of other people.

Measures of social skills

The social ability scale of Gismero (2000) is a self-report instrument that evaluates everyday social behaviors via 33 items. This scale inquiries individuals about their ability to interact with others in different situations. Items are grouped in six dimensions: 1) self-expression in social situations, 2) defense of own rights as a consumer, 3) expression of anger or displeasure, 4) stop

interactions and saying no, 5) make requests, 6) start positive interactions with the opposite gender. Responses are recorded using a 4-point Likert scale (1 = I do not identify with that at all / most of the time it does not happen / I would not do it to 4 = I totally agree / most of the time / I would behave like that). The scale has an alpha Cronbach of 0.88 and has demonstrated to be sensitive to social skills variations in normal populations (Gismero, 2000). Larger values of this score suggest reduced social assertion.

4.3.3. Emotion recognition task (ERT)

A task for identifying faces and words with emotional content was implemented in E-prime (Psychology Software Tools, Pittsburg, USA). The stimuli consisted of 90 pictures of female and male faces (30 happy, 30 neutral and 30 angry) which were taken from the MMI Facial Expression Database (Pantic et al., 2005). Additionally, 90 words (30 pleasant, 30 neutral and 30 unpleasant) were selected from the linguistic corpus generated by the communications faculty of the University of Antioquia (PRESEEA, 2005). The Linguistic corpus contains the list of words more frequently used in Antioquia, Colombia (PRESEEA, 2005). From the corpus we selected words with two to three syllabi with the highest frequency in the metropolitan area of the city, categorized as positive, neutral or negative in content according to the report by (PRESEEA, 2005). Both faces and words were adapted following Ibanez et al.'s (2011) methodology. The stimuli were presented on a 17" PC screen placed 60 cm away from the participant's eyes. In addition, a pilot study was carried out to corroborate the validity of the adapted task to investigate emotional recognition discrimination. We found a large overall precision (around 90%), differential reactions times across conditions and the Stimulus Type effect reported by Rossion (2003) (See details of the pilot study in Supplementary Material 1).

The task sequence is shown in Figure 1. A fixation cross was presented for 1000 ms which was followed by the stimulus display (i.e. face or word) presented for 200 ms. immediately after, the participant's response was requested. If the stimulus was a face, they were asked to decide whether it showed a happy, neutral, or angry expression. If the stimulus was a word, they were asked to decide whether it described a pleasant, neutral, or unpleasant emotion. Participants entered their responses by pressing one of three keys previously allocated of a standard PC keyboard. Correct responses were followed by a black screen which appeared for a random duration between 700 and 1000 ms (i.e., inter- trial interval). The incorrect response was indicated by a red letter "X" which appeared in the center of the screen for 100 ms. this feedback was used to encourage attention to the task. The feedback screen was followed by the inter-trial interval described above.

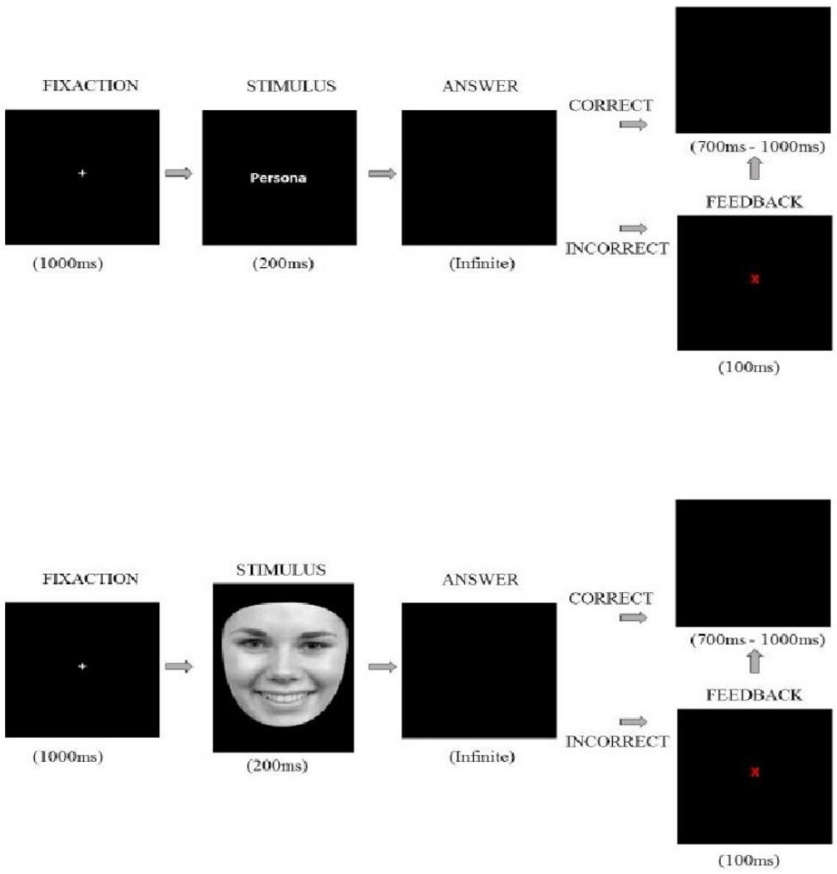


Figure 1. An example trial for each stimulus category of the Emotion Recognition Task

The experiment was divided into two blocks, each with 180 stimuli. Each block consisted of 45 faces and 45 words (15 happy, 15 neutral and 15 angry faces, and 15 pleasant, 15 neutral and 15 unpleasant words). Each stimulus was presented twice in a random order with faces and words intermixed in the same sequence always avoiding more than two consecutive stimuli of the same valence. We calculated reaction time, accuracy and types of errors (i.e. the proportion of response erroneously assigned from the other two conditions).

4.3.4. EEG recordings

The ERT was synchronized with EEG recordings. EEG signals were acquired with a 64-channel EEG NeuroScan SynAmps2 sampling at a frequency of 1KHz. Quick-caps were placed according to the 10-20 system. Impedances were kept below 10 kΩ. Recording sessions were carried out in a Faraday cage of 2x1 m with dimmed light for guaranteeing isolated electric conditions.

4.3.5. Signal Processing

EEG recordings were pre-processed in EEGLab toolbox ran on Matlab 2012 (Delorme, and Makeig, 2004). The original signals were downsampled from 1000 to 500 Hz and offline re-referenced to mastoids. In order to reduce the environmental artifacts a band-pass Infinite Impulse Response (IIR) digital filter was applied (0.1 to 30 Hz). An Independent Component Analysis (ICA) for EEGlab (Delorme, and Makeig, 2004) was performed in order to remove electrooculography (EOG) artifacts. A maximum of two artifact components were removed. Thereafter, signals were reconstructed to their original configuration.

Each Task (Face/Word) and Condition (Happy/Pleasant, Neutral/Neutral and Angry/Unpleasant) was epoched with 1s windows (-200 to 800ms). Epochs were baseline

corrected using the window -200 to 0 ms. Additionally, each epoched signal was visually inspected to manually remove the remaining artifacts.

4.3.6. Procedures

The application of the SCB scales and the ERT was counterbalanced across participants whereby half of the sample received the SCB scales first and the ERT second, and the other half received them in the opposite order.

4.3.7. Statistical analysis

Demographic variables and SCB scales were analyzed using independent-samples t-tests or Chi2 (for gender) (see Table 1). To analyze the behavioral data, two 2-way mixed ANOVA models were used, one for Faces and one for Words. Condition (Happy/Pleasant vs Neutral/Neutral vs Angry/Unpleasant) was the within-subjects factor and Group (Ex-combatants vs Controls) the between-subjects factor. We entered reaction time and accuracy (percentage of correct responses). In addition, Errors were calculated as the proportion of responses within each alternative valence (i.e., Type) erroneously assigned to the judged valence. For example, if the stimulus presented a Neutral face, two types of errors could be committed i.e., Neutral-Happy whereby the subject identifies a happy emotion or Neutral-Angry whereby the subject identifies an angry emotion. The analysis of Error Type across task conditions is relevant as it would inform whether poor accuracy is driven by a particular bias towards a specific emotion and whether the pattern of bias differs across groups. The same two-way ANOVA model was used to analyze the Type of Error (Type of Error 1 vs. Type of Error 2) and Group (G1 vs. G2).

To analyze the ERP (N170) data we implemented a 4-way repeated-measures ANOVA for amplitude and latency in which Task (Face vs. Word), Condition (Positive (Happy/Pleasant) vs. Neutral (Neutral Face/ Neutral Word) vs. Negative (Angry/Unpleasant)), and Hemisphere (Left vs. Right) were the within-subjects factors and Group (Ex-combatants vs. Controls) was the between-subjects factor. In the model, we considered that the relation between Task and Hemisphere would be crucial to investigate the presence of the Stimulus Type Effect described by Rossion (2003) and Ibañez et al. (2014). For the sake of brevity, we focus on the significant interactions that involved Group. To further explore significant interactions, we used Bonferroni corrected post-hoc tests adjusting the Alfa level according to the number contrasts. For the interactions we calculated effect size (eta-square - η2: 0.1 = small, 0.24 = medium, and 0.31 large) and power (β), whereas for post-hoc analyses the effect size was calculated using the Cohen´s d (0.2 = small, 0.5 = medium, and 0.8 =large).

To explore whether SCB could be predicted by neurocognitive functions (i.e., behavioral: accuracy/reaction time and electrophysiological: amplitude/latency) which proved informative of between-group differences, we ran a stepwise multiple regression analysis. Following the aim of the present study, SCB dimensions were the dependent variables and neurocognitive functions (i.e., EP behavioral and ERP variables) were the predictors.

4.4.Results

4.4.1. Social cognition and behavior

No between-group differences were observed for age, education, theory of mind or empathy. Ex-combatants showed higher social skills than Controls in domains such as “saying no and cutting interactions”, and “initiating interactions with the opposite gender”. Hence, ex-combatants showed

higher assertion skills than Controls. Table 1 shows demographic data and SCB scores from the two groups.

4.4.2. ERT: Behavioral Data

For the Face Task neither accuracy [$F(2,45)=0.91$, $p=0.39$, $\eta2=0.14$, $\beta=0.19$] nor reaction time [$F(2,45)=1.01$ $p=0.37$, $\eta2=0.21$, $\beta=0,22$] yielded significant Group x Condition interactions. The same outcomes were observed for the Word Task [Accuracy: $F(2,45)=0.43$, $p=0.6$, $\eta2=0.09$, $\beta=0.11$; Reaction Time: $F(2,45)=0.02$ $p=0.98$, $\eta2=0.03$, $\beta=0.05$].

For the Face Task, the Type Error during the Neutral Condition yielded a significant interaction [$F(1,47)=4.56$, $p=0.04$, $\eta2=0.30$, $\beta=0.55$]. Post-hoc analyses carried our across the Types of Error revealed that Controls committed more errors of the type Neutral answered erroneously Angry compared to the type Neutral answered erroneously Happy [$t=3.2$, $p=0.01$, $d=0.73$]. No difference were found for ex-combatants across the Type of Errors in the Neutral Condition [$t=0.03$, $p=0.97$, $d=0.01$]. No interaction with Group were observed for the Types of Error during Happy [$F(1,47)=0.88$, $p=0.35$, $\eta2=0.13$, $\beta= 0.15$] or Angry faces [$F(1,47)=0.38$, $p=0.54$, $\eta2=0.09$, $\beta=0.09$]. In sum, Controls but not ex-combatants were more biased towards angry than happy emotions when they saw neutral faces.

For the Word Task no significant Type of Error x Group interaction was found for Pleasant [$F(1,47)=1.03$, $p=0.32$, $\eta2=0.14$, $\beta=0.17$], Neutral [$F(1,47)=0.51$, $p=0.48$, $\eta2=0.10$, $\beta=0.11$] or Unpleasant words [$F(1,47)=0.73$, $p=0.40$, $\eta2=0.12$, $\beta= 0.13$]. Table 2 shows the mean and standard deviation for accuracy, type of error, and reaction time for each condition of the Face and Word tasks.

Table 2.
Mean and standard deviation for Reaction Time, Accuracy and Type of Error for Faces and Words Conditions in the behavioral performance of the emotional recognition task (ERT)

	Ex-combatants M(DS)	Controls M(DS)
Faces		
Reaction time (ms)		
Happy	908.68 (316.97)	1190.87 (599.95)
Neutral	980.52 (268.94)	1357.31 (579.79)
Angry	983.51 (267.90)	1242.03 (560.44)
Accuracy (%)		
Happy	82.81 (19.12)	87.02 (18.70)
Neutral	61.55 (24.09)	64.31 (22.53)
Angry	62.93 (21.76)	73.68 (18.90)
Errors (%)		
Happy	17.18 (19.13)	12.98 (18.70)
Happy error Neutral*	6.32 (8.74)	6.84 (13.35)
Happy error Angry	10.86 (13.76)	6.14 (7.63)
Neutral	38.45 (24.09)	35.69 (22.53)
Neutral error Happy	19.05 (16.49)	13.04 (12.76)
Neutral error Angry	19.40 (12.71)	22.65 (13.29)
Angry	37.01 (21.78)	24.74 (14.84)
Angry error Happy	11.49 (14.90)	6.93 (11.30)
Angry error Neutral	25.51 (17.28)	17.80 (11.30)
Words		
Reaction time (ms)		
Pleasant	1032.67 (301.63)	1242.51 (487.77)
Neutral	1111.98 (416.91)	1329.25 (449.28)
Unpleasant	1115.75 (350.90)	1338.17 (456.43)
Accuracy (%)		
Pleasant	69.02 (20.24)	81.89 (13.45)
Neutral	56.12 (21.81)	64.61 (19.28)
Unpleasant	65.17 (25.16)	78.42 (17.85)
Errors (%)		
Pleasant	20.98 (20.80)	18.10 (13.45)
Pleasant error Neutral	16.95 (12.12)	12.84 (9.76)
Pleasant error Unpleasant	14.02 (14.77)	5.26 (7.47)
Neutral	43.92 (21.85)	35.39 (19.28)
Neutral error Pleasant	30.89 (13.18)	28.54 (16.51)
Neutral error Unpleasant	13.03 (13.17)	6.84 (7.63)
Unpleasant	34.83 (25.16)	21.58 (17.85)
Unpleasant error Pleasant	17.87 (17.61)	8.94 (8.59)
Unpleasant error Neutral	16.95 (15.82)	12.63 (11.86)

*On Error Type the first label (i.e., Happy) correspond to the expected respond whereas the second label represent the erroneous answer (i.e., Neutral) given by the subject.

4.4.3. Emotion Recognition Task: ERP Data

Mean amplitude and latency data are presented in Table 3. Table 4 shows main effects and statistical interactions. Using amplitude data, we found a significant main effect of Task whereby Faces yielded greater amplitudes than Words (MSE= 0.62, p= 0.00, CI= 0.32 – 0.93). The main effect of Condition was also significant indicating that Positive stimuli (Happy/Pleasant) elicited larger N170 than Neutral (MSE= 0.12, p= 0.03, CI= 0.09 – 0.23) and Negative stimuli (Angry/Unpleasant) (MSE= 0.13, p= 0.04, CI= 0.04 – 0.26). N170 amplitude for Neutral and Negative stimuli did not differ (MSE= 0.08, p= 0.84, CI= -0.07 – 0.09). No other main effect was found to be significant.

Table 3.
Mean of amplitude and latency of component N170

	Ex-combatants M(DS)				**Controls M(DS)**			
	Amplitude (uV)		**Latency (ms)**		**Amplitude (uV)**		**Latency (ms)**	
	Left	**Right**	**Left**	**Right**	**Left**	**Right**	**Left**	**Right**
	4.08	4.70	240.40	243.27	3.67	4.48	231.50	226.50
Happy	(1.63)	(2.25)	(14.12)	(12.01)	(2.16)	(1.99)	(20.71)	(29.13)
	4.09	4.69	239.93	243.40	3.80	4.59	230.40	236
Neutral	(1.45)	(2.13)	(14.08)	(11.11)	(2.03)	(2.16)	(19.72)	(25.76)
	3.98	4.57	239.53	241.67	3.80	4.49	231	236.60
Angry	(1.75)	(2.29)	(13.24)	(15.12)	(2.00)	(1.96)	(20.55)	(23.81)
	3.33	3.52	227.73	221.07	3.77	4.59	224.9	236
Pleasant	(1.66)	(1.96)	(13.67)	(21.16)	(2.06)	(2.16)	(11.87)	(25.77)
	3.28	3.51	231.13	226.80	3.89	3.33	226	221.60
Neutral	(1.56)	(1.80)	(14.37)	(18.71)	(2.29)	(1.56)	(12.58)	(15.87)
	3.20	3.50	228.33	223.47	4.03	3.54	226.90	218.70
Unpleasant	(1.56)	(1.80)	(15.66)	(16.20)	(2.37)	(1.84)	(9.21)	(16.08)

Mean of amplitude and latency of component N170 across Face and Word Conditions (Happy/Pleasant vs Neutral/Neutral vs Angry/Unpleasant) in Left and Right Hemisphere, in Ex-combatants and Controls.

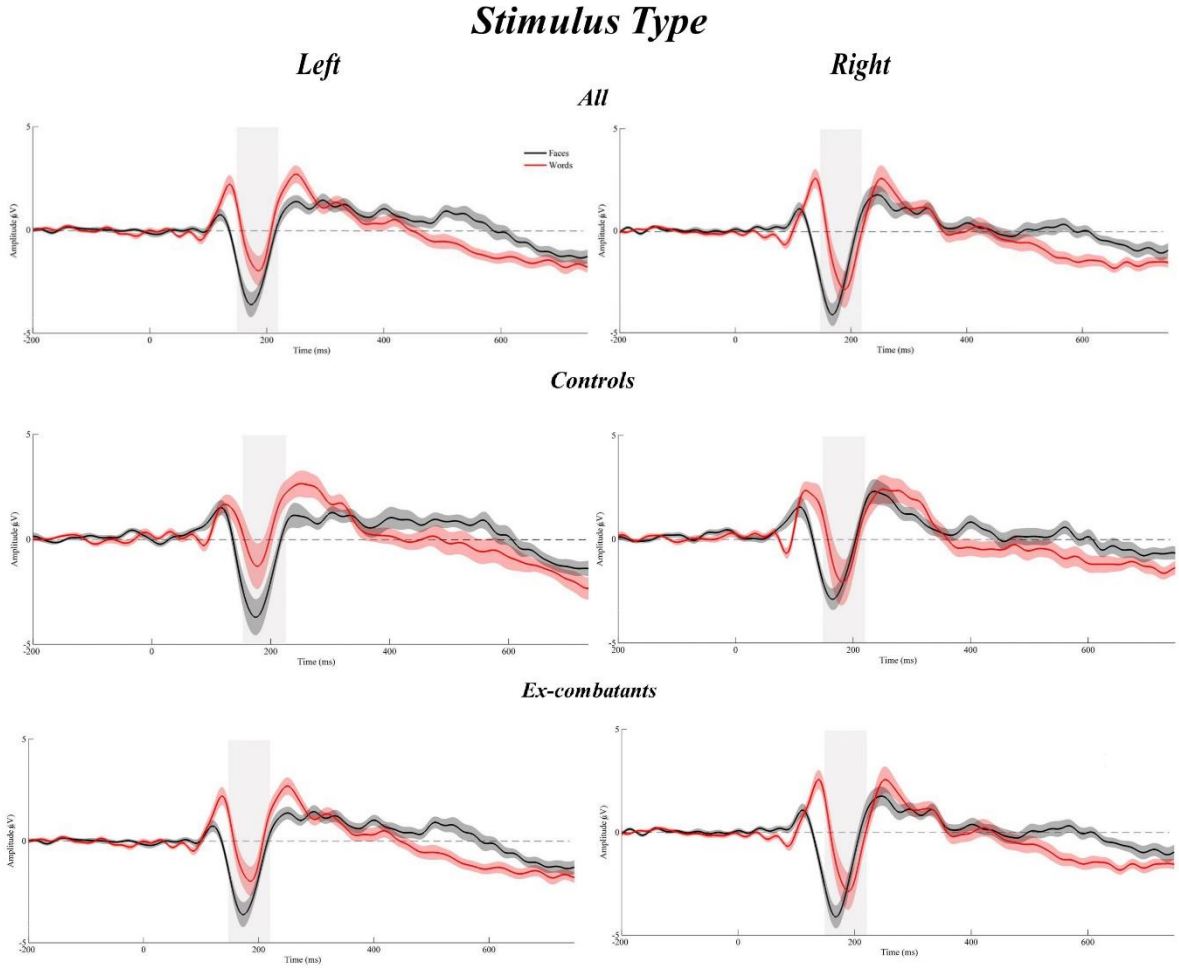
Table 4
Results from the statistical analysis of the ERP data illustrating main effects and interactions

	Amplitude F**(p),** η^2**,** β	**Latency** F**(p),** η^2**,** β
Task	***16.63 (0.00), 0.51, 0.98***	***40.03 (0.00), 0.67, 1***
Condition	***3.69 (0.03), 0.26, 0.67***	0.74 (0.48), 0.12, 0.13
Hemisphere	2.70 (0.11), 0.22, 0.36	0.02 (0.88), 0.02, 0.05
Group	0.08 (0.78), 0.04, 0.06	2.33 (0.13), 0.21, 0.32
Task x Group	***4.98 (0.03), 0.30, 0.59***	***6.59 (0.01), 0.34, 0.71***
Condition x Group	2.0 (0.14), 0.37, 0.40	1.69 (0.19), 0.18, 0.35
Hemisphere x Group	0.28 (0.87), 0.03, 0.05	0.49 (0.49), 0.10, 0.11
Task x Condition	***6.00 (0.03), 0.33, 0.87***	1.65 (0.19), 0.18, 0.34
Task x Hemisphere	***7.98 (0.01), 0.37, 0.79***	3.65 (0.06), 0.27, 0.47
Condition x Hemisphere	***11.73 (0.00), 0.44, 0.99***	0.33 (0.72), 0.08, 0.10
Task x Condition x Group	***5.37 (0.01), 0.32, 0.83***	***5.48 (0.01), 0.32, 0.84***
Task x Hemisphere x Group	1.20 (0.28), 0.15, 0.19	0.98 (0.33), 0.14, 0.16
Task x Condition x Hemisphere	***8.35 (0.00), 0.38, 0.96***	***5.64 (0.01), 0.32, 0.85***
Condition x Hemisphere x Group	***13.88 (0.00), 0.47, 0.99***	0.56 (0.57), 0.11, 0.14
Task x Condition x Hemisphere x Group	***11.07 (0.00), 0.43, 0.99***	***7.71 (0.00), 0.37, 0.94***

Bold and italic represent significant effects.

The statistical interaction informing about the Stimulus-Type Effect (Task by Hemisphere) was significant. Post-hoc contrasts were carried out across the two Factors (Task (2) x Hemisphere (2) = 4; adjusted-α=0.01). The factor Task showed that Faces elicited a larger N170 component over the Right than over Left Hemisphere [t=2.67, p=0.01, d=0.36]. This differential activation was not present for Words. Post-hoc contrasts carried out for each Hemisphere across Tasks showed that it was only over the Right Hemisphere that Faces elicited greater activation than words [t=5.1, p<0.001, d=0.51]. Looking at other interactions, we found that the Task by Group interaction was also significant. Post-hoc contrasts carried out across Tasks show that Faces elicited larger N170 component than Words, and effect observed in Ex-combatants only [t(29)=4.75, p<0.001, d=0.60]. No other post-hoc contrasts revealed significant effects (see Figure 2). In sum, the analysis of the Stimulus Type Effect not only confirmed the presence of this effect in the investigated groups but

also revealed a significantly larger effect during face processing in Ex-combatants than in Controls.



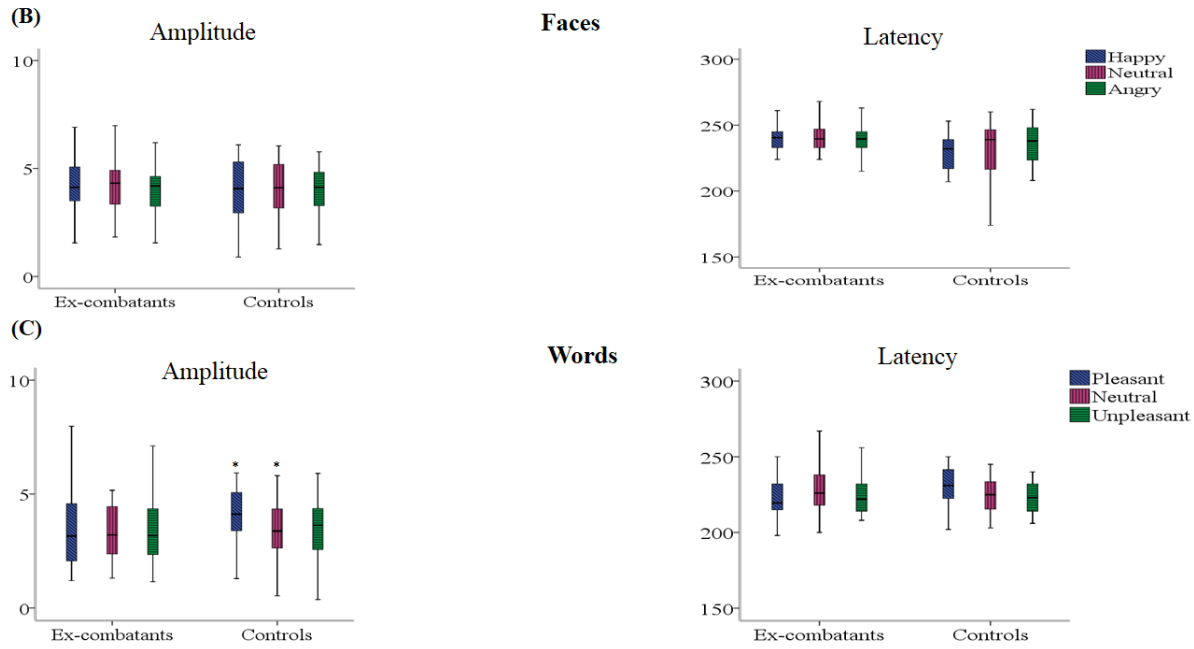


Figure 2. *Stimulus Type Effect: graphs show waveforms for Face and Word Task from the Right and Left Hemisphere from Controls and Ex-combatants respectively. (B) Mean amplitude and latency for the Face Task across the two groups. (C) Mean amplitude and latency for the Word Task across the two groups. *= significant differences*.

The 3-way Task by Condition by Group interaction was significant. Post-hoc contrasts were carried out across the three Factors (Task (2) x Condition (3) x Group (2) = 12; adjusted-α=0.004). For the sake of comparability we explored post-hoc contrasts for each Task separately. The Face Task revealed no significant differences across the contrasted factors. For the Word Task, Condition yielded a statistically significant difference only for Controls and for the contrast between Pleasant vs. Neutral stimuli [$t(19)=3.61$, $p<0.001$, $d=0.71$]. No other post-hoc contrasts revealed significant effects. There three-way Condition by Hemisphere by Group interaction was significant. However, post-hoc contrasts carried out as described above failed to reach the significance threshold. Finally, although the 4-way Task by Condition by Hemisphere by Group interaction was found to be significant, none of the performed post-hoc contrasts reached the

corrected threshold (2x3x2x2=24; adjusted-α=0.002). In sum, the set of interactions found to be significant during the analysis of the N170 amplitude revealed that only Controls reacted to the emotional content of words and neither Controls nor Ex-combatants reacted to the emotional content of faces.

Taken together, these ERP findings suggest that Faces elicited greater activation than Words over the right hemisphere in both groups. However, Ex-combatants' face reactivity was more pronounced than that seen in Controls. Processing emotions conveyed by Faces did not generate differential activations while emotions conveyed by words did but only in Controls.

The same model was used to analyze the Latency of the N170 component. Table 4 shows main effects and statistical interactions. There was a significant effect of Task whereby shorter latencies characterized N170 for Words than for Faces than (MSE= -0.11, p= 0.00, IC= -0.11 – -0.70). Task interacted with Group. Post-hoc contrasts (adjusted-α=0.01) showed that Words elicited a faster N170 component in Ex-combatants [t(29)=8.61, p=0.00, d=1.19] with no significant effects in Controls. Contrasts carried out for each Task separately and between groups revealed no significant effects. Other interactions which were found to be significant were those between Task x Condition x Group and Task x Condition x Hemisphere x Group. However, corrected post-hoc tests carried out to explore theses interaction were non-significant. In sum, the set of interactions found to be significant during the analysis of the N170 latency revealed that Words are processed faster than Faces, an effect drove by the Ex-combatant Group.

Finally, the stepwise regression model incorporated Social Skills as the dependent variables [Global social skills score (GSSS); auto-expression in social situations (SS1); defense of the rights as consumer (SS2); anger or unconformity expression (SS3); to say not and to cut interactions (SS4); make petitions (SS5) and initiate interactions with opposed sex (SS6) dimensions

independently], and N170 latency for Words, N170 amplitude for Faces, N170 amplitude for Neutral and Pleasant Words, and Type Error during Neutral Faces (i.e., error happy and error angry) as the predictors. The analysis revealed that the "auto-expression in social situations" was significantly predicted by Type of Error during Neutral Faces (error happy) [B= 0.33; F(1,48) = 5.66; p= 0.02]. Moreover, the "expression of anger and displeasure" was significantly predicted by N170 latency for Words [B= -0.34; F(1,48) = 5.96; p=0.02]. These models explained 33% and 34% of the variance respectively. No other associations were found to be significant.

4.5. Discussion

This study was set out to investigate the extent to which modulations of the N170 component elicited during an ERT that relies on Words and Faces would serve as a marker of EP and whether they would predict SCB in Colombian ex-combatants and Controls. We found that (1) Ex-combatants presented with higher assertion skills than Controls. (2) The previously reported Stimulus Type Effect was present in both groups and Ex-combatant showed an exacerbated response to Faces (i.e., N170). (3) Ex-combatants were less likely than controls to misclassify Neutral Faces but showed an atypical word valence processing. (4) Of note, the efficiency to process neutral stimuli and the N170 latency for Words significantly predicted SCB functions. These results have important implications for our understanding of the bio-psycho-social consequences of war conflicts and their influence on social behaviors. We now discuss such implications.

The first three findings of our study suggest that chronic exposure to war experiences may reshape the EP system as to become more efficient for socially relevant cues. Ex-combatants showed higher scores than Controls in some areas of social assertion which inform about abilities

to interact in heterogeneous environments. The demands posed by rapidly changing violent contexts such as those wherein Ex-combatants regularly interact may require continues readjustments of SCB skills. From this perspective, it is not entirely surprising to observe higher social assertion in Ex-combatants than in individuals who are not directly exposed to violent contexts. Ex-combatants showed better abilities to cut interactions and to establish social relationships with members of the opposite gender. Similar features have been found in subjects with antisocial behaviors (Raine, 2002; Glenn et al., 2007). Our view is that members of armed groups are continuously trained to modulate their emotions and generate pragmatic social responses which allow them to successfully evaluate complex contexts and map social situations arising from these contexts to adaptive behaviors. Further research will be necessary to identify factors accounting for these adaptive mechanisms such as roles taken in war scenarios, length of the exposure to war conflicts, and SCB features prior to war conflicts. Moreover, future research will be needed to identify if such adaptive mechanisms are characteristic of all Colombian Ex-combatants.

A second finding suggesting some form of functional reorganization at a social level in Ex-combatants is that linked to the Stimulus Type Effect (Rossion et al., 2014). Ex-combatants seem to rely on carriers of social cues which are more relevant to their environments. This study reveals that Faces appear to be more relevant to Ex-combatants than Words. Not only they showed the well-known Stimulus Type Effect as Controls did, but their neural responses to Faces was more pronounced overall than that of Controls. Behaviorally, Ex-Combatants were less likely to misclassify Neutral Faces. The Stimulus Type Effect has been considered a marker of the spatio-temporal properties of stimuli and their distribution in the visual network (Rossion et al., 2003). Our findings in Ex-combatants suggest that although they are unresponsive to the emotional

valence of stimuli whether shown by faces or words, they process words quickly and faces more slowly and deeply, thus suggesting a superior value of visual information over verbal information for this group. Ex-combatants seem to have developed high-level visual processing skills which are necessary for a fast recognition of salient aspects of visual scenes, such as faces (Rossion et al., 2014). One might argue that this process, which is fundamental for successful social interactions (Ibanez et al., 2014), may undergo reorganization following war experiences.

Words proved less informative in Ex-combatants than in Controls. Differential activation of words with emotional valence relative to neutral words has been reported previously (Kissler et al., 2006). The emotional valence of words affects early stages of EP. This influence seems to be contingent upon factors such as life experience, motivational drives, and personality traits (Citron, 2012). Atypical modulation of word processing has been informed in patients with bipolar disorder (Ibanez et al., 2014), chronic pain, anxiety, and on psychopaths (Kissler et al., 2006). In war contexts, words may be less relevant than visual stimuli. It is less likely to encounter survival-related information conveyed by words than by visual stimuli. This could explain why relative to Controls, Ex-combatants showed an atypical word valence processing (i.e., did not discriminate between word valences). This finding could not be due to lower literacy in Ex-combatants as both groups were matched according to their education. Future studies should further investigate the superiority of visual information over verbal information in Ex-combatants. For instance, whether emotions portrayed by scenes of real life events would have an impact on SCB variables similar to that described here for faces. It is necessary to identify the most efficient carriers of emotional valences in this population as this would create an opportunity to enhance communication and social skills via intervention programs.

One final and novel finding of this study is the informative association between Neutral errors during the Face task and the temporal dynamic of word processing (i.e., N170 Latency) with social assertion skills. The "auto-expression in social situations" and the "expression of anger and displeasure" were significantly predicted by behavioral and electrophysiological variables, respectively, drawn from the ERT. Interpreting responses to neutral stimuli have not been the focus of the literature on EP. However, the influence of neutral stimuli on EP has more recently become a topic of interest (Güntekin and Başar, 2014; Camfield et al., 2016; Da Silva et al., 2016; Trujillo et al., 2017). While some attribute a passive role to neutral stimuli as the baseline condition in Emotion Recognition Tasks (Sprengelmeyer et al., 1998; Kesler-West et al., 2001; Pessoa et al., 2002; Kilts et al., 2003), others suggest that correct neutral categorization is contingent upon a meticulous reading of embedded contextual cues (Anderson et al., 2003; Hugenberg and Bodenhausen, 2004). In our study, we found that Controls were more prompted to misclassify Neutral Faces attributing a different valence (i.e. Angry). This suggests that their EP system is reactive to the ambiguity generated by multi-valence contexts such as that created by the ERT (see Trujillo et al., 2017). However, Ex-combatants did not show such reactivity suggesting that their ability to resolve emotional ambiguities may have been modified by war experiences. The fact that Ex-combatants presented with emotional undifferentiated mechanisms which tend to prioritize visual (Faces) over verbal (word) stimuli, indicates that their cognitive architecture in general and specifically that one supporting EP has been reorganized to operate in an adaptive way which best meets the demands of aggressive environments.

We acknowledge a number of limitations of the current study. For instance, we did not use a formal psychiatric interview, drug screening tests, or self-report clinical questionnaires to gather the individual's health history. Although we gathered personal information about these antecedents

during the general interview, future studies should incorporate standardized assessment procedures to collect this information. This would be relevant to investigate whether the adaptive mechanisms described here characterize all Colombian Ex-combatants. It might be argued that the findings presented here might not necessarily reflect the influence of war experiences. However, we made every effort to ensure that our investigated groups could only be distinguished based on war experiences and not on any socio-demographic background measures. Nevertheless, we acknowledge that populations embedded in conflict zones are very heterogeneous and there may be a number of confounding variables which could modulate the effects reported here. Despite this limitation, we feel confident to suggest that our results do reflect the influence of war experiences. For instanced recent studies involving actors from the same conflict zone investigated here have reported very similar findings and have suggested that chronic exposure to war conflict can reshape the functional architecture of cognition (Trujillo et al., 2017); see also (Quintero-Zea et al., 2017)). Interestingly, (Trujillo et al., 2017) suggested that such changes can be reverted via valid intervention approaches. Finally, we acknowledge that some effects might be underestimated due to sample size. Thus, the replication of the analytical model in a larger population could inform, for instance, if the modulation of emotion as informed by condition could reveal complementary information.

CAPÍTULO 5

SOCIAL COGNITIVE TRAINING IMPROVES EMOTIONAL PROCESSING AND REDUCES AGGRESSIVE ATTITUDES IN EX-COMBATANTS

El contenido de este capítulo se encuentra publicado como Trujillo, S., Trujillo, N., Lopez, J. D., Gomez, D., Valencia, S., Rendon, J., ... & Parra, M. A. (2017). Social cognitive training improves emotional processing and reduces aggressive attitudes in ex-combatants. *Frontiers in psychology*, *8*, 510.DOI: 10.3389/fpsyg.2017.00510

5.1. Abstract

Emotional processing (EP) is a complex cognitive function necessary to successfully adjust to social environments where we need to interpret and respond to cues that convey threat or reward signals. Ex-combatants have consistently shown atypical EP as well as poor social interactions. Available reintegration programs aim to facilitate the re-adaptation of ex-combatants to their communities. However, they do not incorporate actions to improve EP and to enhance cognitive-emotional regulation. The present study was aimed at evaluating the usefulness of an intervention focused on Social Cognitive Training (SCT), which was designed to equip ex-combatants enrolled in the Social Reintegration Route with EP and social cognition skills. A group of 31 ex-combatants (mean age of 37.2, 29 men) from Colombian illegal armed groups were recruited into this study. Of these, 16 were invited to take part in a SCT and the other continued with the conventional reintegration intervention. Both groups underwent 12 training sessions in a period 12-14 weeks. They were assessed with a comprehensive protocol which included Psychosocial, Behavioral and Emotion Processing instruments. The scores on these instruments prior to and after the intervention were compared within and between groups. Both groups were matched at baseline. Ex-combatants receiving the SCT experienced significant improvements in EP and a reduction in aggressive attitudes, effects not observed in those continuing the conventional reintegration intervention. This is the first study that achieves such outcomes in such a population using SCT intervention. We discuss the implications of such results towards better social reintegration strategies.

5.2. Introduction

Emotional processing (EP) is a broad concept that comprises the ability to perceptually analyze the emotional valence of incoming stimuli, to regulate our self-expression to emotions, and to recognize the emotional state of others (Brand et al., 2016). EP is necessary to successfully adjust to social environments where we constantly need to read, interpret, and act upon cues that can convey either threat or reward signals (Lang et al., 2013). In support to this notion, the recognition of basic features (i.e., perceptual) carrying primary emotional information has been considered a fast and automatic process (Pratto and John, 1991; Öhman et al., 2001) responsible for programing and executing social responses (Fazio and Olson, 2003). This view has emerged from the use of experimental tasks designed to evaluate emotion recognition of faces (Heuer et al., 2007; Hurtado et al, 2009; Luo et al, 2010; Ibáñez et al 2011; Petroni et al., 2011; Ibáñez et al, 2014; Zhang et al, 2014) or words (Schacht and Sommer, 2009; Ibáñez et al, 2014;). Petroni et al. (2011) found that the recognition of face valence is associated to the ability to read others' intentions. EP has also been linked to responses during social conflicts (Seehausen et al., 2012; Seehausen et al., 2014). Taken together this evidence suggests that EP is crucial for rapidly and accurately scanning the environment in the search of cues that can trigger adaptive social responses.

Ex-combatants have shown atypical EP expressions (Boxer et al., 2011, Tobon et al., 2015; Quintero-Zea et al. in press,). They present with an increased reactivity to emotional images (i.e., International Affective Picture System - IAPS) revealed via late electrophysiological responses that are associated to a reduction in their empathic disposition (Tobon et al., 2015). A more recent study has confirmed that modulations of Event Related Potentials elicited during the EP of faces or words together with the analysis of aggressive responses and social interactions can distinguish between ex-combatants and controls (Quintero-Zea et al. in press). Ex-combatants are

characterized by persistent aggressive behaviors, reduction of moral standards, the presence of mental health problems, impairments in social interactions (Engen, 2008), and dehumanizing tendencies towards their enemies (Williams et al., 2006). Based on these studies, it seems adequate to suggest that the characterization and improvement of EP in ex-combatants will be a crucial step towards identifying routes to enhance their ability to better cope and positively interact with social challenges in post-war conflicts.

Social Cognitive Training (SCT) is a cost-effective, adaptable, evidence-based model that have been used for the intervention of social cognition in schizophrenia and autism related disorders (Turner-Brown et a., 2008; Kurtz and Richardson 2011; Peyroux, and Franck, 2014; Kurtz et al., 2016). It has yielded improvements of basic EP (i.e. face recognition) (Kurtz and Richardson 2011; Kandalaft et al., 2013), as well as of theory of mind and social interaction skills (Turner-Brown et al., 2008; Kandalaft et al., 2013). Similar approaches have proved valid in individuals with Traumatic Stress Disorder (PTSD), (Foa, 1997; Foa et al., 2005; Sin and Lyubomirsky, 2009; Akbarian et al., 2015), and also in active military (Castro et al., 2012; Cacioppo et al., 2015) and ex-combatants (Karlin et al., 2010). SCT seems to be a feasible approach to improve emotional recognition in ex-combatants (Quintero-Zea et al., in press; Kurtz and Richardson, 2011; Tobon et al., 2015). Furthermore, SCT interventions that combine strategies to enhance cognitive-emotional regulation and social-cognition skills may be more effective at improving EP in ex-combatants in a socially meaningful way.

Colombia offers a suitable scenario to investigate this hypothesis. The country has hosted one of the longest war conflicts built mainly on left political ideologies (Dennis, 2006). Amnesty International estimates that, in the past 20 years, more than 70,000 people have been injured or killed and thousands have been kidnapped, tortured or forcibly abducted to serve in one of the

armed forces (Theidon, 2007). The psychological aftermath of war has been reported by civilians after a long-term exposure to violence, by victims of the conflict, as well as by ex-combatants (Nussio and Oppenheim, 2013). Colombia currently undergoes a process of transition to post-conflict via the implementation of a Demobilization, Disarmament and Reintegration (DDR) Program. The social reintegration component of the DDR Program focuses on promoting psychosocial wellbeing and improving everyday behaviors. However, the evidence supporting its efficacy to enhance cognitive-emotional regulation is currently lacking (Betancourt et al., 2010). Based on a quasi-experimental design, the present study was aimed at investigating whether a SCT intervention adapted for ex-combatants enrolled in the Reintegration Route could positively impact on their EP and by this means enhance their cognitive-emotional regulation. We hypothesized that positive outcomes would be observed in the group under the newly devised SCT program but not in the group receiving conventional intervention, which does not target such socio-emotional skills.

5.3. Methods

5.3.1. Participants

Participants were recruited from "Agencia Colombiana para la Reintegración" (ACR) [Colombian Agency for Reintegration: http://www.reintegracion.gov.co/en]. The ACR is a governmental institution aimed at facilitating psychosocial support [i.e., living costs, occupational education, psychological group activates] towards the re-adaptation of ex-combatants to their communities. After returning to civil life, ex-combatants are offered a set of activities which are part of the "*Reintegration Route Program*: … *a path that each person, in the process led by the*

ACR must walk through in order to fully reintegrate into the social and economic life…[4]" , . This consists of compulsory (i.e., weekly communication with the route mentor) and optional activities (e.g., baking workshop). Subjects embarked on the *Reintegration Route* are normally enrolled on this program for approximately 2.5 years (Henao-Alvarez, 2013). The total sample comprised thirty-one subjects (29 men, 29 right handed) aged between 27-57 (M= 37.16, SD=8.30) and with an average education of 10.23 years (SD=3.03). The sample was divided in two groups. The first group, which we labelled the Social Cognitive Training Intervention Group (SCTIG), involved sixteen subjects (14 men and 2 women). The second group, labelled Conventional Reintegration Group (CRG), involved fifteen subjects (all were men). The two groups completed the pre-intervention assessment at time 1 (T1). Four subjects, two assigned to the SCTIG and two to the CRG, abandoned the study and did not provide follow up assessment at time 2 (T2) data. This assessment was performed by two blind trained psychologists who were involved neither in the recruitment nor in the intervention sessions. For the post-intervention assessment the SCTIG and CRG retained 14 (12 men) and 13 (all men) subjects respectively. Due to limitations to accessing, retaining, and following up individuals from this population, we relied on a Convenience Sampling approach that focused on subjects' availability. Participants enrolled in the *Reintegration Route Program* offered by the ACR were approached and invited to take part in the study. Once they accepted they were allocated to one of the two groups (for details see figure 1 CONSORT flowchart). The allocation was based on the researchers' decisions, which focused on the availability of the participant to take part in the individual weekly sessions. No personal data or background information was used during the allocation process. Neither the participants' motivation nor their preferences were considered during the allocation process. Participants were

[4] http://www.reintegracion.gov.co/en/reintegration/Pages/route.aspx

excluded if they had a history of present or past use of psychoactive drugs. The sample recruited into this study was free of psychiatric, neurological, or drug related disorders and had not been previously treated due to any these conditions. SCTIG and CRG did not significantly differ in age, gender, or education. Demographic data and descriptive statistics are presented in Table 1.

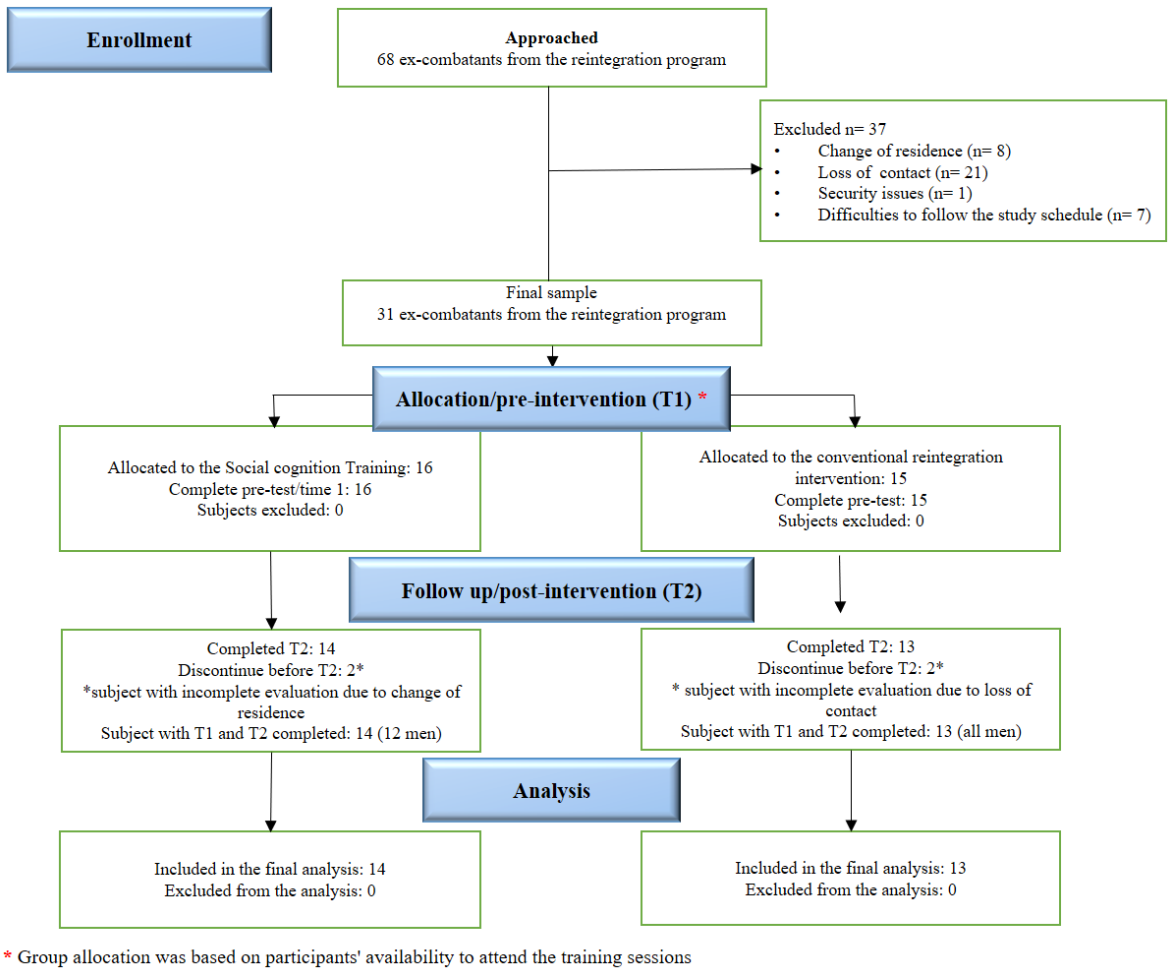


Figure 1. CONSORT flow diagram illustrating the steps followed during the study

During the first session, participants were individually informed about the characteristics of the initial and final assessments, and about the structure of the twelve-session intervention program. All the participants read and signed the informed consent before starting the study. The study's procedures and informed consent were approved by the Bioethical Committee of the Faculty of

Medicine from University of Antioquia, Medellin, Colombia. Participants were requested to confirm their availability to attend one-hour-per-week session at the University of Antioquia for twelve weeks.

5.3.2. Assessment protocol

The assessment included measures of social and behavioral responses to aggressive experiences and an experimental task that assesses cognitive aspects of EP.

Emotion Processing Instrument

The Emotion Recognition Task (ERT) is a face and word recognition task adapted from previous studies (Hurtado et al., 2009; Ibáñez et al., 2010, Ibánez et al., 2011, Petroni et al., 2011). This cognitive function has been thought of as a building block of social cognition (Green et al. 2008; Kurtz and Richardson, 2011; Pinkham et al. 2014). In the context of our study, we interpret the outcomes from such a task as evidence of cognitive functioning that can be crucial to support core aspects of social cognition. We implemented a version of this task in E-prime (Psychology Software Tools, Pittsburg, USA). The task was divided in two blocks, each comprising 90 stimuli. Of these 45 were faces and 45 were words (Faces: 15 happy, 15 neutral and 15 angry; Words: 15 pleasant, 15 neutral and 15 unpleasant). Pictures of female and male faces taken from the MMI Facial Expression Database were used in this task (Pantic et al., 2005). Words were selected from the linguistic corpus generated by the communications faculty of the Universidad de Antioquia (Grajales, 2011) which offers a list of the most commonly used words in this region of Colombia. The stimulus (word or face) was presented on a 17” screen, placed 60 cm away from the

participant's eyes. Each stimulus was presented twice within the same block and there were no more than two consecutive stimuli presenting the same valence.

The task sequence is shown in Figure 2. A fixation cross was presented for 1000 ms which was followed by the stimulus display (i.e. face or word) presented for 200 ms. Immediately after, the participants' response was requested. If the stimulus was a face, they were asked to decide whether it showed a happy, neutral, or angry expression. If the stimulus was a word, they were asked to decide whether it described a pleasant, neutral, or unpleasant emotion. Participants entered their responses by pressing one of three keys previously allocated of a standard PC keyboard. Correct responses were followed by a black screen which appeared for a random duration between 700 and 1000 ms (i.e., inter trial interval). Incorrect response were indicated by a red letter "X" which appeared in the center of the screen for 100 ms. This feedback was used to encourage attention to the task. The feedback screen was followed by the inter trial interval described above. We recorded reaction time, the number of hits and the errors. The ERT has been previously used in SCT intervention studies involving adults with high functioning autisms (Turner-Brown et al., 2008); schizophrenia (Kurtz and Richardson, 2011), and also in the assessment of Colombian ex-combatants (Quintero-Zea et al., in press).

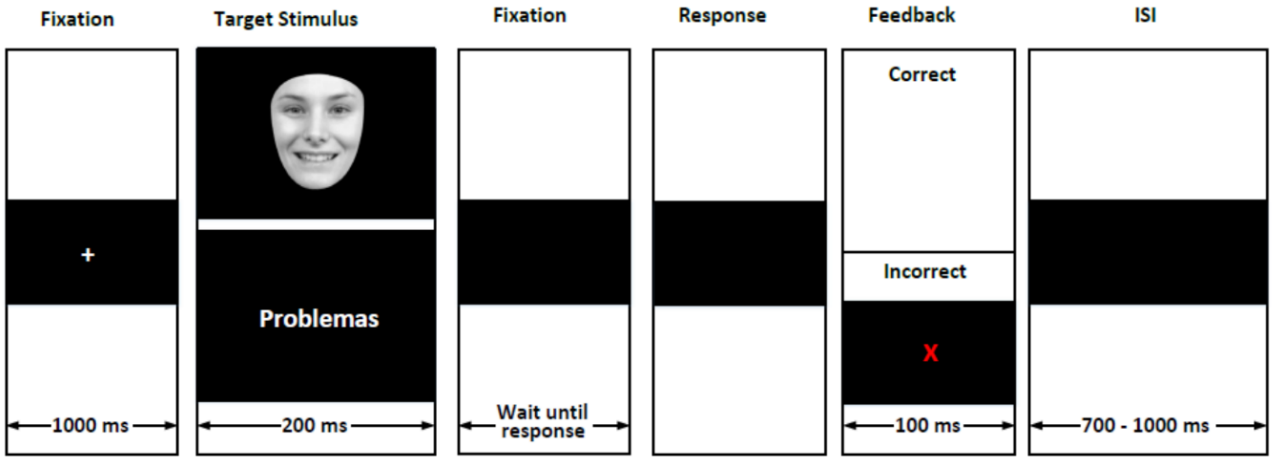


Figure 2. Sequence of the Emotion Recognition Task for both stimulus categories: Faces and Words

Psychosocial and Behavioral Instruments

Situation and Aggressive Behavior Inventory (ISCA: Spanish acronym) (Juarez-Acosta and Montejo-Hernandez, 2008). The instrument assesses the expression of violent behaviors triggered by different situations during the last 4 weeks prior to assessment. It is divided into two subscales: *situations* with 13 items and *behaviors* with 13 items. Participants responded using a 3-point Likert scale (1 = never, 2 = sometimes, 3 = often) and received a separate score for each subscale and a global score. ISCA has an alfa of Chronbach of 0.87 and 0.81 for each respective subscale, and 0.79 for the global score.

Motives for Aggression Inventory (IMA: Spanish acronym) (Juarez-Acosta and Montejo-Hernandez, 2008) is a self-report scale comprising 26 items rated on a 3-point Likert scale (1 = *never/almost never*, 2 = *sometimes*, and 3 = *frequently*), indicating frequency of each motive leading to aggressive behaviors. The scale asks questions such as "*When you act aggressively, is*

because you feel too tense?" This questionnaire is based on the concept that violent behaviors vary as a function of the intensity of their drivers. It yields a global score which has shown an alpha of Cronbach of 0.91 (Juarez-Acosta and Montejo-Hernandez, 2008).

Interpersonal Reactivity Index (Davis, 1983) assesses dispositional empathy and sensitivity to experiences of others. The Spanish version was adapted by Mestre et al., (2004). The scale has 28 self-report items of which 19 are redacted in a positive sense and 9 in a negative sense. Responses are entered using a 5-point Likert scale (1 = *it does not describe me well* to 5 = *it describes me very well*). The scale is divided in 4 dimensions: *Perspective Taking* (PT), *Empathic Concern* (EC), *Fantasy* (FS), and *Personal Distress* (PD). PT evaluates the ability to consider other´s points of view. EC assesses the response to feelings of compassion or sympathy through recognizing others' misfortunes. FS explores the ability to self-identify as a fictional character in a story such as novels, books or movies. PD measures self-oriented negative arousal in response to stressors, attitudes and experiences of other people. The reliability of the scale ranges from 0.70 to 0.77 (Mestre et al 2004). The instrument was standardized for Colombian ex-combatants (Garcia-Barrera et al., 2016; Pineda et al, 2013).

Social Skills (SS) Scale (Gismero, 2000) is a self-report instrument that evaluates everyday social behaviors via 33 items. This scale enquires individuals about their ability to interact with others in different situations. Items are grouped in six dimensions: *1) self-expression in social situations, 2) defense of own rights as a consumer, 3) expression of anger or displeasure, 4) stop interactions and saying no, 5) make requests, 6) start positive interactions with the opposite gender*. Responses are recorded using a 4-point Likert scale (1 = *I do not identify with that at all / most of the time it does not happen / I would not do it* to 4 = *I totally agree / most of the time / I would behave like that*). The scale has an alpha Cronbach of 0.88 and has demonstrated to be

sensitive to SS variations in normal population (Gismero, 2000). In this study, we focused on the Global SS Score. Larger values of this score suggest reduced social assertion.

5.3.3. Intervention Programs

Social Cognitive Training Intervention Group (SCTIG)

The SCT was a low-intensity, brief (45 minutes, 12 sessions) individual intervention, developed for the purpose of this study, to be used in former combatants from Colombian illegal armed groups. The intervention aimed to improve social skills, theory of mind as well as EP (Kurtz and Richardson, 2011). Sessions of the SCT intervention involved (a) the discussion of the subject's response in hypothetical social interactions, (b) social scene simulations such as role playing, (c) revisiting individual response on everyday situation and (d) performance of tasks which require applying skills developed via the new training (Kurtz and Richardson, 2011; Kandalaft et al., 2013; Peyroux, and Franck, 2014). The SCT consisted of the following axes: *Axis 1* focused on the identification of basic emotions (session 1 to 3) emphasizing on the improvement of emotional recognition skills. *Axis 2* focused on social skills and assertive expressions of emotion in everyday situations (session 4–8). *Axis 3* enhanced aspects of theory of mind and social-cues reading (session 9 to 12).

This program was designed to train individuals to accurately recognize and interpret social cues as well as basic and complex emotions. For example, in *Axis 1*, participants learned about the role of basic emotions and associated cues (Happy, Anger, Disgust, Fear, Surprise, and Sadness) and how to recognize such emotions in themselves and in others relying on imaginary or real-life situations. After each session, the therapist recommended additional *work to do* with their families and co-workers outside the training context which encouraged ex-combatants to further apply the

acquired knowledge to daily living scenarios. The therapist requested inputs from such additional work and provided feedback. We anticipated that such a program would (re)equip ex-combatants with the skills needed to identify the intentions of others in everyday situations and use assertiveness to manage aggressive responses.

Conventional Reintegration Group (CRG)

The CRG took part in a 45 minute weekly session which were aimed at developing competencies in family life, education, work, community challenges, and problem solving. As we mentioned before, ex-combatants are normally embarked on the *Reintegration Route Program* for approximately 2.5 years (Henao-Alvarez, 2013). However, the time each individual spends in the *Reintegration Route Program* might be tailored by the ACR according to factors only known to them (ACR keeps this information strictly confidential). Educational achievements and improvements in daily life performance are monitored monthly whereas work adaptation and community participation are assessed every six months. These data are kept in strict confidentiality by the ACR.

5.3.4. Procedures

The study followed a pre-post intervention design which includes a comprehensive assessment protocol comprising cognitive and psychosocial-behavioral instruments that were applied prior to and after two types of interventions. After consenting participants were given a set of questionnaires and tests to gather baseline data (T1). They then went to receive the newly devised intervention program (SCTIG group) or to continue with the standard intervention program offered by the ARC (CRG group). After completing 12 intervention sessions the same assessment protocol

was applied (T2). This assessment was performed by two blind trained psychologists who were involved neither in the recruitment nor in the intervention sessions. The cognitive and psychosocial-behavioral components of the assessment were counterbalanced across participants and the same counterbalancing order was used during the pre and post-intervention assessment. The SCT applied to the SCTIG was always delivered by the same psychotherapist. The psychotherapist was a psychologist with advanced clinical training and expertise in the intervention of similar populations. Ex-combatants allocated to the SCTIG group stopped attending the regular training offered by the ACR for the duration of the study. The CRG continued attending the regular training delivered by the professional staff from the ACR and was the only intervention they received. Due to confidentiality issues, the exact time each participant had spent in the *Reintegration Route Program* was not disclosed to the research team. All the participants however, were part of the demobilization agreement derived from the Peace and Justice Law from 2003 to 2006. By the time of this study, they should have been enrolled in the *Reintegration Route Program* from seven to ten years. Each assessment was separated by a window of 12 to 14 weeks which was filled with the intervention programs (see a diagram of the study design in Figure 3). The duration of each assessment session was approximately of 2.5 hours per participant.

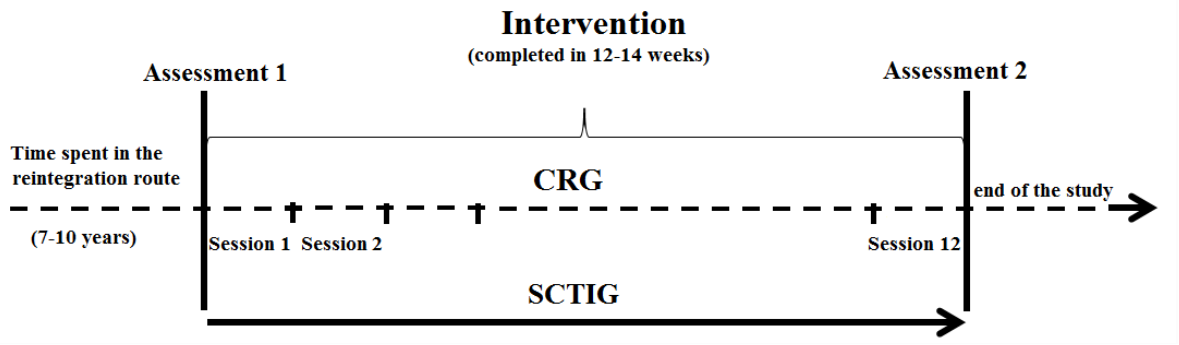


Figure 3. Diagram illustrating the study design

5.3.5. Statistical analysis

Demographic variables were compared using independent sample *t*-tests or Chi^2. Psychosocial and behavioral variables drawn from assessment 1 (T1) were compared across SCTIG and CRG using independent-sample *t*-tests. This analysis was aimed at ascertaining that there were no baseline differences in psychosocial scores across the investigated groups. To investigate the effect of the intervention we implemented a mixed ANOVA model which included Group (SCTIG vs. CRG) as a between-subjects factor and Time (T1 vs. T2) as the repeated measure. Our outcome measures for psychological rating scale were: IMA, ISCA-situation, ISCA-conduct, IRI perspective taken; IRI fantasy; IRI empathic concern; IRI personal distress; Social skills. When necessary, we ran ANCOVA to control for potential confounders.

For the ERT, our outcome measures were the percentage of correct responses (accuracy), reaction time and error type (see definition below) across each emotional Condition (Face: happy, neutral, or angry; Word: pleasant, neutral, or unpleasant). Mixed ANOVA models were implemented for the mean reaction time and accuracy on each Time (T1 vs. T2) and for each Condition (Face: happy, neutral, or angry; Word: pleasant, neutral, or unpleasant) across Groups (SCTIG vs. CRG). Errors were calculated as the proportion of responses within each alternative valence (i.e., type) erroneously assigned to the to-be-judged valence. For example, if the stimulus presented a Neutral face, two types of errors could be committed i.e., Neutral-Happy whereby the subject identifies a happy emotion or Neutral-Angry whereby the subject identifies an angry emotion. The analysis of Error Type across task conditions is relevant as it would inform whether poor accuracy is driven by a particular bias towards a specific emotion and whether the pattern of bias differs across groups. The ANOVA model to analyze Error Type was similar to that above

described but included this new additional repeated measure. For main effects and interactions effect size was informed by eta-square (η^2) (0.1 = small, 0.24 = medium, and 0.31 = large) (Cohen, 1988) and power by β. To further explore significant interactions, Tukey corrected post-hoc analyses were carried out. For these contrasts, the effect size was calculated using the Cohen's d (0.2 = small, 0.5 = medium, and 0.8 large) (Cohen, 1973). For significant 3-way interactions we calculated the T2-T1 discrepancy for each relevant variable and entered these values to post-hoc tests. Those discrepancies that reached the significance threshold in ANOVA models were subjected to stepwise linear regression models. These models were implemented to identify the predictive values of those variables yielding significant effects in the previous analysis. To this aim, we selected cognitive variables from the ERT (i.e., behavioral: Accuracy/Error Type/Reaction Time) which were included as dependent variables and psychosocial-behavioral variables from rating scales that identified between-group differences in previous analyses which were entered as predictors. All the analyses were performed in IBM SPSS 21 for windows.

5.4. Results

5.4.1. Emotion Processing Assessment

The analysis of demographic variables showed no significant differences between SCTIG and CRG in age, gender, or education (Table 1). Table 1 also presents the mean and standard deviation for accuracy, reaction time and error type at T1 and T2 for each group as well as the outcomes from the mixed ANOVA models. The first model assessed group differences at baseline (Condition x Group) and the second the effects of the intervention (Time x Condition x Group). For the sake of brevity, we report only on the key interactions (i.e., 3-way interactions). Baseline

models revealed no significant effects thus confirming that the two groups could not be differentiated based on baseline measures of emotion processing.

ANOVA models investigating the effects of the intervention on Face processing using accuracy data revealed a significant Time by Condition by Group interaction [$F(1,27)=5.46$, $p=0.01$, $\eta^2=0.41$, $\beta=0.82$]. Post-hoc contrasts were carried out across conditions for each group separately entering differences between T2-T1 (see Statistical Analysis above). SCTIG ex-combatants showed a significantly larger discrepancy in accuracy for neutral faces (T1<T2) than for happy faces (T1=T2) [$t=2.37$, $p=0.03$, $d=0.85$]. No other contrasts revealed significant differences. No significant differences were observed for CRG ex-combatants. Post-hoc contrasts carried out across groups for each condition separately also entering differences between T2-T1 revealed a significant discrepancy (T1<T2) for SCTIG ex-combatants in accuracy for neutral faces [$t=3$, $p=0.01$, $d=1.12$] an effect not observed in the CRG group. No other contrasts revealed significant differences. ANOVA models investigating the effects of the intervention on Word processing using accuracy data failed to reach the significance threshold for the 3-way interaction [Time by Condition by Group: $F(1,27)=0.21$, $p=0.81$, $\eta^2=0.09$, $\beta=0.08$].

Table 1
Descriptive statistics for demographic and Emotion Processing variables, and results from ANOVA models at T1 and at T2 compa

Variable	Time 1		Time 2		ANOVA (N=31, df= Conditi Group
Behavioral	SCTIG M(SD)	CRG M(SD)	SCTIG M(SD)	CRG M(SD)	*F*(p), η
Demographic					
Age	39.5(8.18)	35.2 (7.93)	-	-	1.45 (0.
Gender (F:M)	2:14	15	-	-	0.41 (0.
School level	10.4 (2.91)	10.1 (3.25)	-	-	0.27 (0.
Emotion Processing					
Accuracy					
F Happy	81.67 (19.89)	83.81 (18.18)	85.56 (22.00)	92.02 (19.03)	
F Neutral	49.69 (28.18)	66.79 (25.56)	65.00 (21.42)	62.86 (26.22)	2.82 (0.07
F Angry	63.65 (21.99)	62.26 (21.59)	67.33 (25.68)	73.45 (17.15)	0.53
W Pleasant	67.80 (26.48)	65.74 (19.79)	74.46 (21.16)	66.22 (27.54)	
W Neutral	48.36 (25.98)	57.03 (29.89)	60.44 (25.62)	61.36 (30.03)	0.65 (0.53)
W Unpleasant	63.44 (30.29)	62.86 (23.96)	74.00 (23.63)	72.26 (19.87)	0.15
Reaction time (ms)					
F Happy	878.90 (172.52)	950.03 (424.18)	968.34 (272.68)	886.51 (284.65)	
F Neutral	1049.52 (269.59)	906.33 (245.90)	1180.94 (294.73)	983.68 (224.49)	2.01 (0.14)
F Angry	945.18 (159.74)	1024.46 (348.79)	1101.10 (236.81)	1000.08 (303.68)	0.40
W Pleasant	1107.77 (410.59)	1027.85 (305.60)	1175.04 (310.97)	1114.77 (337.66)	
W Neutral	1243.32 (567.11)	1056.47 (337.06)	1176.70 (263.71)	1032.58 (300.42)	1.37 (0.35)
W Unpleasant	1191.13 (525.67)	1150.78 (399.25)	1257.35 (272.19)	1101.10 (341.42)	0.23
Error Type (%)					
Happy err. neutral	8.0 (10.39)	4.52 (6.45)	8.78 (17.61)	2.02 (2.55)	
Happy err. angry	10.11 (11.84)	11.67 (15.99)	5.67 (8.49)	5.95 (18.03)	1.11(0.30)
Neutral err. happy	20.83 (17.95)	17.14 (15.21)	14.44 (11.33)	14.88 (14.46)	0.17

Neutral err. Angry	22.52 (11.78)	16.07 (13.25)	20.56 (12.75)	22.26 (18.1)	0.2 (0.67), 0.07
Angry err. Neutral	11.44 (16.49)	11.55 (13.63)	8.67 (8.89)	5.24 (6.66)	
Angry err. happy	25 (15.58)	26.07 (19.52)	24 (18.35)	21.31 (11.59)	0.01(0.92) 0.05
Pleasant err. Wneutral	14.35 (9.26)	19.74 (14.42)	14.58 (13.37)	19.85(13.79)	
Pleasant err. Unpleasant	13.56 (14.73)	14.53 (15.34)	10.96 (14.03)	13.92 (21.39)	0.43(0.52) 0.10
Wneutral err. Pleasant	36.27 (10.28)	25.14(13.83)	29.18 (15.01)	27.05(19.17)	
Wneutral er. Unpleasant	14.92 (14.83)	11.01 (11.32)	10.38 (12.8)	11.59 (15.72)	1.79(0.19) 0.25
Unpleasant err. Pleasant	15.66 (18.73)	20.24 (16.70)	12.89 (15.41)	10.6 (10.91)	0.32(0.58)
Unpleasant err. Neutral	17 (16.62)	16.90 (15.54)	13.11 (11.53)	17.14 (14.42)	0.08

F= face condition, W= word condition, H= happy face, Ne= neutral face, A= angry face, Pl= pleasant word, Nt= neutral word, U= un
Cognitive Training Intervention Group, CRG= conventional reintegration group, Err= error, Wneutral= neutral word, AeN= angry
happy, NeP= neutral word error pleasant, NeU= neutral word error pleasant

ANOVA models investigating the effects of the intervention on Face and Word processing revealed significant 3-way interactions neither for Reaction Time data nor for the Type of Error committed (See Table 1).

5.4.2. Psychosocial and Behavioral Scales

Between-group comparisons of outcomes from Psychosocial scales applied during the pre-intervention assessment (Time 1) revealed significant differences on ISCA *behavior* whereby the CRG group showed higher score than the SCTIG group. However, these scores did not yield a significant interaction in the ANOVA model (see Table 2). Thus as for emotion processing, the two groups could not be differentiated based on baseline outcomes from the Psychosocial and Behavioral rating scales. For the *Motives for Aggression Inventory* (IMA), the ANOVA model identified a significant Time by Group interaction. This was driven by lower scores of the SCTIG group at T2 relative to T1, an effect not observed in the CRG group (see Table 2). Such an interaction was still present after correcting for ISCA (i.e., ANCOVA) [$F(1,27) = 12.86$, $p < 0.001$, $\eta 2 = 0.57$, $\beta = 0.93$].

In sum, the analysis of Emotion Processing (i.e., ERT) and Psychosocial and Behavioral Rating Scales revealed an impact of the intervention program which was characterized by an increase in accuracy during the recognition of neutral faces, as informed by the former assessment, and a reduction of aggressive attitudes, as informed by the latter test. These effects were observed in SCTIG ex-combatants only.

Table 2.
Descriptive statistics for variables from the Psychosocial and Behavioral Rating Scales, and results from ANOVA models at T1 an
groups

Variable	Time 1		Time 2		*t*-test at T1 (N=31)
	SCTIG	CRG	SCTIG	CRG	SCTIG vs. CRG
	M(SD)	M(SD)	M(SD)	M(SD)	t (p)
Demographic					
Age	39.5(8.18)	35.2 (7.93)	-	-	1.45 (0.16)
Gender (F:M)	2:14	15	-	-	0.41 (0.52)
School level	10.4 (2.91)	10.1 (3.25)	-	-	0.27 (0.79)
Psychosocial					
IMA	38.13 (10.84)	33.86 (7.18)	27.94 (8.91)	34.57 (11.0)	1.25 (0.22)
ISCA1	27.38 (3.20)	27.71 (4.55)	13.88 (4.62)	16.36 (3.75)	0.24 (0.81)
ISCA2	10.06 (1.12)	11.14 (1.51)	8.94 (2.54)	10.71 (1.77)	***2.24 (0.03)***
IRIPT	16.38 (5.38)	17.50 (4.50)	17.13 (3.94)	18.92 (4.70)	-0.62 (0.54)
IRIF	13.69 (4.76)	12.86 (4.74)	11.47 (5.38)	12.62 (5.81)	0.48 (0.64)
IRIEC	13.81 (5.42)	14.14 (3.46)	18.80 (4.31)	19.92 (5.09)	0.20 (0.85)
IRIPT	11.81 (5.13)	11.38 (4.33)	10.20 (4.48)	9.62 (4.25)	0.66 (0.51)
SSG	71.31 (15.10)	64.43 (16.46)	68.23 (21.68)	64.00 (34.8)	1.19 (0.24)

IMA= Motives for Aggression Inventory, ISCA= Situation and Aggressive Behavior Inventory, ISCA1= ISCA-situation dime
dimension, IRI= interpersonal reactivity index, IRI PT= perspective taken; IRI FS= fantasy; IRI EC= empathic concern; IRI PD= p
social skills score; SCTIG= Social Cognitive Training Intervention Group, CRG= Conventional Reintegration Group, T1= time 1,

Finally, accuracy data from the ERT that yielded significant effects in the ANOVA model and that from the Psychosocial and Behavioral Rating Scales entered regression analysis. This was aimed at investigating potential associations between behavioral and psychosocial improvements resulting from the intervention. A stepwise regression analysis with Accuracy fixed as the dependent variable and Aggression IMA score as the predictor showed a significant association [B= -.53; $F(1,29)$= 10.41, p< 0.001]. Thus, improvements in controlling the influence of aggressive behavior triggers (i.e., informed by lower IMA scores) were associated to improvements in recognizing neutral faces among faces of negative or positive valence (i.e., informed by higher accuracy).

5.5. Discussion

This study was set out to investigate whether a SCT intervention program adapted for ex-combatants enrolled in the *Reintegration Route Program* could positively impact on their EP and in doing so improve their cognitive-emotional regulation. We predicted positive outcomes for SCTIG. Three main findings lend support to this hypothesis. The SCT delivered to SCTIG ex-combatants (1) significantly improved the recognition of neutral faces and (2) reduced aggressive attitudes, effects not observed in CRG ex-combatants. (3) Enhancement of EP significantly predicted a reduction of aggressive behavior triggers. These findings are discussed in turn.

To date, the literature on EP has focused on the analysis of responses to stimuli conveying emotionally relevant information which are contrasted to neutral stimuli. Interpreting the response to neutral stimuli has not been the focus of such analyses. The influence of neutral stimuli on EP has more recently become a topic of interest. For example, the role of neutral faces on EP has been a controversial topic in the literature on affective neuroscience (Güntekin

and Başar, 2014; Camfield et al., 2016; Da Silva et al., 2016). While some consider that neutral faces, as a baseline condition in Facial Emotion Recognition tasks, have a passive role (Sprengelmeyer et al., 1998; Kesler-West et al., 2001; Pessoa et al., 2002; Kilts et al., 2003), others suggest that correct neutral categorization is contingent upon a meticulous reading of embedded contextual cues. Such a reading is time consuming whereas for emotional faces the recognition is faster (Vuilleumier and Pourtois, 2007; Foti and Hajcak, 2008; MacNamara et al., 2009, 2011). The results from our study suggest that processing neutral faces is far from being a passive process. In the context of the ERT, processing neutral faces appears to index valence recognition mechanisms necessary to resolve ambiguity and uncertainty, which are pillars of successful social interactions (Harris and Menzies 1998; Schupp et al., 2004; Vuilleumier, 2005; Vuilleumier, and Pourtois, 2007).

In line with previous studies, we showed that changes in EP observed in the SCTIG are likely driven by reorganization of brain areas necessary for perceptual analysis of faces in connection with areas implicated in the attribution of valance (Mazza et al., 2010; Popov et al., 2015, Campos et al., 2016). Using EEG, improvements in alpha power modulations have been observed in schizophrenia patients after training aimed at enhancing the analysis of perceptual features to promote social abilities (Popov et al., 2015). Mazza et al., 2010 also found enhancement in emotional recognition of anger, disgust, and sadness through neuropsychological and physiological (i.e., N200) responses after an intervention relying on imitation theories (Mazza et al., 2010). More recently, a systematic review of studies reporting on neural changes after social cognitive training in patients with schizophrenia, identified increased efficiency of brain areas such as superior temporal lobe, fusiform and middle occipital gyrus, known to be involved in automatic face encoding during emotional processing (Campos et al., 2016). The authors suggested that patients develop visual strategies to serially scan facial

traits which in turn improves their ability to identify emotions. Furthermore, functional changes observed in such populations were linked to improvements in behavioral performance (Campos et al., 2016). So, there is enough evidence to suggest that positive outcomes from intervention programs, as the one reported here, do not reflect transient changes which will fade away at the intervention offset (though this is still a contentious point). Instead, they seem to result from the reorganization of core brain functions and networks which may enable such benefits endure future social challenges. Future studies should investigate the long-term persistence of such benefits and their role as predictors of successful social re-insertion.

The SCTIG received an intervention that incorporates actions towards the improvement of abilities necessary to infer others' mental state via facial expressions, a function that is essential for social interactions (Ekman and Friesen, 1971; Ekman, 1992, Shariff and Tracy, 2011). It is plausible to suggest that SCT boosted SCTIG ex-combatants' skills to discriminate between emotional valences and absence of emotion (i.e., neutrality) (e.g., Baudouin et al., 2000; D'Argembeau et al., 2003; Savaskan et al., 2007; Liu et al., 2015). People enrolled in chronic armed conflicts are more accustomed to constantly experience strong emotions than absence of emotion. From this perspective, recognition of neutral stimuli may pose a greater challenge to ex-combatants than recognition of negative or positive stimuli. Before the SCT, they tended to miss-categorize neutral faces without a preferential pattern, as shown by the Error Type analysis. This ability significantly improved only after the SCT received by the SCTIG. Hence, the SCT seems to have promoted not just the recognition of emotions but the ability to resolve discrepancies in the identification of emotions.

A second relevant finding of our study was a significant reduction of aggressive attitudes in the SCTIG. Previous studies have reported high levels of aggressive behaviors in ex-combatants (e.g., Rona et al., 2015). Former combatants have shown high scores on the

Appetitive Aggression Scale (Köbach et al., 2015). Higher scores on this scale are linked to an increased risk to get involved in physical confrontations, relational violence, difficulties to regulate anger (Orcutt et al., 2003; Shea et al., 2013), and larger prevalence of externalized conduct disorder (Elbogen et al., 2014; Sherman et al., 2015). Using automatic classification algorithms (i.e., Support Vector Machine), Quintero-Zea et al. (*in press*) recently found that proactive (i.e., instrumental) and reactive (i.e., impulsive) aggression scores segregated Colombian ex-combatants from controls. By relying on psycho-emotional strategies that equipped ex-combatants with knowledge about everyday challenges and skills to deal with them, the SCT reduced the influence of everyday triggers that typically elicit aggressive reactions. Similar effects have been observed in individuals with PTSD, personality disorders, eating disorders, autism, and disruptive behavior disorders after psycho-educational interventions (Lukens and McFarlane, 2006).

Our third and key finding was an association between improvements in EP and reductions in aggressive attitudes as a result of the SCT. Better EP is known to facilitate self-regulation (Weierstall et al., 2013). For example, improvements in the recognition of neutral faces have been found to be associated with reductions of aggressive drives (Quadflieg et al., 2012; Spisak et al., 2012). Individuals with borderline personality disorders present with a negative bias to neutral faces (Wagner and Linehan, 1999) and also tend to misinterpret interpersonal situations (Veen and Arntz, 2000; Lazarus et al., 2014). Quintero-Zea et al. (*in press*) reported that in ex-combatants, atypical EP is associated to aggressive responses. Our findings suggest that SCT promotes a better reading of neutral faces and a better interpretation of ambiguous situations thus leading to a reduction in the selection of aggressive responses. Resolving emotional ambiguity may be a skill hampered by a chronic exposure to violent experiences. Whether because of the high frequency of emotionally loaded experiences or because of the few

alternatives in terms of response choices, ex-combatants' socio-emotional system seems to bias towards contextually relevant options i.e., aggressive responses to emotionally loaded stimuli. By helping them (re)expand the emotion recognition spectrum along its continuum, and map the links between emotion and response onto everyday life situations, the SCT restored fundamental aspects of EP and social cognition which should enable a smooth social reintegration.

There are some limitations to this study which are worth considering. First, we acknowledge that a proper randomization procedure was not possible in the present study (see Methods for a description of our sampling approach). Albeit our efforts to avoid as much as possible potential selection bias, future studies may rely on standard randomization techniques to replicate the findings reported here. Second, although our statistical analyses revealed large effect sizes and acceptable power for key study outcomes, it might still be possible that a small sample size could have precluded the identification of other relevant findings. To overcome this limitation we focused only on results from carefully controlled statistical models which extracted only the most robust evidence. Future studies will be needed to replicate and expand the evidence reported here as well as to evaluate the stability of the benefits drawn from SCT in the long term. Increasing the sample size will also allow identifying differential profiles among ex-combatants (e.g., antisocial personality) what would substantiate the analysis and further identification of bio-psycho-social phenotypes of those leaving the weapons behind and opting for the social *Reintegration Route Program*. It will be also necessary to investigate whether the time elapsed between the demobilization and the initiation of the SCT matters. In this study, both groups had been enrolled in the ACR program for several years. The influence that war experiences exerted on them may have vanished through the effects of the program or time itself. Although this will be worth addressing in future studies, in the context of the present

study it can be considered a strength as a randomly selected group of ex-combatants who were given an alternative SCT intervention experienced benefits in areas of EP and social cognition not observed in those who continued the traditional intervention program. This reinforces the notion that innovative solutions which focus on actions that have a meaningful impact on socio-cognitive abilities are of a paramount importance for a faster and more successful post-war conflict reintegration. One final limitation worth mentioning is the identification of psychiatry profiles. The assessment and identification of psychiatry profiles among subjects enrolled in this type of study will allow controlling for potential confounding factors which are likely associated with the presence of mental health disorders such as depression, anxiety, or others.

5.6. Conclusion

A brief SCT program can improve EP and reduce aggressive attitudes in ex-combatants. To our knowledge this is the first study in which SCT intervention focusing on EP is delivered to a sample of ex-combatants embarked on the *Reintegration Route Program*. In addition to unveiling fundamental features of the cognitive (EP) and psychosocial (aggression) phenotype of ex-combatants, we have revealed their association and sensitivity to SCT. The ACR and similar organizations from other countries which also face similar social challenges should consider this alternative intervention as it can equip those who decide to return to society with better psychosocial coping mechanisms.

CAPÍTULO 6

DISCUSIÓN GENERAL

Los estudios que integran esta tesis, posiblemente, son los primeros que se han realizado en personas con diferentes grados de exposición al conflicto armado colombiano (grupos de excombatientes, de víctimas y de población civil que no ha estado expuesta directamente al conflicto armado) que no presentan trastornos clínicos definidos. Esto nos ha permitido obtener información sobre las características de la población expuesta crónicamente al conflicto en Colombia a partir de la implementación de un protocolo general de evaluación neuropsicológica y socio-afectiva, mediante el que se han valorado algunos efectos cognitivos, conductuales y afectivos experimentados por víctimas, excombatientes y población general como producto de la exposición al conflicto armado.

Como contribuciones fundamentales, en primer lugar, destacamos la identificación de algunos patrones de funcionamiento cognitivo-afectivo asociados con la respuesta que víctimas y excombatientes tienen frente a las demandas de su contexto social, en comparación con población civil sin exposición directa al conflicto armado. En segundo lugar, se ha proporcionado información de la eficacia de un programa de entrenamiento socio-cognitivo en un grupo de excombatientes del conflicto armado colombiano en proceso de reintegración a la vida civil.

En este capítulo se discuten los resultados obtenidos en los estudios que componen esta tesis, siguiendo los grandes apartados que organizaron los contenidos presentados en la introducción. Seguidamente, se describen las limitaciones identificadas en el desarrollo de las investigaciones. Finalmente, se comentan las implicaciones de estos hallazgos para el desarrollo de futuras investigaciones y para el diseño e implementación de intervenciones psicológicas basadas en la evidencia, que promueven el desarrollo de estrategias útiles para la construcción de paz y la reintegración social en las personas afectadas por conflictos armados en Colombia y otros lugares del mundo.

6.1. Evaluación Neuropsicológica

El uso de instrumentos neuropsicológicos, integrados con la aplicación de tareas computarizadas, es relativamente reciente en poblaciones de excombatientes y personas expuestas al conflicto armado (Tobón et al., 2016; Weierstall, Castellanos, Neuner & Elbert, 2013). En ese sentido, los resultados presentados en la tesis se suman a estos trabajos y contribuyen a mejorar el estado del conocimiento sobre el tema, no solo con el desarrollo de protocolos que integran estos recursos, sino también con la búsqueda de estrategias para mejorar la confiabilidad de los procesos de evaluación en estas poblaciones.

Este trabajo se diferencia de otras investigaciones realizadas con fuentes secundarias y en escenarios de laboratorio por Morgan y Lilienfield (2000); Morey et al., (2008); Polak, Witteveen, Reitsma y Olff (2012); Vasterling, Verfaellie, y Sullivan (2009); Vuilleumier, Armony, Driver y Dolan (2001) en personas con trastorno antisocial de conducta y en veteranos de guerra con trastorno ansioso, trastorno del estado de ánimo y lesión cerebral, entre otras alteraciones clínicas, por la recolección de información de primera mano realizada por evaluadores previamente capacitados en la aplicación de los instrumentos neuropsicológicos y en las tareas computarizadas. Además, y esto es determinante, tenían conocimiento del contexto histórico del conflicto armado experimentado por las comunidades evaluadas en las regiones en donde se hizo cada uno de los estudios presentados en la tesis.

En el estudio descrito en el capítulo 2 se utilizó un criterio estricto de inclusión y exclusión para el análisis de los datos neuropsicológicos y de tareas computarizadas de los grupos que participaron en la investigación (Aciertos >70%). Esto garantizó la confiabilidad de la información recolectada y, además, aportó nueva evidencia para identificar la sensibilidad y limitaciones de estos instrumentos para la evaluación y caracterización de poblaciones expuestas crónicamente al conflicto armado. Las tareas computarizadas utilizadas

desprendieron los efectos principales e interacciones habituales al utilizarlas (i.e. interacciones entre las redes en la Attentional Network Test for Interaction and Vigilance (ANTI-V), efecto principal de sensibilidad perceptiva en Go-No-Go, y efecto de cambio de tarea en la Social Categorization Switching Task (SCST). Todo ello garantiza la validez de su administración. Se trata de uno de los primeros estudios, realizados en Colombia, en que se amplía la información neuropsicológica reportada por Baez et al. (2017) y Tobón et al. (2016) al comparar excombatientes y controles, pues se incluye un grupo de víctimas para proporcionar el panorama general sobre los perfiles cognitivos que se pueden encontrar en personas expuestas crónicamente al conflicto en Colombia.

Los resultados presentados en el primer estudio (Capítulo 2) coinciden parcialmente con los de Tobón et al., (2016) en lo referente a las medidas de inteligencia. Estos investigadores reportaron en los excombatientes un valor promedio de inteligencia de 77, semejante al observado por nosotros (M=77.46, DS=14.5). Adicionalmente, el estudio de Tobón y colaboradores de 2016 describió diferencias entre grupos, evidenciando mejor desempeño en los controles que en los excombatientes (i.e. mayor valor en el Coeficiente Intelectual total). Estas diferencias entre excombatientes y controles, también se observaron en el funcionamiento ejecutivo de la prueba INECO Frontal Screening. En nuestro estudio se amplía la información relacionada con esta escala con la inclusión de una nueva muestra (victimas) donde se observó un patrón diferencial entre los grupos: los excombatientes presentan un menor puntaje (M=17.49, DS=4.43) en comparación con las víctimas (M=19.55, DS=3.66) y los controles (M=20.28, DS=4.43) respectivamente. Lo anterior sugiere que los excombatientes, pueden presentar un menor desempeño en la comprensión de instrucciones orientadas a la ejecución de las tareas presentadas en esta prueba (p.ej. dígitos a la inversa, control inhibitorio, memoria verbal) lo que pudo influir en su desempeño global, en comparación con los otros dos grupos.

La presencia de estas diferencias en el grupo de excombatientes puede atribuirse, como señalan Gutiérrez (2008) y Montoya, (2008) a contextos familiares disfuncionales, edad temprana de reclutamiento y la exposición crónica a la violencia, factores que influyen, entre otros, en su desempeño académico (p.ej. deserción escolar, repitencia académica), así como en la manera como interpretan su entorno social, responden y se adaptan a la vida civil.

En los instrumentos neuropsicológicos clásicos —Wisconsin Card Sorting Test (WCST) y el Trial Making Test A y B (TMT A-B) — también se observó alguna diferenciación entre los grupos. Los resultados de los aciertos del WCST y las variables de Tiempo de ejecución del TMT A-B diferenciaron al grupo de controles, que presentó un mejor desempeño en el seguimiento de instrucciones y en la velocidad para procesar la información requerida, de los grupos de víctimas y excombatientes. Además, los excombatientes mostraron una ejecución peor que las víctimas. En conjunto, los excombatientes presentan diferencias en el patrón de respuesta cognitivo, caracterizado por un mayor tiempo de ejecución en las tareas complejas (i.e. WCST, TMT-B) y un menor número de aciertos, en comparación con víctimas y controles, mientras sobresalen en su desempeño para el seguimiento de instrucciones de menor complejidad del TMT-A. Un patrón de respuesta semejante fue reportado por Dolan (2012) y Dolan y Anderson, (2002) en personas con trastorno de personalidad antisocial y psicopatía, donde el autor y sus colaboradores encuentran una asociación entre las fallas en el desempeño en las medidas cognitivas y las dificultades en la adaptación al contexto social de estas personas, particularmente se observa el uso de la agresión como estrategia para la resolución de problemas. El uso de estas medidas se estudió también por Alvarez y Emory, (2006), Aupperle et al., (2012) y Diamond, (2013) en sujetos con trastornos del estado de ánimo, de ansiedad y lesión cerebral, donde se encontró una asociación entre el bajo desempeño cognitivo (p.ej. atención, control inhibitorio) y sus dificultades para adaptarse y afrontar las demandas de su

contexto social (i.e. buen desempeño laboral, rendimiento escolar) luego de estar expuestos a eventos traumáticos (p.ej. accidentes, catástrofes naturales, guerras) o emocionalmente estresantes (i.e. separación o muerte de seres queridos, crisis vitales, falta de apoyo familiar). Por último, en otros estudios realizados con veteranos de guerra y excombatientes por Baez et al., (2017), Moran, (2015), y Weierstall et al., (2013) utilizando el INECO Frontal Screening, escalas de agresión (p.ej. cuestionarios de agresión reactiva y proactiva (RPQ) y de agresión apetitiva (AAS), así como evaluaciones de cognición social, se evidenció, al igual que en nuestro estudio, un menor desempeño en las medidas cognitivas y un mayor uso de comportamientos agresivos para responder a situaciones sociales al compararlos con grupos de controles y civiles no expuestos al conflicto armado.

Por otra parte, los resultados derivados de la aplicación de tareas computarizadas permitieron identificar diferentes patrones de funcionamiento cognitivo en víctimas, excombatientes y controles. Se observaron algunas interacciones por grupo en el tiempo de respuesta de la tarea ANTI-V: una interacción de 4 vías, en donde las redes atencionales (alerta, orientación y control) se diferenciaron por grupo, y una interacción de dos vías entre el índice de vigilancia por grupo. Estos efectos sugieren que los Tiempos de Respuesta (TR) de las redes atencionales son diferentes entre los grupos, siendo las víctimas las que presentaron un menor TR ante la presencia de los estímulos, seguidos por los controles y los excombatientes, Los resultados sugieren que la exposición al conflicto armado puede influir en los patrones de respuesta de las redes e índices atencionales evaluados a través de esta tarea. Aunque no es posible interpretar linealmente los resultados, estos efectos pueden atribuirse a la suma de cambios menores en cada una de las redes atencionales (i.e. alerta, orientación y control ejecutivo) que, en conjunto con el TR de los grupos, diferenció el patrón de respuesta atencional de las víctimas del grupo de excombatientes y de controles.

En el caso de la tarea Go-No-Go, no se encontraron efectos significativos de interacción por grupo en el sesgo de respuesta (β). Esto también se evidenció en las medidas de la tarea SCST.

En la Go-No-Go, los efectos principales fueron significativos para TR y sensibilidad perceptual (d'). De manera general, los participantes tuvieron una mayor sensibilidad y una menor rapidez para responder a estímulos distractores con valencia negativa en la condición Go. En otros estudios, en población universitaria y veteranos de guerra con trastornos de ansiedad y problemas de conducta (Nigg, 2000; Morey, Petty, Cooper, LaBar, & McCarthy, 2008; y Pacheco-Unguetti et al., 2012, Schulz et al., 2007) también se encontró una asociación entre la exposición a situaciones estresantes y la modulación de la respuesta en el reconocimiento de estímulos con diferentes valencias emocionales, particularmente de la negativa. Esta modulación en el TR se caracterizó por ser más rápida en rostros con valencia positiva (i.e. felices) que en rostros con valencia negativa (i.e. tristes). Este patrón de funcionamiento diferencial también fue reportado por Verona, Sprague y Sadeh, (2012) en sujetos con Trastornos de Personalidad Antisocial (TPA). En su estudio encontraron fallas en la modulación del procesamiento emocional de la valencia negativa asociada con el control inhibitorio. Nuestro estudio evidenció de manera general las variaciones en el tiempo de respuesta ante la presencia de estímulos emocionales, particularmente ante estímulos distractores con valencia negativa, sugiriendo que las personas, al distraerse, presentaban una mayor dificultad, para inhibir la respuesta.

Para la tarea SCST, al igual que la tarea Go-No-Go, se observaron efectos principales en el índice de cambio de tarea, pero no efectos por grupo. El desempeño de los participantes fue superior al 80%. Aunque es la primera vez que esta tarea se utiliza con estas poblaciones, los resultados de los análisis en efectos principales coinciden parcialmente con lo reportado previamente en estudiantes universitarios monolingües y bilingües por Marzecová et al. (2013),

donde se observó que los participantes tuvieron un porcentaje de aciertos superior al 80 %, sugiriendo una mayor precisión para el dominio de flexibilidad cognitiva para las categorías de género y edad presentadas en esta tarea. También fue significativo el efecto principal para TR en la condición de cambio de tarea para género y edad donde los participantes obtuvieron una mayor puntuación para categorizar la edad respecto al género. Los resultados de nuestro estudio indican que los tres grupos presentan un desempeño similar en los procesos de flexibilidad cognitiva, planteando una preservación de este recurso cognitivo para su adaptación social.

El análisis de correlaciones mostró asociaciones entre diferentes dominios cognitivos. Se identificó una relación positiva entre los aciertos del WCST y el índice de vigilancia derivado de la tarea ANTI-V, así como una relación negativa entre este índice de vigilancia y el del tiempo del TMT. El índice de control en ANTI-V también covarió positivamente con el tiempo en TMT, especialmente en su forma B.

Las asociaciones entre componentes atencionales, medidas clásicas de flexibilidad cognitiva y categorización se han estudiado en personas con depresión y ansiedad (Castaneda, Tuulio-Henriksson, Marttunen, Suvisaari, & Lönnqvist, 2008; Stein, Kennedy, Twamley, 2002). En estos, se observó alteraciones en su funcionamiento cognitivo, particularmente, en el desarrollo de las evaluaciones (i.e. mayor tiempo para la comprensión y ejecución de instrucciones), y bajo desempeño en medidas como dígitos a la inversa, TMT A-B. En nuestro estudio, se identificó una relación positiva entre la captura atencional (Vigilancia) y la categorización de estímulos (Aciertos del WCST), sugiriendo que una mejor vigilancia se asocia con un mejor desempeño del sujeto en las evaluaciones, así como una reducción en el tiempo de ejecución en tareas como el TMT. Por otra parte, una mayor puntuación en la red atencional de control, se asoció con un mayor tiempo de ejecución en el TMT. Esto implica en los sujetos, una mayor cantidad de tiempo y recursos atencionales para el desarrollo de estas tareas. Este patrón de

funcionamiento cognitivo puede estar asociado con los diferentes niveles de exposición al conflicto de los participantes en la evaluación (Giraldo, Aguirre-Acevedo, Trujillo, Ugarriza, & Trujillo, 2020)

La ejecución en las pruebas neuropsicológicas se relacionó especialmente con los valores de sensibilidad perceptiva ($d´$) en la tarea Go-No-Go, en las tres condiciones de valencia de los estímulos distractores (negativa, neutral y positiva). Así mismo, el índice de sensibilidad ($d´$) se asoció positivamente con los valores totales del INECO Frontal Screening, el índice de aciertos en WCST y la evaluación breve de la Inteligencia. Por otro lado, este índice de sensibilidad se asoció negativamente con los índices temporales en TMT.

Estos hallazgos aportan nueva evidencia sobre la relevancia de variables neuropsicológicas como las puntuaciones totales del INECO Frontal Screening, comportamentales como los índices de sensibilidad perceptual ($d´$) y los niveles de inteligencia para la construcción de un perfil para la identificación de patrones de funcionamiento cognitivo y de respuesta inhibitoria en la población evaluada.

Los análisis correlaciónales de la tarea SCST no arrojaron asociaciones significativas entre las variables neuropsicológicas y los índices de las tareas computarizadas.

De manera general, los resultados mostraron la relación entre los procesos de categorización y flexibilidad cognitiva, con la disminución de la respuesta de alerta y vigilancia experimentada por el sujeto frente a condiciones amenazantes o estresantes (p.ej. conflicto armado) (Krohne, & Hock, 2011). Autores como Albert, Moss, Tanzi, y Jones (2001); Blair, (2006); Dolan y Anderson, (2002); Dolan, (2012) y Feldberg et al., (2016) identificaron esta relación en pacientes adultos con psicopatologías clínicas diagnosticadas (p.ej. trastorno antisocial, psicopatía) y con lesión cerebral, reportando que esta disminución en la respuesta, también podía asociarse a bajas puntuaciones en dominios de inteligencia (p.ej. vocabulario, imágenes

incompletas), afectando los procesos de adaptación y respuesta a las demandas de su contexto social.

Los hallazgos del estudio descrito en el capítulo dos aportan nueva información sobre el funcionamiento cognitivo de personas expuestas y no expuestas al conflicto armado en Colombia, evidenciando cómo estas condiciones pueden influir en el desempeño neuropsicológico y comportamental de la población. Se requieren investigaciones adicionales para mejorar los protocolos de evaluación socio-cognitivos en dos vías. La primera, orientada a caracterizar con mayor precisión el funcionamiento e interacción de las redes atencionales, a partir de la construcción de tareas con instrucciones simples que se ajusten a las condiciones educativas y socio-culturales de estas personas. La segunda, dirigida a la incorporación, dentro de la programación de las tareas computarizadas, de estímulos auditivos y visuales (p.ej. Imágenes, rostros y palabras (escritas o habladas) adaptadas al contexto comunicativo de estas poblaciones) que pueden presentarse en el escenario de conflicto armado.

Esto ayudará en la identificación de patrones de respuesta cognitiva (p.ej. atencional, inhibitoria) con mayor validez ecológica, permitiendo evaluar su impacto sobre la salud mental de la población expuesta al conflicto armado en espacios laborales, educativos y familiares, contando con nueva evidencia para la caracterización de los perfiles de la población y la implementación de intervenciones efectivas orientadas a mejorar las estrategias de afrontamiento y la adaptación social de excombatientes y víctimas del conflicto armado en Colombia.

6.2. Procesamiento afectivo

Otro hallazgo importante de nuestros estudios fue la caracterización del procesamiento afectivo a partir del Interpersonal Reactivity Index (IRI) y tareas computarizadas de

reconocimiento emocional en personas que han experimentado de manera directa el conflicto armado en Colombia. El IRI se ha utilizado para evaluar las dimensiones de la empatía y su influencia sobre los procesos de adaptación social en veteranos de guerra y excombatientes con trastorno de estrés postraumático (TEPT) (Kishon-Barash, Midlarsky, & Johnson 1999; Litz et al. 2009; Teten et al., 2008). Este instrumento, también se ha administrado en excombatientes sin trastornos clínicos para buscar sus perfiles empáticos (Pineda et al., 2013; Garcia-Barrera, Karr, Trujillo, N., Trujillo, S. & Pineda 2017)

En el Capítulo 3, se describe un estudio en que se utilizó un modelo de Análisis de Clúster de Clases Latentes (ACL) para encontrar diferencias en los perfiles empáticos del grupo de excombatientes. Las variaciones se encontraron principalmente en las dimensiones cognitivas y afectivas del IRI. De los tres grupos derivados del ACL, el primero representó el 46% de la muestra y se caracterizó por tener bajas puntuaciones en las cuatro dimensiones empáticas: Toma de Perspectiva (TP), Preocupación Empática (PE), Fantasía (F), y Estrés Personal (EP). Este grupo cuenta con estrategias cognitivas y afectivas limitadas para el reconocimiento de sentimientos (p.ej. ansiedad y tristeza) en otras personas, desarrollando comportamientos agresivos e inadecuados para responder a las demandas socio-afectivas de su contexto. Por otra parte, el segundo grupo, con el 32% del total de la muestra, presentó puntuaciones altas respecto a los otros grupos en TP y PE. Finalmente, el tercer grupo, con el 22% de la muestra obtuvo una puntuación de media a alta en las dimensiones TP, F y EP y una baja puntuación en la PE que coinciden con los valores de referencia de la validación de la prueba realizada por Mestre-Escrivá, Frías Navarro y Samper García en 2004. En los últimos dos grupos, los excombatientes son capaces de hacer una valoración racional de un evento desafortunado, sin embargo, en el grupo dos, esta valoración suele acompañarse de acciones para buscar ayuda (p.ej. proteger a alguien que está siendo agredido por otra persona), las cuales se encuentran en menor

proporción en el grupo 3. Esto puede influir en la manera cómo interactúan los excombatientes frente a su contexto social, presentando una tendencia a racionalizar sus interacciones socio-afectivas hacia otras personas.

En aquellos grupos con puntuaciones bajas en PE (grupo uno y tres), las personas tienen un bajo reconocimiento de emociones y en consecuencia respuestas afectivas inadecuadas (p.ej. agresión y dolor) frente a lo que observan en otras personas. Este patrón de funcionamiento empático fue reportado previamente por Decety y Lamm (2006), Goldstein y Higgins-D'Alessandro (2001), Lamm, Decety, y Singer (2011), Köbach, Schaal, y Elbert, (2015) en población carcelaria e individuos con problemas disruptivos de conducta. Las dimensiones de empatía pueden afectarse por la presencia de conductas disruptivas como las observadas en los excombatientes que hoy en día se encuentran en su ruta de reintegración pero que en el pasado estuvieron en grupos al margen de la ley. Sería de gran interés conocer cómo se van configurando y modificando diferencialmente los procesos empáticos en excombatientes y la causa de esos cambios.

Es por esto que los resultados del ACL presentado en el capítulo 3, representa un avance importante para el estudio de las variables socio-afectivas como las utilizadas en el IRI. Esta herramienta permitió la clasificación de excombatientes expuestos directamente a eventos violentos (p.ej. combates armados, torturas y masacres) como los presentados en este trabajo. Los resultados de nuestro estudio permitieron la identificación de diferentes perfiles, basados en las dimensiones cognitivas y afectivas de la empatía en esta población. Aunque la aproximación de la escala es de corte dimensional, el ACL fue una metodología confiable para establecer el funcionamiento en mayor o menor proporción de estas dimensiones y discutir su potencial influencia en los procesos de adaptación social de los excombatientes. Esto permitirá contar con una clasificación inicial de perfiles empáticos basados en las dimensiones cognitivas

y afectivas del IRI, posibilitando con ello, el diseño, desde un enfoque cognitivo, de intervenciones psicológicas efectivas y eficaces para la atención de estas poblaciones, orientándose al fortalecimiento de componentes socio-cognitivos (p.ej. habilidades sociales, asertividad, estrategias de afrontamiento) para la reducción de la agresión y la adaptación del sujeto a su contexto social (i.e. familiar, laboral, educativo).

En el capítulo 4 se describe un estudio que, también, proporciona información adicional sobre el procesamiento afectivo de los excombatientes, que por el carácter multidimensional e integrativo de algunos de sus componentes (i.e. neurobiológicos, cognitivos, emocionales) se evalúa a través de Tareas de Reconocimiento Emocional (TRE). En los últimos años, el diseño de tareas de reconocimiento emocional sincronizadas con EEG se ha convertido en un tema de especial interés para la evaluación del procesamiento afectivo en personas con trastorno de ansiedad y depresión, así como en grupos de veteranos de guerra y excombatientes (Ibañez et al., 2014; Quintero et al., 2017; Tobón et al., 2015). En ellos, el componente N170 muestra un funcionamiento atípico en comparación con un grupo control.

En ese sentido, los análisis realizados con Potenciales Relacionados a Eventos (PRE´s) de la (TRE) revelaron diferencias entre los grupos, principalmente, en amplitud y latencia del componente N170 durante el reconocimiento de rostros. Los excombatientes describieron una mayor amplitud y latencias más cortas en este componente para el reconocimiento de las caras en comparación con los controles. En el caso del reconocimiento de palabras, solo los controles presentaron diferencias significativas en la amplitud, al comparar los estímulos con valencia positiva de los neutrales, siendo las palabras agradables en las que se observó mayor amplitud que en las neutras. En el caso de los excombatientes, no se observan diferencias en la amplitud de este componente durante el procesamiento de la valencia emocional de palabras. Lo anterior sugiere que los estímulos de la TRE en conjunto con el componente N170 pueden convertirse

en un marcador neural para la valoración del procesamiento socio-cognitivo en excombatientes y controles.

La modulación atípica en el procesamiento de palabras ha sido estudiada en personas con trastorno bipolar, dolor crónico, trastorno de ansiedad y psicopatía (Ibáñez et al., 2014; Kissler et al., 2006). Los hallazgos de nuestro estudio evidencian la presencia de patrones diferenciales en excombatientes y controles, complementando lo reportado por Quintero-Zea et al., (2017) y Tobón et al., (2019), donde identificaron variaciones en el funcionamiento electrofisiológico de excombatientes y controles en componentes como el Early Posterior Negativity (EPN), el Late Positive Potential (LPP), el N170 y la P300 en el procesamiento cognitivo y el reconocimiento de la valencia emocional de rostros y palabras.

La presencia de estos perfiles socio-cognitivos diferenciales fue reportada en pacientes psiquiátricos (Esquizofrenia, Trastorno Bipolar) y excombatientes por Ibáñez et al., (2014), y Tobón et al., (2015). Estos estudios señalan la relación entre componentes tempranos (N170, EPN) y componentes tardíos (LPP) del procesamiento emocional, con el desempeño que tienen estas personas para el reconocimiento de la valencia de rostros, palabras e imágenes afectivas como las presentadas en el International Affective Picture System (IAPS). En el caso de los excombatientes, se observaron diferencias en el EPN para efectos principales de categorización de la valencia emocional de imágenes afectivas (positiva, negativa, neutra), y diferencias entre grupos (i.e. excombatientes vs. controles) en la amplitud del componente LPP, siendo los excombatientes quienes presentaron una mayor amplitud para categorizar la valencia de las imágenes afectivas, en comparación con los controles quienes no presentaron modulaciones diferenciales en la amplitud de este componente ante la presencia de estímulos emocionales.

A nivel comportamental, los resultados de TRE mostraron un efecto significativo en el tipo de error, durante la presentación de la cara neutra. El grupo control sesgó la respuesta asignando

una valencia negativa (rostro enojado) al rostro neutro en un 22.7% de los ensayos; para la valencia positiva (Error Neutro-Alegre), el porcentaje de errores se ubicó en un 13%. Este patrón de respuesta no se observó en los excombatientes quienes presentaron un tipo de error para ambas condiciones (Error Neutro-Alegre, Error Neutro-Enojado) del 19%. Estudios previos en poblaciones con esquizofrenia, autismo y trastornos del estado de ánimo también identificaron errores en la asignación de respuesta para los estímulos neutros. (Camfield, Mills, Kornfeld, & Croft, 2016; Da Silva, Crager, & Puce, 2016; Güntekin & Başar 2014). Esto ha planteado la discusión sobre el papel de la condición neutra respecto a la valencia positiva y negativa en la lectura del contexto social y la modulación del procesamiento emocional, principalmente en la asignación de sesgos en la respuesta social y la valoración de situaciones en contextos violentos (Anderson et al., 2003; Hugenberg & Bodenhausen, 2004)

Aunque no todas las medidas incluidas sobre de comportamiento y procesamiento socio-cognitivo (empatía, teoría de la mente) presentadas en este trabajo arrojaron diferencias significativas por grupos, los resultados obtenidos en la Escala de Habilidades Sociales (EHS) permitieron identificar de manera inesperada, en el grupo de excombatientes, un mejor desempeño al interactuar socialmente y expresar desacuerdos. Además, se identificó un rol predictivo de la dimensión socio-cognitiva para las variables amplitud, latencia y tipo de error derivada de la TRE en excombatientes colombianos y controles. Lo anterior sugiere que, ante situaciones violentas (i.e. conflicto armado), los excombatientes presentan un repertorio social diferente, caracterizado por un mayor uso de recursos para evaluar rostros que potencialmente les permiten adaptarse a ese contexto, así como para manifestar sus ideas y desacuerdos a otras personas, posiblemente, ante las demandas particulares del escenario de combate.

Los hallazgos de PRE´s en conjunto con la TRE mostraron su utilidad para diferenciar la modulación de la amplitud y latencia en excombatientes y controles. En las variables

comportamentales (tiempo de reacción, aciertos, errores), solo se pudo observar diferencias en el porcentaje de errores para la asignación de la valencia de la condición neutra en el grupo de controles. Esto sugiere una sensibilidad de los componentes electrofisiológicos para capturar las variaciones sutiles por grupo en el reconocimiento de estímulos emocionales que no alcanzan a observarse en las variables comportamentales y clínicas. Esto lo confirman los estudios realizados por Chapin y Russell-Chapin, (2013) y Olbrich, van Dinteren y Arns, (2015) donde proponen que las medidas electrofisiológicas pueden detectar etapas tempranas e incluso preclínicas de los trastornos neuropsiquiátricos.

Lo anterior, sumado a lo encontrado en nuestro estudio, supone una reorganización funcional en los excombatientes, particularmente en la amplitud de componentes electrofisiológicos y en los mecanismos cognitivo-afectivos responsables de la respuesta social. Esto puede estar relacionado con su exposición a la experiencia de guerra, donde disponen de un repertorio de claves sociales en el que confían para adaptarse a las demandas de su entorno social (p.ej. uso de palabras claves o códigos para comunicar la presencia de grupos armados o amenaza de enfrentamientos armados, lenguaje corporal).

Nuestros hallazgos sugieren que la adición de medidas electrofisiológicas a protocolos de evaluación de poblaciones expuestas a conflictos armados puede mejorar la caracterización socio-cognitiva de estas poblaciones, proporcionando nueva evidencia para la identificación de los diferentes perfiles y variables para la medición de la efectividad de las intervenciones psicológicas implementadas en los programas de atención al personal que se encuentra en proceso de reintegración a la vida civil. Este estudio aporta nueva información para la identificación de patrones electrofisiológicos y comportamentales relacionados con el funcionamiento afectivo y la adaptación al contexto social de los excombatientes. Para ello, se espera, en futuros estudios, mejorar la adaptación y diseño de instrumentos orientados a

fortalecer aquellos componentes del repertorio cognitivo- afectivo que se encuentran alterados en ellos y de esta manera, caracterizar e intervenir con mayor precisión a excombatientes y otras poblaciones expuestas al conflicto armado en Colombia.

6.3. Entrenamiento Socio-Cognitivo (ESC)

El Entrenamiento Socio Cognitivo (ESC) utilizado en excombatientes que no presentan trastorno clínico se ha descrito en el Capítulo 5 de esta tesis. Entendemos que es uno de los aportes clave para la generación de tratamiento psicológico alternativo en poblaciones expuestas a conflictos armados. Los ejes que conformaron el entrenamiento (emociones básicas, habilidades sociales y teoría de la mente) tienen como propósito fortalecer el repertorio afectivo y conductual del que disponen los participantes para adaptarse a las demandas propias de su contexto social. La participación de los excombatientes en este entrenamiento mejoró el reconocimiento de rostros neutros. Así mismo, el entrenamiento redujo los motivos para agredir a otras personas, modulando tendencias comportamentales, posiblemente, establecidas por la experiencia directa de combate experimentada durante su permanencia en el grupo armado.

El uso de la terapia cognitiva y la psicoeducación para el tratamiento y entrenamiento psicológico en excombatientes se ha estudiado previamente en el Trastorno de Estrés Postraumático (TEPT), otros trastornos ansiosos y del estado de ánimo, y en personas con comportamiento disruptivo y /o personalidad antisocial (Lukens & Mcfarlane, 2006; Steenkamp, Litz, Hoge, & Marmar, 2015). Los resultados evidenciaron una reducción de los síntomas (ansiedad, agresión, depresión) reportados al inicio del tratamiento, así como el mejoramiento del funcionamiento social frente a su entorno (p.ej. incremento de afrontamientos asertivos), incluso después de sólo un mes de tratamiento, en comparación con grupos control o grupos en lista de espera.

En el estudio descrito en el capítulo 4, la modulación electrofisiológica de los excombatientes en la TRE se caracterizó por una mayor amplitud en el componente N170 durante el reconocimiento de rostros, al igual que un procesamiento atípico de la amplitud en dicho componente durante el reconocimiento de la valencia emocional de las palabras incluidas en el diseño de la tarea. En la intervención descrita en el Capítulo 5, se encontró que el ESC recibido por el grupo de excombatientes mejoró el reconocimiento de rostros neutros.

Estudios previos en el tema se han centrado en el análisis de la respuesta a estímulos con valencias emocionales relevantes (i.e. rostros e imágenes positivas o negativas con umbrales altos de activación) que se comparan con estímulos neutros, donde estos últimos, de acuerdo con Sprengelmeyer et al., (1998), Kesler-West et al., (2001), Pessoa et al., (2002), Kilts et al., (2003) tenían poca relevancia en el análisis del reconocimiento emocional de rostros. Hasta hace poco, la interpretación de la condición neutra no se consideraba como parte de los análisis de resultados en las tareas de procesamiento emocional, siendo un tema discutido y controvertido en la literatura (Güntekin y Başar, 2014; Camfield et al., 2016; da Silva et al., 2016). Recientemente, se ha reconocido la influencia del contexto social en la categorización de la condición neutra, donde su procesamiento, requiere de una mayor cantidad de tiempo en comparación con estímulos emocionales con valencia positiva y negativa, ante los cuales, las personas responden con mayor rapidez (Vuilleumier & Pourtois, 2007; Foti & Hajcak, 2008; MacNamara et al., 2009, 2011). Los resultados de nuestro estudio sugieren, a diferencia de lo reportado por Sprengelmeyer et al., (1998), Kesler-West et al., (2001), Pessoa et al., (2002), Kilts et al., (2003), que el procesamiento de rostros neutros aporta información relevante. En el caso de la TRE utilizada como medida del ESC, la condición neutra parece reclutar recursos cognitivos para su reconocimiento y diferenciación de otras valencias (positiva-negativa) lo

cual es necesario para el desarrollo de interacciones sociales exitosas (Harris & Menzies, 1998; Schupp et al., 2004; Vuilleumier, 2005; Vuilleumier & Pourtois, 2007).

La neutralidad se ha reportado también en pacientes con esquizofrenia, luego de participar en un entrenamiento dirigido para mejorar el reconocimiento de claves contextuales y sus habilidades sociales (Popov et al., 2015; Mazza et al., 2010). Así mismo, se observó a través de medidas neuropsicológicas y neurofisiológicas (i.e. TMT-AB, Matrices progresivas de Raven, componente N200), el cambio experimentado por los sujetos luego de participar en entrenamientos socio-cognitivos en donde se reportó un mayor reconocimiento de la ira, el asco, y la tristeza. La evidencia descrita sugiere que este tipo de entrenamientos mejoran las habilidades para el reconocimiento de rostros con contenido emocional (Mazza et al., 2010; Campos et al., 2016).

En nuestro estudio, el grupo que recibió el ESC mejoró sus habilidades para inferir las intenciones y el estado emocional de otras personas (ToM) a partir de la identificación de claves contextuales, particularmente, en el reconocimiento emocional de expresiones faciales, necesarias para su adaptación a las demandas de su contexto social (Ekman & Friesen, 1971; Ekman, 1992; Shariff & Tracy, 2011). Los excombatientes que participaron en el ESC mejoraron sus habilidades para discriminar entre valencias emocionales y ausencia de emoción (i.e. neutralidad) (Baudouin et al., 2000; D'Argembeau et al., 2003; Savaskan et al., 2007; Liu et al., 2015). Con frecuencia, las personas que han estado expuestas crónicamente a conflictos armados clasifican mejor estímulos positivos y negativos que la ausencia de estos. En los excombatientes, antes de su participación en el ESC, el reconocimiento de estímulos neutros no evidenciaba un patrón de respuesta preferente, confirmando lo reportado en excombatientes colombianos por Quintero y colaboradores, (2017). Esta habilidad mejoró significativamente en el grupo que participó en el ESC y no en el grupo que continuó con su ruta de reintegración

convencional, sugiriendo que el entrenamiento mejoró la habilidad para reconocer y clasificar la valencia emocional de los rostros.

El segundo hallazgo relevante de nuestro estudio fue la reducción significativa de la agresión en los excombatientes que participaron en el ESC. Estudios previos en veteranos de guerra y excombatientes realizados por Rona y colaboradores, (2015) reportaron un mayor repertorio de conductas agresivas en estas poblaciones. Así mismo, se observaron puntuaciones altas en la escala de agresión apetitiva, las cuales han sido relacionadas a un mayor riesgo ejercer conductas violentas (p.ej. participar en peleas y/o confrontaciones físicas, ejercer violencia contra la pareja y controlar la ira) (Köbach et al., 2015; Orcutt et al., 2003; Shea et al., 2013), y una mayor prevalencia de trastornos disruptivos de conducta (Elbogen et al., 2014; Sherman et al., 2015). Otras aproximaciones que utilizan máquinas de soporte vectorial (Quintero-Zea et al. 2017) han informado que los puntajes de agresión proactiva (i.e. instrumental) y reactiva (i.e. impulsivo), permitieron diferenciar a excombatientes y controles, siendo los excombatientes quienes presentaron un mayor puntaje en ambas categorías (proactiva-reactiva) en comparación con los controles.

A partir del ESC, los participantes contaron con un nuevo repertorio de estrategias socio-afectivas para afrontar los desafíos cotidianos de su vida (p.ej. trabajo, escuela, familia), reduciendo la influencia de aquellas situaciones y comportamientos que motivan la respuesta agresiva (p.ej. situación económica, problemas en el trabajo/estudio). Este patrón de resultados no se observó en los participantes que continuaron su proceso reintegración convencional. Otros estudios realizados en personas con TEPT, trastornos de la personalidad, trastornos de la conducta alimentaria, autismo, y trastornos disruptivos de conducta presentaron resultados similares a los reportados en nuestro estudio (i.e. reducción de la agresión) luego de su participación en intervenciones psicoeducativas (Lukens & Mcfarlane, 2006).

Nuestro tercer hallazgo fue una asociación entre un mejor desempeño en el procesamiento emocional y la reducción de las actitudes agresivas como resultado de su participación en el ESC. De acuerdo con Weierstall et al., (2013), mejores habilidades en el procesamiento de emociones facilitan la adaptación y la autorregulación del comportamiento social. En ese sentido Quadflieg et al., (2012) y Spisak et al., (2012) encontraron en personas expuestas a la guerra, una asociación entre el reconocimiento de rostros neutros y la reducción de impulsos agresivos. Esta asociación también se encontró en individuos con trastorno límite de personalidad, donde el sesgo negativo en la identificación de caras neutrales se relacionó negativamente con la manera responder adecuadamente ante situaciones sociales (Lazarus et al., 2014; Veen & Arntz, 2000; Wagner & Linehan, 1999). En los excombatientes, esto se evidencia en un procesamiento atípico de las emociones asociado con la presencia de comportamientos agresivos (Quintero Zea et al., 2017).

Los hallazgos de este estudio evidenciaron que la participación de los excombatientes en el ESC mejoró la lectura de caras neutras y la interpretación de situaciones ambiguas lo que influyó en la reducción de la respuesta agresiva como alternativa para la solución de problemas, sugiriendo que el sistema socio-afectivo de los excombatientes, por la exposición crónica a experiencias violentas, direcciona sus recursos a opciones relevantes (i.e. valencia negativa, alta activación) que conducen al desarrollo de una respuesta agresiva. El ESC amplía el repertorio respuestas socio-afectivas y establece una relación entre la emoción y la respuesta para atender a las demandas de la vida cotidiana, encaminadas al desarrollo efectivo de la reintegración social de esta población.

Un aspecto que hay que destacar a lo largo de los diferentes estadios de esta investigación fue la disposición de la población para el desarrollo de las diferentes fases de evaluación y tratamiento. Desde el encuadre hasta el cierre del entrenamiento, las sesiones se desarrollaron

con naturalidad de manera individual, y no se tomó como punto de partida una condición clínica de base (p.ej. TEPT) para el trabajo con los participantes. Las actividades propuestas para cada uno de los ejes de intervención fueron socializadas por la terapeuta en cada encuentro con ellos y se basaban en situaciones que podían presentarse en su vida diaria. Esto favoreció la adherencia y compromiso en su participación y asistencia semana a semana a las diferentes sesiones individuales pre-post entrenamiento, en las que además aportaron valiosa información sobre sus necesidades psicosociales. Estudios previos en estas poblaciones describen, dentro de sus limitaciones, la deserción e inasistencia de los excombatientes a las sesiones programadas para evaluación e intervención (Bell, Méndez, Martínez, Palma, & Bosch, 2012).

En conjunto, la caracterización presentada en los capítulos 2, 3 y 4 brindó las pautas mediante las cuales se pudo identificar los patrones diferenciales en el funcionamiento socio-cognitivo de personas expuestas crónicamente al conflicto armado en Colombia, particularmente de excombatientes en proceso de reintegración. La contribución de estos resultados favoreció el desarrollo de un ESC lo que permitió transferir estos resultados a una propuesta de tratamiento psicológico adaptado a estas diferencias, las cuales mostraron variaciones entre los excombatientes que participaron del ESC de aquellos que continuaron con su ruta de reintegración convencional. Esto muestra la necesidad de investigar a futuro la efectividad de la atención psicológica diferencial para el tratamiento, no solo de los excombatientes, también de otras poblaciones que se han visto expuestas al conflicto armado como es el caso de víctimas y militares en uso de buen retiro.

Por último, es importante considerar el papel que juega la implementación de estas alternativas de tratamiento en la salud mental, complementando los programas de atención existentes para estas poblaciones, principalmente en lo que se relaciona a la comprensión que tiene la persona que recibe el entrenamiento sobre sus propias emociones y las de otras personas

para mejorar su interacción social, utilizando estos aprendizajes para responder adaptativamente a estas demandas, facilitando una sana convivencia y la construcción de paz al interior de sus comunidades.

6.4. Limitaciones

Muestras de participantes y situación sociopolítica de Colombia

Los acontecimientos socio-políticos ocurridos en Colombia durante el desarrollo de esta tesis ocasionaron dificultades para incorporar excombatientes en las investigaciones. Un ejemplo de esta situación se derivó del desarrollo de los diálogos con las Fuerzas Armadas Revolucionarias de Colombia (FARC), lo que implicó, por razones de seguridad, una serie de restricciones de orden político-administrativo para el acceso a la muestra, retrasando la fase de evaluación en dos ocasiones. En la primera, se tardó más de dos años en autorizar el acceso a la muestra de excombatientes. En la segunda, posterior a la firma del acuerdo de paz con las FARC, el acceso a la población de excombatientes se proporcionó de forma intermitente después del primer trimestre del 2017.

Lo anterior restringió los encuentros de manera que solo permitió tomar una única medida post entrenamiento, dificultando el seguimiento del grupo de excombatientes que participó en el ESC y del grupo que recibió el tratamiento convencional en el marco de su ruta de reintegración con la Agencia para la Reincorporación y Normalización (ARN).

Otra de las dificultades presentadas en el desarrollo de nuestra investigación fue el tamaño reducido de la muestra de excombatientes. Paradójicamente, aunque las cifras oficiales de la ARN y de la Unidad para las Víctimas del gobierno de Colombia reportan más de 60.000 excombatientes y 8 millones de víctimas, la mayor parte de los estudios presentados en esta tesis tienen tamaños de muestra modestos (un total de 738 excombatientes participantes). Esta

dificultad parece habitual, cuando se incluyen participantes soldados, ex combatientes y veteranos de guerra (Bell et al., 2012). En Colombia, además, el acceso a esta población se dificulta por las amenazas directas a la seguridad que experimentan los excombatientes y sus familias, lo que está relacionado con la dinámica misma del conflicto armado. Estas personas tuvieron que desplazarse desde su lugar de residencia original (Medellín y área metropolitana) a diferentes regiones del país.

Considerando que, a nuestro conocimiento, algunos de los estudios presentados en esta tesis son de los primeros reportados en la literatura donde se utilizaron estas herramientas de evaluación e intervención y aunque la confiabilidad de los hallazgos está bien asentada en los análisis estadísticos, debe mantenerse la prudencia al generalizarlos a otras poblaciones de excombatientes. Esto considerando que condiciones como el nivel educativo de los participantes evaluados en los estudios referidos en esta tesis no era muy elevado (M=8-10; DS=3-4). Algunas de las personas evaluadas presentaron dificultades para comprender las instrucciones del protocolo de evaluación psicológico y de las tareas computarizadas utilizadas para este trabajo.

Para garantizar la confiabilidad de los datos, en el Capítulo 2 se estableció un criterio estricto de inclusión de la muestra basado en el porcentaje de aciertos obtenido en las tareas computarizadas, que en este caso fue del 70% de aciertos en adelante, lo que redujo el número de sujetos por grupo que se utilizaron en el análisis estadístico de los datos.

En el caso de los Capítulos 3, 4 y 5, el criterio de desempeño en aciertos no se asumió para el análisis de la información, entre otras razones, porque la recolección de información se hizo en un solo momento con muestras independientes de excombatientes y controles, y diferentes participantes en cada uno de los estudios. Solo en el Capítulo 5 se tomaron medidas de pre- y post para la evaluación del ESC.

6.5. Perspectivas a futuro

6.5.1. Protocolo de evaluación

Se espera replicar en futuros estudios los protocolos de evaluación y tratamiento utilizados en personas expuestas al conflicto armado (p.ej. excombatientes) y, de esta manera, mejorar la información y evidencia disponible (i.e. biológica, comportamental y social) sobre los patrones de funcionamiento socio-cognitivo de estas poblaciones, contribuyendo a la implementación y mejoramiento de rutas de atención y reintegración social de víctimas y excombatientes de conflictos armados.

Así mismo, es importante considerar la inclusión de escalas de rastreo como la versión en español de la Mini Entrevista Neuropsiquiatrica Internacional (MINI) del DSM IV (Ferrando, Bobes, Gibert, Soto, & Soto, 1998), que identifiquen la presencia de condiciones clínicas de base como trastornos del espectro ansioso, depresión u otros trastornos que pueden relacionarse con alteraciones en el procesamiento afectivo, permitiendo caracterizar el estado psicopatológico del sujeto al iniciar su participación en la investigación. Lo anterior sumado a la validación de instrumentos psicológicos y tareas computarizadas, permitiría identificar perfiles diferenciales en excombatientes a partir de la asociación entre procesos cognitivo-afectivos y los índices de ejecución de las tareas computarizadas, generando rutas de atención diferenciales (i.e. farmacológicas, psicoterapéuticas) para estas poblaciones. Esto se basa en las diferencias reportadas por los participantes de los estudios que conforman esta tesis.

6.5.2. Tratamientos psicológicos en poblaciones expuestas crónicamente al conflicto armado

Se espera replicar el ESC presentado en el Capítulo 5, no solo en nuevos grupos de excombatientes en su ruta de reintegración, también desarrollarlo en otras poblaciones expuestas al conflicto armado (p.ej. víctimas de desplazamiento forzado, civiles y militares) en Colombia, y otras naciones con conflictos similares (p. ej. Norte de África, Siria) (Martz, 2010; Maedl, Schauer, Odenwald, & Elbert, 2010). En esta línea, se propone en el futuro, realizar un seguimiento con medidas a 6 y 12 meses para la evaluación de la eficacia del ESC en estas poblaciones.

Aunque este estudio es uno de los primeros referentes de entrenamiento basado en la evidencia en excombatientes colombianos, abre la puerta a nuevas propuestas de tratamiento psicológico orientadas a fortalecer mecanismos cognitivo-afectivos en estas poblaciones, para favorecer la adaptación a su contexto social y que estos procesos de evaluación, implementación y seguimiento cuenten con herramientas confiables para la medición del cambio terapéutico experimentado por la población, y de esta manera, contribuir con los procesos de transición y pos-conflicto que se vienen adelantado a la fecha en el país.

6.5.3. Validez del constructo de un instrumento de situaciones de exposición crónica al conflicto armado

Teniendo en cuenta las características particulares que presenta el conflicto armado en Colombia (baja intensidad y larga duración), se espera validar en futuros estudios, herramientas que permitan valorar en estas poblaciones el constructo de "situaciones de exposición crónica al conflicto armado". En la actualidad se cuenta con un marco jurídico y conceptual que permitió interpretar los resultados de este estudio (Centro de Recursos para el Análisis de Conflictos CERAC, 2017; Levy & Sidel, 2016; Restrepo & Aponte, 2009); se considera importante disponer de un instrumento confiable que permita, en primer lugar, identificar el

nivel de exposición crónica al conflicto armado experimentado por cada individuo (p.ej. alto, medio y bajo) y, en segundo lugar, discriminar las agrupaciones de acuerdo con la funcionalidad de su respuesta social (p.ej. alta funcionalidad, funcionalidad normal, disfuncional).

Para esto, es importante definir las categorías mediante las cuales se evaluaría la información del instrumento con el propósito de direccionar efectivamente su tratamiento, y posiblemente, sugiriendo que, el nivel de exposición al conflicto, puede brindar información relevante para el diseño de estrategias evaluación e intervención psicológica con estas poblaciones.

Una primera aproximación a esta hipótesis se observó en el Capítulo 2, en donde los análisis de ANOVAS no evidenciaron, a excepción de la tarea ANTI-V, diferencias significativas por grupos, principalmente en la evaluación de víctimas y excombatientes en los patrones de ejecución cognitiva y comportamental. Esto podría implicar una relación entre los diferentes niveles de exposición al conflicto experimentados por estos grupos y la afectación que estas personas puedan tener a nivel socio-cognitivo (p.ej. empatía, flexibilidad cognitiva, velocidad de procesamiento). Para la fecha de la elaboración de este apartado del documento, el artículo de validación del instrumento que mide el nivel de exposición crónica al conflicto (Giraldo et al., 2020) se encuentra publicado en Psychiatric Quarterly.

6.5.4. Construcción de paz y tejido social en territorios afectados por el conflicto armado

Se espera que la implementación de entrenamientos cognitivos basados en la evidencia como el presentado en el Capítulo 5, mejore la comprensión de las dinámicas complejas y afectaciones socio-afectivas ocasionadas por esta problemática, direccionando estratégicamente los programas de atención realizados con grupos de víctimas y excombatientes, para el fortalecimiento del tejido social y la construcción de paz en las

comunidades que, por más de medio siglo, estuvieron expuestas directamente al conflicto armado en Colombia.

Para esto, nuestro primer paso fue la aplicación de las herramientas de evaluación para la caracterización de la población expuesta crónicamente al conflicto armado en el país que hizo parte de los estudios presentados en esta tesis. Luego, desde el ESC se buscó promover la asertividad y la disminución de los afrontamientos agresivos en la población, mejorando su adaptación a la realidad particular de cada individuo y contexto social.

Finalmente, se espera que los resultados de investigación presentados en esta tesis, promueva la construcción de un discurso integrativo entre disciplinas (p.ej. psicología, salud pública, neurociencias, historia, antropología) que conduzca al desarrollo de propuestas enfocadas en investigación para la paz, que impacten sobre el escenario político y académico, para el diseño e implementación de políticas públicas y programas de rehabilitación en salud mental pensados específicamente para estas poblaciones, y así: (1) Empoderar a las personas a ser agentes de cambio en sus comunidades, y (2) promover el desarrollo pacífico y saludable en los territorios expuestos históricamente a la confrontación armada en Colombia.

Referencias

Adolphs, R. (2001). The neurobiology of social cognition. *Current opinion in neurobiology*, *11*(2), 231-239. https://doi.org/10.1016/S0959-4388(00)00202-6

Adolphs, R., Sears, L., & Piven, J. (2001). Abnormal processing of social information from faces in autism. *Journal of cognitive neuroscience*, *13*(2), 232-240. https://doi.org/10.1162/089892901564289

Adolphs, R., Baron-Cohen, S., & Tranel, D. (2002). Impaired recognition of social emotions following amygdala damage. *Journal of cognitive neuroscience*, *14*(8), 1264-1274. https://doi.org/10.1162/089892902760807258.

Adolphs, R. (2003). Cognitive neuroscience of human social behaviour. *Nature Reviews Neuroscience*, *4*(3), 165-178. https://doi.org/10.1038/nrn1056

Adolphs, R. (2009). The social brain: neural basis of social knowledge. *Annual review of psychology*, 60, 693-716. https://doi.org/10.1146/annurev.psych.60.110707.163514

Akbarian, F., Bajoghli, H., Haghighi, M., Kalak, N., Holsboer-Trachsler, E., & Brand, S. (2015). The effectiveness of cognitive behavioral therapy with respect to psychological symptoms and recovering autobiographical memory in patients suffering from post-traumatic stress disorder. *Neuropsychiatric disease and treatment*, *11*, 395. doi: 10.2147/NDT.S79581

Albert, M. S., Moss, M. B., Tanzi, R., & Jones, K. (2001). Preclinical prediction of AD using neuropsychological tests. J*ournal of the International Neuropsychological Society*, 7(5), 631-639. https://doi.org/10.1017/S1355617701755105

Alvarez, J. A., & Emory, E. (2006). Executive function and the frontal lobes: a meta-analytic review. *Neuropsychology Review*, 16(1), 17-42. https://doi: 10.1007/s11065-006-9002-x

Anderson, C. A., Carnagey, N. L., & Eubanks, J. (2003). Exposure to violent media: The effects of songs with violent lyrics on aggressive thoughts and feelings. *Journal of personality and social psychology*, *84*(5), 960.. doi: 10.1037/0022-3514.84.5.960

Andreou, C., Kelm, L., Bierbrodt, J., Braun, V., Lipp, M., Yassari, A. H., & Moritz, S. (2015). Factors contributing to social cognition impairment in borderline personality disorder and schizophrenia. *Psychiatry Research*, *229*(3), 872-879. https://doi.org/10.1016/j.psychres.2015.07.057.

Antai-Otong, D. (2016). Psychosocial recovery and rehabilitation. *Nursing Clinics*, *51*(2), 287-297. https://doi.org/10.1016/j.cnur.2016.01.011

Aupperle, R. L., Melrose, A. J., Stein, M. B., & Paulus, M. P. (2012). Executive function and PTSD: disengaging from trauma. *Neuropharmacology*, 62(2), 686-694. https://doi:10.1016/j.neuropharm.2011.02.008

Ávila-Toscano, J. H. (2015) Tipos de redes personales basados en indicadores estructurales y apoyo social, y su influencia en la salud mental de personas desmovilizadas del conflicto armado en Colombia. Recuperado de http://www.reintegracion.gov.co/es/la-reintegracion/centro-de-documentacion/Documentos/Tipos%20de%20redes%20personales.pdf

Baez, S., Manes, F., Huepe, D., Torralva, T., Fiorentino, N., Richter, F., ... & Matallana, D. (2014). Primary empathy deficits in frontotemporal dementia. *Frontiers in aging neuroscience*, 6, 262. https://doi.org/10.3389/fnagi.2014.00262

Baez, S., Manes, F., Huepe, D., Torralva, T., Fiorentino, N., Richter, F., ... & Matallana, D. (2014). Primary empathy deficits in frontotemporal dementia. *Frontiers in aging neuroscience*, 6, 262. https://doi:10.3389/fnagi.2014.00262

Barnard, P. J., Duke, D. J., Byrne, R. W., & Davidson, I. (2007). Differentiation in cognitive and Emotional meanings: An evolutionary analysis. *Cognition and Emotion*, 21, 1155-1184. https://doi.org/10.1080/02699930701437477

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the Mind in the Eyes" Test revised version: a study with normal adults, and adults with Asperger syndrome or high-functioning autism. *The Journal of Child Psychology and Psychiatry and Allied Disciplines*, *42*(2), 241-251. https://doi.org/10.1017/S0021963001006643

Barratt, D., & Bundesen, C. (2012). Attentional capture by emotional faces is contingent on attentional control settings. Cognition & emotion, 26(7), 1223-1237. https://doi.org/10.1080/02699931.2011.645279

Bate, S., Parris, B., Haslam, C., & Kay, J. (2010). Socio-emotional functioning and face recognition ability in the normal population. *Personality and Individual Differences*, 48(2), 239-242. https://doi.org/10.1016/j.paid.2009.10.005

Batty, M., & Taylor, M. J. (2003). Early processing of the six basic facial emotional expressions. *Cognitive Brain Research*, *17*(3), 613-620. https://doi.org/10.1016/S0926-6410(03)00174-5

Baudouin, J. Y., Gilibert, D., Sansone, S., and Tiberghien, G. (2000). When the smile is a cue to familiarity. *Memory* 8, 285–292. doi: 10.1080/09658210050117717

Bauer, R. M., Iverson, G. L., Cernich, A. N., Binder, L. M., Ruff, R. M., & Naugle, R. I. (2012). Computerized neuropsychological assessment devices: joint position paper of the American Academy of Clinical Neuropsychology and the National Academy of Neuropsychology. *The Clinical neuropsychologist*, 26(2), 177-196. https://doi.org/10.1080/13854046.2012.663001

Bell, V., Méndez, F., Martínez, C., Palma, P. P., & Bosch, M. (2012). Characteristics of the Colombian armed conflict and the mental health of civilians living in active conflict zones. *Conflict and health*, 6(1), 10. https://doi.org/10.1186/1752-1505-6-10

Bernat, E. M., Cadwallader, M., Seo, D., Vizueta, N., & Patrick, C. J. (2011). Effects of instructed emotion regulation on valence, arousal, and attentional measures of affective processing. *Developmental Neuropsychology*, 36(4), 493-518. https://doi.org/10.1080/87565641.2010.549881

Betancourt, T. S., Borisova, I. I., Williams, T. P., Brennan, R. T., Whitfield, T. H., De La Soudiere, M., ... & Gilman, S. E. (2010). Sierra Leone's former child soldiers: A follow-up study of psychosocial adjustment and community reintegration. *Child development*, *81*(4), 1077-1095. https://doi.org/10.1111/j.1467-8624.2010.01455.x

Blair, K. S., Newman, C., Mitchell, D. G., Richell, R. A., Leonard, A., Morton, J., & Blair, R. J. R. (2006). Differentiating among prefrontal substrates in psychopathy: neuropsychological test findings. *Neuropsychology*, 20(2), 153. https://doi.org/10.1037/0894-4105.20.2.153

Blau, V. C., Maurer, U., Tottenham, N., & McCandliss, B. D. (2007). The face-specific N170 component is modulated by emotional facial expression. *Behavioral and brain functions*, 3(1), 1. https://doi.org/10.1186/1744-9081-3-7

Bora, E., Velakoulis, D., & Walterfang, M. (2016). Social cognition in Huntington's disease: a meta-analysis. *Behavioural Brain Research SreeTestContent1*, *297*, 131-140. https://doi.org/10.1016/j.bbr.2015.10.001

Bourke, C., Porter, R. J., Carter, J. D., McIntosh, V. V., Jordan, J., Bell, C., ... & Joyce, P. R. (2012). Comparison of neuropsychological functioning and emotional processing in major depression and social anxiety disorder subjects, and matched healthy controls.

Australian & New Zealand Journal of Psychiatry, 46(10), 972-981. https://doi.org/10.1177/0004867412451502

Boxer, P., Schappell, A., Middlemass, K., & Mercado, I. (2011). Cognitive and emotional covariates of violence exposure among former prisoners: links to antisocial behavior and emotional distress and implications for theory. *Aggressive behavior*, *37*(5), 465-475. https://doi.org/10.1002/ab.20405

Brand, S., Kirov, R., Kalak, N., Gerber, M., Schmidt, N. B., Lemola, S., ... & Holsboer-Trachsler, E. (2016). Poor sleep is related to lower emotional competence among adolescents. *Behavioral sleep medicine*, *14*(6), 602-614. https://doi.org/10.1080/15402002.2015.1048450

Brenner, L. A., Terrio, H., Homaifar, B. Y., Gutierrez, P. M., Staves, P. J., Harwood, J. E., ... & Warden, D. (2010). Neuropsychological test performance in soldiers with blast-related mild TBI. *Neuropsychology*, *24*(2), 160. https://doi.org/10.1037/a0017966

Brown, C., El-Deredy, W., & Blanchette, I. (2010). Attentional modulation of visual-evoked potentials by threat: investigating the effect of evolutionary relevance. *Brain and cognition*, *74*(3), 281-287. https://doi.org/10.1016/j.bandc.2010.08.008

Bukowski, M., Asanowicz, D., Marzecová, A., & Lupiáñez, J. (2015). Limits of control: The effects of uncontrollability experiences on the efficiency of attentional control. *Acta psychologica*, *154*, 43-53. https://doi.org/10.1016/j.actpsy.2014.11.005

Drake, D. I. B. M. A., & HARRIS, P. (2007). *Evaluación neuropsicológica en adultos*. Buenos Aires: Paidós.

Butler, A. C., Chapman, J. E., Forman, E. M., & Beck, A. T. (2006). The empirical status of cognitive-behavioral therapy: a review of meta-analyses. *Clinical psychology review*, *26*(1), 17-31. https://doi.org/10.1016/j.cpr.2005.07.003

Cacioppo, J. T., Adler, A. B., Lester, P. B., McGurk, D., Thomas, J. L., Chen, H. Y., & Cacioppo, S. (2015). Building social resilience in soldiers: A double dissociative randomized controlled study. *Journal of Personality and Social Psychology*, *109*(1), 90. https://doi.org/10.1037/pspi0000022

Callejas, A., Lupiáñez, J., & Tudela, P. (2004). The three attentional networks: On their independence and interactions. *Brain and cognition*, 54(3), 225-227. https://doi.org/10.1016/j.bandc.2004.02.012

Camfield, D. A., Mills, J., Kornfeld, E. J., & Croft, R. J. (2016). Modulation of the N170 with classical conditioning: the use of emotional imagery and acoustic startle in healthy and depressed participants. *Frontiers in human neuroscience*, *10*, 337. https://doi.org/10.3389/fnhum.2016.00337

Campos, C., Santos, S., Gagen, E., Machado, S., Rocha, S., Kurtz, M. M., & Rocha, N. B. (2016). Neuroplastic changes following social cognition training in schizophrenia: a systematic review. *Neuropsychology review*, *26*(3), 310-328. https://doi.org/10.1007/s11065-016-9326-0

Castaneda, A. E., Tuulio-Henriksson, A., Marttunen, M., Suvisaari, J., & Lönnqvist, J. (2008). A review on cognitive impairments in depressive and anxiety disorders with a focus on young adults. *Journal of affective disorders*, *106*(1-2), 1-27. https://doi.org/10.1016/j.jad.2007.06.006

Castro, C. A., Adler, A. B., McGurk, D., & Bliese, P. D. (2012). Mental health training with soldiers four months after returning from Iraq: Randomization by platoon. *Journal of Traumatic Stress*, *25*(4), 376-383. https://doi.org/10.1002/jts.21721

CERAC. Datos del conflicto armado en Colombia 2017 [Available from: http://www.cerac.org.co/es/recursos/datosconflictoscolombia/.

Chapin, T. J., & Russell-Chapin, L. A. (2013). *Neurotherapy and neurofeedback: Brain-based treatment for psychological and behavioral problems*. Routledge. https://doi.org/10.4324/9780203072523

Chaux, E., Molano, A., & Podlesky, P. (2009). Socio-economic, socio-political and socio-emotional variables explaining school bullying: a country-wide multilevel analysis. *Aggressive behavior*, 35(6), 520-529. https://doi.org/10.1002/ab.20320

Chen, P., Lin, J., Chen, B., Lu, C., & Guo, T. (2015). Processing emotional words in two languages with one brain: ERP and fMRI evidence from Chinese–English bilinguals. *Cortex*. 71, 34-48. https://doi.org/10.1016/j.cortex.2015.06.002

Citron, F. M. (2012). Neural correlates of written emotion word processing: a review of recent electrophysiological and hemodynamic neuroimaging studies. *Brain and language*, *122*(3), 211-226. https://doi.org/10.1016/j.bandl.2011.12.007

Cohen, J. (1973). Eta-squared and partial eta-squared in fixed factor ANOVA designs. *Educational and psychological measurement*, *33*(1), 107-112. https://doi.org/10.1177/001316447303300111

Cohen, J. (1988). Set correlation and multivariate methods. *Statistical Power Analysis for the Behavioral Sciences. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc*, 467-530.

Combs, D. R., Adams, S. D., Penn, D. L., Roberts, D., Tiegreen, J., & Stem, P. (2007). Social Cognition and Interaction Training (SCIT) for inpatients with schizophrenia spectrum disorders: preliminary findings. *Schizophrenia research*, *91*(1-3), 112-116. https://doi.org/10.1016/j.schres.2006.12.010

Congreso de la República de Colombia (10 de junio de 2011). Ley 1448 de 2011. Bogotá.

Corcoran, R., Mercer, G., & Frith, C. D. (1995). Schizophrenia, symptomatology and social inference: investigating “theory of mind” in people with schizophrenia. *Schizophrenia Research*. 17(1), 5-13. https://doi.org/10.1016/0920-9964(95)00024-G

Da Silva, E., Crager, K., and Puce, A. (2016). On dissociating the neural time course of the processing of positive emotions. *Neuropsychologia* 83, 123–137. doi: 10.1016/j.neuropsychologia.2015.12.001

D'Argembeau, A., Van der Linden, M., Comblain, C., & Etienne, A. M. (2003). The effects of happy and angry expressions on identity and expression memory for unfamiliar faces. *Cognition and Emotion*, *17*(4), 609-622. https://doi.org/10.1080/02699930302303

Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *Catalog of Selected Documents in Psychology*, 10, 1 – 19.

Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of personality and social psychology*, *44*(1), 113. https://doi.org/10.1037/0022-3514.44.1.113

de Wied, M., Gispen-de Wied, C., & van Boxtel, A. (2010). Empathy dysfunction in children and adolescents with disruptive behavior disorders. *European journal of pharmacology*, *626*(1), 97-103. https://doi.org/10.1016/j.ejphar.2009.10.016

Decety, J., & Jackson, P. L. (2006). A social-neuroscience perspective on empathy. *Current directions in psychological science*, 15(2), 54-58. https://doi.org/10.1111/j.0963-7214.2006.00406.x

Decety, J., & Lamm, C. (2006). Human empathy through the lens of social neuroscience. *The scientific World journal*, 6, 1146-1163. https://doi.org/10.1100/tsw.2006.221

Decety, J., & Ickes, W. (Eds.). (2009). The social neuroscience of empathy. Cambridge, MA: MIT press. http://dx.doi.org/10.7551/mitpress/9780262012973.001.0001

Decety, J., Skelly, L., Yoder, K. J., & Kiehl, K. A. (2014). Neural processing of dynamic emotional facial expressions in psychopaths. *Social neuroscience*, *9*(1), 36-49. https://doi.org/10.1080/17470919.2013.866905

Decreto 128 del 22 de enero de 2003, Publicado en el Diario Oficial Colombia, Bogotá, Colombia, 24 de enero de 2003.

Decreto 2767del 22 de enero de 2003, Publicado en el Diario Oficial Colombia, Bogotá, Colombia, 31 de agosto de 2004.

Delorme, A., & Makeig, S. (2004). EEGLAB: an open source toolbox for analysis of single-trial EEG dynamics including independent component analysis. *Journal of neuroscience methods*, *134*(1), 9-21. https://doi.org/10.1016/j.jneumeth.2003.10.009

Dennis, M. (2006). National identity and violence: the case of Colombia. In *Political violence and the construction of national identity in Latin America* (pp. 91-109). Palgrave Macmillan, New York. https://doi.org/10.1057/9780230601727_6

Diamond, A. (2013). Executive functions. *Annual Review of Psychology*, 64, 135–168. http://dx.doi.org/10.1146/annurev-psych-113011-143750

Dobson, K. S., & Dozois, D. J. (2010). *Historical and philosophical bases of the cognitive-behavioral therapies*. Guilford Press.

Dolan, M., & Anderson, I. M. (2002). Executive and memory function and its relationship to trait impulsivity and aggression in personality disordered offenders. *The Journal of Forensic Psychiatry*, 13(3), 503-526. https://doi:10.1080/0958518021000019452

Dolan, M. (2012). The neuropsychology of prefrontal function in antisocial personality disordered offenders with varying degrees of psychopathy. *Psychological medicine*, 42(8), 1715-1725. https://doi:10.1017/S0033291711002686

Donders, J., & Axlerod, B. N. (2002). Two-subtest estimations of WAIS-III factor index scores. *Psychological assessment*, *14*(3), 360. https://doi.org/10.1037/1040-3590.14.3.360

Dozolme, D., Brunet-Gouet, E., Passerieux, C., & Amorim, M. A. (2015). Neuroelectric correlates of pragmatic emotional incongruence processing: empathy matters. *PloS one*, *10*(6). DOI:10.1371/journal.pone.0129770

Dube, O., & Vargas, J. F. (2013). Commodity price shocks and civil conflict: Evidence from Colombia. *The Review of Economic Studies*, 80(4), 1384-1421. https://doi:10.1093/restud/rdt009

Duncan, J., & Owen, A. M. (2000). Common regions of the human frontal lobe recruited by diverse cognitive demands. *Trends in neurosciences*, 23(10), 475-483. https://doi:10.1016/S0166-2236(00)01633-7

Duncan, S., & Barrett, L. F. (2007). Affect is a form of cognition: A neurobiological analysis. *Cognition and emotion*, 21(6), 1184-1211. https://doi.org/10.1080/02699930701437931

Ecker, B., Ticic, R., & Hulley, L. (2012). *Unlocking the emotional brain: Eliminating symptoms at their roots using memory reconsolidation*. Routledge.

Historical Antecedents, C. D., Edwards, J., & Parsons, T. D. (2017). Virtual Reality Applications for Neuropsychological Assessment in the Military. *The Role of Technology in Clinical Neuropsychology*, 175.

Eimer, M., & Holmes, A. (2007). Event-related brain potential correlates of emotional face processing. *Neuropsychologia*. 45(1), 15-31. https://doi.org/10.1016/j.neuropsychologia.2006.04.022

Ekman, P., & Friesen, W. V. (1971). Constants across cultures in the face and emotion. *Journal of personality and social psychology*, *17*(2), 124. https://doi.org/10.1037/h0030377

Ekman, P., & Oster, H. (1979). Facial expressions of emotion. *Annual review of psychology*, *30*(1), 527-554. https://doi.org/10.1146/annurev.ps.30.020179.002523

Ekman, P. (1992). An argument for basic emotions. *Cognition & emotion*, *6*(3-4), 169-200. https://doi.org/10.1080/02699939208411068

Elbogen, E. B., Johnson, S. C., Wagner, H. R., Sullivan, C., Taft, C. T., & Beckham, J. C. (2014). Violent behaviour and post-traumatic stress disorder in US Iraq and Afghanistan veterans. *The British Journal of Psychiatry*, *204*(5), 368-375. https://doi.org/10.1192/bjp.bp.113.134627

Elliott, R. (2003). Executive functions and their disorders: Imaging in clinical neuroscience. *British medical bulletin*, 65(1), 49-59. https://doi.org/10.1093/bmb/65.1.49

Engen, G. (2008). The psychosocial predictors of psychological distress and life satisfaction in a cohort of Norwegian students. [dissertation/master's thesis]. [Oslo, Norwegian], University of Oslo.

Erceg-Hurn, D. M., & Mirosevich, V. M. (2008). Modern robust statistical methods: an easy way to maximize the accuracy and power of your research. *American Psychologist*, *63*(7), 591.

Fan, J., McCandliss, B. D., Sommer, T., Raz, A., & Posner, M. I. (2002). Testing the efficiency and independence of attentional networks. *Journal of cognitive neuroscience*, 14(3), 340-347. https://doi:10.1162/089892902317361886

Fan, J., Byrne, J., Worden, M. S., Guise, K. G., McCandliss, B. D., Fossella, J., & Posner, M. I. (2007). The relation of brain oscillations to attentional networks. *Journal of Neuroscience*, *27*(23), 6197-6206. https://doi:10.1523/JNEUROSCI.1833-07.2007

Fan, J., Gu, X., Guise, K. G., Liu, X., Fossella, J., Wang, H., & Posner, M. I. (2009). Testing the behavioral interaction and integration of attentional networks. *Brain and cognition*, 70(2), 209-220. https://doi.org/10.1016/j.bandc.2009.02.002

Fazio, R. H., & Olson, M. A. (2003). Implicit measures in social cognition research: Their meaning and use. *Annual review of psychology*, 54(1), 297-327. https://doi.org/10.1146/annurev.psych.54.101601.145225

Feldberg, C., Hermida, P., Tartaglini, M.F., Dorina, S., Somale, V., Allegri, R. F. (2016). Cognitive Reserve in Patients with Mild Cognitive Impairment: The Importance of Occupational Complexity as a Buffer of Declining Cognition in Older Adults. *AIMS Medical Science*, 3(1), 77-95. https://doi:10.3934/medsci.2016.1.77

Ferrando, L., Bobes, J., Gibert, J., Soto, M., & Soto, O. (2000). 1.1. MINI Entrevista Neuropsiquiátrica Internacional (MINI International Neuropsychiatric Interview, MINI). *Instrum. Detección Orientación Diagnóstica*.

Fiske, S. T., & Taylor, S. E. (2013). *Social cognition: From brains to culture*. Sage.

Foa, E. B. (1997). Psychological processes related to recovery from a trauma and an effective treatment for PTSD. In R. Yehuda & A. C. McFarlane (Eds.), *Annals of the New York Academy of Sciences: Vol. 821. Psychobiology of posttraumatic stress disorder* (p. 410–424). New York Academy of Sciences.

Foa, E. B., Hembree, E. A., Cahill, S. P., Rauch, S. A., Riggs, D. S., Feeny, N. C., and Yadin, E. (2005). Randomized trial of prolonged exposure for posttraumatic stress disorder

with and without cognitive restructuring: outcome at academic and community clinics. *J. Consult. Clin. Psychol*. 73, 953-964. https://doi.org/10.1037/0022-006X.73.5.953

Foti, D., & Hajcak, G. (2008). Deconstructing reappraisal: descriptions preceding arousing pictures modulate the subsequent neural response. *Journal of cognitive neuroscience*, *20*(6), 977-988. https://doi.org/10.1162/jocn.2008.20066

Gallaway, M. S., Fink, D. S., Millikan, A. M., & Bell, M. R. (2012). Factors Associated With Physical Aggression Among US A rmy Soldiers. *Aggressive behavior*, *38*(5), 357-367. https://doi.org/10.1002/ab.21436

Gallo, G. (2013). Conflict theory, complexity and systems approach. *Systems Research and Behavioral Science*, 30(2), 156-175. https://doi.org/10.1002/sres.2132

Garcia-Barrera, M. A., Karr, J. E., Trujillo-Orrego, N., Trujillo-Orrego, S., & Pineda, D. A. (2017). Evaluating empathy in Colombian excombatants: Examination of the internal structure of the Interpersonal Reactivity Index (IRI) in Spanish. *Psychological Assessment*, 29, 116–122. http://dx.doi.org/10.1037/pas0000331

Gawerc, M. I. (2006). Peace-building: Theoretical and Concrete Perspectives. *Peace & Change*, 31(4), 435-478. https://doi.org/10.1111/j.1468-0130.2006.00387.x

Gerber, A. J., Posner, J., Gorman, D., Colibazzi, T., Yu, S., Wang, Z., ... & Peterson, B. S. (2008). An affective circumplex model of neural systems subserving valence, arousal, and cognitive overlay during the appraisal of emotional faces. *Neuropsychologia*, 46(8), 2129-2139. https://doi.org/10.1016/j.neuropsychologia.2008.02.032

Gil, D., Fernández-Modamio, M., Bengochea, R., & Arrieta, M. (2012). Adaptación al español de la prueba de teoría de la mente Hinting Task. *Revista de psiquiatría y salud mental*, *5*(2), 79-88. https://doi.org/10.1016/j.rpsm.2011.11.004

Gilbertson, M. W., Gurvits, T. V., Lasko, N. B., Orr, S. P., & Pitman, R. K. (2001). Multivariate assessment of explicit memory function in combat veterans with posttraumatic stress disorder. *Journal of traumatic stress*, *14*(2), 413-432. https://doi.org/10.1023/A:1011181305501

Giraldo, L. S., Aguirre-Acevedo, D. C., Trujillo, S., Ugarriza, J. E., & Trujillo, N. (2020). Validation of the Extreme Experiences Scale (EX 2) for armed conflict contexts. *Psychiatric quarterly*, 1-26. https://doi.org/10.1007/s11126-020-09710-z

Gismero, E. (2000). EHS Escala de habilidades sociales. *Madrid: TEA Publicaciones de Psicología Aplicada*.

Gleichgerrcht, E., Roca, M., Manes, F., & Torralva, T. (2011). Comparing the clinical usefulness of the Institute of Cognitive Neurology (INECO) Frontal Screening (IFS) and the Frontal Assessment Battery (FAB) in frontotemporal dementia. *Journal of clinical and experimental neuropsychology*, 33(9), 997-1004. https://doi:10.1080/13803395.2011.589375

Glenn, A. L., Raine, A., Venables, P. H., & Mednick, S. A. (2007). Early temperamental and psychophysiological precursors of adult psychopathic personality. *Journal of Abnormal Psychology*, *116*(3), 508. DOI:10.1037/0021-843X.116.3.508

Goldstein, H., & Higgins-D'Alessandro, A. (2001). Empathy and attachment in relation to violent vs. non-violent offense history among jail inmates. *Journal of Offender Rehabilitation*, *32*(4), 31-53. https://doi.org/10.1300/J076v32n04_03

Gozzi, M., Zamboni, G., Krueger, F., & Grafman, J. (2010). Interest in politics modulates neural activity in the amygdala and ventral striatum. *Human Brain Mapping*, 31, 1763–1771. https://doi.org/10.1002/hbm.20976

Grajales Alzate, R. (2011). Functions of the discourse marker pues in the speech of Medellín, Colombia. *Forma y Función*, 24(1), 25-45.

Grant, D. A., & Berg, E. (1948). A behavioral analysis of degree of reinforcement and ease of shifting to new responses in a Weigl-type card-sorting problem. *Journal of experimental psychology*, 38(4), 404. http://dx.doi.org/10.1037/h0059831

Green, M. F., Penn, D. L., Bentall, R., Carpenter, W. T., Gaebel, W., Gur, R. C., ... & Heinssen, R. (2008). Social cognition in schizophrenia: an NIMH workshop on definitions, assessment, and research opportunities. *Schizophrenia bulletin*, *34*(6), 1211-1220. https://doi.org/10.1093/schbul/sbm145

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *Journal of personality and social psychology*, 85(2), 348. https://doi.org/10.1037/0022-3514.85.2.348

Groth-Marnat, G. (2009). *Handbook of psychological assessment*. John Wiley & Sons.

Güntekin, B., & Başar, E. (2014). A review of brain oscillations in perception of faces and emotional pictures. *Neuropsychologia*, 58, 33-51. https://doi.org/10.1016/j.neuropsychologia.2014.03.014

Gutiérrez Sanín, F. (2008). Telling the difference: Guerrillas and paramilitaries in the Colombian war. *Politics & Society*, 36(1), 3-34. https://doi.org/10.1177/0032329207312181

Hall, J., Harris, J. M., Sprengelmeyer, R., Sprengelmeyer, A., Young, A. W., Santos, I. M., ... & Lawrie, S. M. (2004). Social cognition and face processing in schizophrenia. *The British Journal of Psychiatry*, *185*(2), 169-170. https://doi.org/10.1192/bjp.185.2.169

Harris, L. M., & Menzies, R. G. (1998). Changing attentional bias: Can it effect self-reported anxiety?. *Anxiety, Stress and Coping*, *11*(2), 167-179. https://doi.org/10.1080/10615809808248310

Heaton, R. K., Chelune, G. J., Talley, J. L., Kay, G. G., & Curtiss, G. (1993). Wisconsin Card Sorting Test (WCST): Manual: Revised and Expanded. Psychological Assessment Resources (PAR).

Heisz, J. J., Watter, S., & Shedden, J. M. (2006). Automatic face identity encoding at the N170. *Vision Research*, *46*(28), 4604-4614. https://doi.org/10.1016/j.visres.2006.09.026

Henao Álvarez, M. (2013). Modelo de atención psicosocial de la política de reintegración de grupos armados ilegales una pregunta por la identidad. [dissertation/master's thesis]. [Bogota, Colombia]: Pontificia Universidad Javeriana.

Henao-Arboleda, E., Muñoz, C., Aguirre-Acevedo, D. C., Lara, E., Pineda, D. A., & Lopera, F. (2010). Datos normativos de pruebas neuropsicológicas en adultos mayores en una población Colombiana. *Revista Chilena de Neuropsicología*, 5 (3), 214-226

Herrmann, M. J., Ellgring, H., & Fallgatter, A. J. (2004). Early-stage face processing dysfunction in patients with schizophrenia. *American Journal of Psychiatry*, *161*(5), 915-917. https://doi.org/10.1176/appi.ajp.161.5.915

Heuer, K., Rinck, M., & Becker, E. S. (2007). Avoidance of emotional facial expressions in social anxiety: The approach–avoidance task. *Behaviour research and therapy*, *45*(12), 2990-3001. https://doi.org/10.1016/j.brat.2007.08.010

Hinojosa, J. A., Mercado, F., & Carretié, L. (2015). N170 sensitivity to facial expression: A meta-analysis. *Neuroscience & Biobehavioral Reviews*, 55, 498-509. https://doi.org/10.1016/j.neubiorev.2015.06.002

Hofmann, S. G., Asmundson, G. J., & Beck, A. T. (2013). The science of cognitive therapy. *Behavior therapy*, 44(2), 199-212. https://doi.org/10.1016/j.beth.2009.01.007

Hofmann, S. G., Asnaani, A., Vonk, I. J., Sawyer, A. T., & Fang, A. (2012). The efficacy of cognitive behavioral therapy: A review of meta-analyses. *Cognitive therapy and research*, 36(5), 427-440. https://doi.org/10.1007/s10608-012-9476-1

Hooker, C. I., Bruce, L., Fisher, M., Verosky, S. C., Miyakawa, A., D'Esposito, M., & Vinogradov, S. (2013). The influence of combined cognitive plus social-cognitive training on amygdala response during face emotion recognition in schizophrenia. *Psychiatry Research: Neuroimaging*, 213(2), 99-107. https://doi.org/10.1016/j.pscychresns.2013.04.001

Hooker, C., & Park, S. (2002). Emotion processing and its relationship to social functioning in schizophrenia patients. *Psychiatry research*, *112*(1), 41-50. https://doi.org/10.1016/S0165-1781(02)00177-4

Hugenberg, K., & Bodenhausen, G. V. (2004). Ambiguity in social categorization: The role of prejudice and facial affect in race categorization. *Psychological Science*, *15*(5), 342-345. https://doi.org/10.1111/j.0956-7976.2004.00680.x

Hurtado, E., Haye, A., González, R., Manes, F., & Ibáñez, A. (2009). Contextual blending of ingroup/outgroup face stimuli and word valence: LPP modulation and convergence of measures. *BMC neuroscience*, *10*(1), 69. https://doi.org/10.1186/1471-2202-10-69

Ibáñez, A. M., & Vélez, C. E. (2008). Civil conflict and forced migration: The micro determinants and welfare losses of displacement in Colombia. *World Development*, *36*(4), 659-676. https://doi.org/10.1016/j.worlddev.2007.04.013

Ibáñez, A. M., & Velásquez, A. (2009). Identifying victims of civil conflicts: An evaluation of forced displaced households in Colombia. *Journal of Peace Research*, 46(3), 431-451. https://doi:10.1177/0022343309102661

Ibáñez, A., Gleichgerrcht, E., Hurtado, E., González, R., Haye, A., & Manes, F. F. (2010). Early neural markers of implicit attitudes: N170 modulated by intergroup and evaluative contexts in IAT. *Frontiers in Human Neuroscience*, 4, 188. https://doi.org/10.3389/fnhum.2010.00188

Ibáñez, A., Hurtado, E., Riveros, R., Urquina, H., Cardona, J. F., Petroni, A., ... & Manes, F. (2011). Facial and semantic emotional interference: a pilot study on the behavioral and cortical responses to the Dual Valence Association Task. *Behavioral and Brain Functions*, *7*(1), 8. https://doi.org/10.1186/1744-9081-7-8

Ibáñez, A., Riveros, R., Hurtado, E., Gleichgerrcht, E., Urquina, H., Herrera, E., ... & Manes, F. (2012). The face and its emotion: Right N170 deficits in structural processing and early emotional discrimination in schizophrenic patients and relatives. *Psychiatry Research*, *195*(1-2), 18-26. https://doi.org/10.1016/j.psychres.2011.07.027

Ibanez, A., Aguado, J., Baez, S., Huepe, D., Lopez, V., Ortega, R., ... & Cetkovich, M. (2014). From neural signatures of emotional modulation to social cognition: individual differences in healthy volunteers and psychiatric participants. *Social cognitive and affective neuroscience*, *9*(7), 939-950. https://doi.org/10.1093/scan/nst067

Jakupcak, M., Conybeare, D., Phelps, L., Hunt, S., Holmes, H. A., Felker, B., ... & McFall, M. E. (2007). Anger, hostility, and aggression among Iraq and Afghanistan war veterans reporting PTSD and subthreshold PTSD. *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies*, *20*(6), 945-954. https://doi.org/10.1002/jts.20258

Jolliffe, D., & Farrington, D. P. (2004). Empathy and offending: A systematic review and meta-analysis. *Aggression and violent behavior*, 9(5), 441-476. https://doi.org/10.1016/j.avb.2003.03.001

Juarez-Acosta, F., and Montejo-Hernandez, M. (2008). Propiedades psicométricas del inventario de situaciones y comportamientos agresivos y del inventario de motivos para la agresión [Eng. Psychometric Properties of the Situation and Aggressive Behavior Inventory and the Motives for Aggression Inventory]. *Universitas. Psychologica*. 7, 149-171

Kalin, M., Kaplan, S., Gould, F., Pinkham, A. E., Penn, D. L., & Harvey, P. D. (2015). Social cognition, social competence, negative symptoms and social outcomes: inter-relationships in people with schizophrenia. *Journal of psychiatric research*, *68*, 254-260. https://doi.org/10.1016/j.jpsychires.2015.07.008

Kandalaft, M. R., Didehbani, N., Krawczyk, D. C., Allen, T. T., & Chapman, S. B. (2013). Virtual reality social cognition training for young adults with high-functioning autism. *Journal of autism and developmental disorders*, *43*(1), 34-44. https://doi.org/10.1007/s10803-012-1544-6

Kanske, P., & Kotz, S. A. (2007). Concreteness in emotional words: ERP evidence from a hemifield study. *Brain research*, *1148*, 138-148. https://doi.org/10.1016/j.brainres.2007.02.044

Kaplan, O., & Nussio, E. (2018). Community counts: The social reintegration of ex-combatants in Colombia. *Conflict Management and Peace Science*, *35*(2), 132-153. https://doi.org/10.1177/0738894215614506

Kaplan, O., & Nussio, E. (2018). Explaining recidivism of ex-combatants in Colombia. *Journal of Conflict Resolution*, *62*(1), 64-93. https://doi.org/10.1177/0022002716644326

Karlin, B. E., Ruzek, J. I., Chard, K. M., Eftekhari, A., Monson, C. M., Hembree, E. A., ... & Foa, E. B. (2010). Dissemination of evidence-based psychological treatments for posttraumatic stress disorder in the Veterans Health Administration. *Journal of traumatic stress*, *23*(6), 663-673. https://doi.org/10.1002/jts.20588

Kawamoto, T., Nittono, H., & Ura, M. (2014). Social exclusion induces early-stage perceptual and behavioral changes in response to social cues. *Social neuroscience*, *9*(2), 174-185. https://doi.org/10.1080/17470919.2014.883325

Kesler, M. L., Andersen, A. H., Smith, C. D., Avison, M. J., Davis, C. E., Kryscio, R. J., & Blonder, L. X. (2001). Neural substrates of facial emotion processing using fMRI. *Cognitive Brain Research*, *11*(2), 213-226. https://doi.org/10.1016/S0926-6410(00)00073-2

Khanna, M. M., Badura-Brack, A. S., McDermott, T. J., Embury, C. M., Wiesman, A. I., Shepherd, A., ... & Wilson, T. W. (2017). Veterans with post-traumatic stress disorder exhibit altered emotional processing and attentional control during an emotional Stroop task. *Psychological medicine*, 47(11). https://doi.org/10.1017/S0033291717000460

Kilts, C. D., Egan, G., Gideon, D. A., Ely, T. D., and Hoffman, J. M. (2003). Dissociable neural pathways are involved in the recognition of emotion in static and dynamic facial expressions. *Neuroimage* 18, 156–168. https://doi.org/10.1006/nimg.2002.1323

Kishon-Barash, R., Midlarsky, E., & Johnson, D. R. (1999). Altruism and the Vietnam War veteran: The relationship of helping to symptomatology. *Journal of Traumatic Stress*, 12, 655–662. http://dx.doi.org/10.1023/A:1024769102031

Kissler, J., Assadollahi, R., & Herbert, C. (2006). Emotional and semantic networks in visual word processing: insights from ERP studies. *Progress in brain research*, *156*, 147-183. https://doi.org/10.1016/S0079-6123(06)56008-X

Köbach, A., Nandi, C., Crombach, A., Bambonyé, M., Westner, B., & Elbert, T. (2015). Violent offending promotes appetitive aggression rather than Posttraumatic stress—A replication study with Burundian ex-combatants. *Frontiers in psychology*, *6*, 1755. https://doi.org/10.3389/fpsyg.2015.01755

Krämer, U. M., Mohammadi, B., Doñamayor, N., Samii, A., & Münte, T. F. (2010). Emotional and cognitive aspects of empathy and their relation to social cognition—an fMRI-study. *Brain research*, 1311, 110-120. https://doi.org/10.1016/j.brainres.2009.11.043

Krohne, H. W., & Hock, M. (2011). Anxiety, coping strategies, and the processing of threatening information: Investigations with cognitive-experimental paradigms. *Personality and individual differences*, 50(7), 916-925. https://doi.org/10.1016/j.paid.2010.08.001

Kurtz, M. M., & Richardson, C. L. (2012). Social cognitive training for schizophrenia: a meta-analytic investigation of controlled research. *Schizophrenia bulletin*, *38*(5), 1092-1104. https://doi.org/10.1093/schbul/sbr036

Kurtz, M. M., Gagen, E., Rocha, N. B., Machado, S., & Penn, D. L. (2016). Comprehensive treatments for social cognitive deficits in schizophrenia: A critical review and effect-size analysis of controlled studies. *Clinical Psychology Review*, *43*, 80-89. https://doi.org/10.1016/j.cpr.2015.09.003

Lamm, C., Decety, J., & Singer, T. (2011). Meta-analytic evidence for common and distinct neural networks associated with directly experienced pain and empathy for pain. *Neuroimage*, *54*(3), 2492-2502. https://doi.org/10.1016/j.neuroimage.2010.10.014

Lane, R. D., Ryan, L., Nadel, L., & Greenberg, L. (2015). Memory reconsolidation, emotional arousal, and the process of change in psychotherapy: New insights from brain

science. *Behavioral and Brain Sciences*, *38*. https://doi.org/10.1017/S0140525X14000041

Lang, P. J., Bradley, M. M., & Cuthbert, B. (1988). The international affective picture system. *Center for Research in Psychophysiology, University of florida*, Gainesville, USA.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1999). International affective picture system (IAPS): Instruction manual and affective ratings. *The center for research in psychophysiology, University of Florida*.

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1997). International affective picture system (IAPS): Technical manual and affective ratings. *NIMH Center for the Study of Emotion and Attention*, *1*, 39-58.

Lang, P. J., Simons, R. F., Balaban, M., & Simons, R. (2013). *Attention and orienting: Sensory and motivational processes*. Psychology Press.

Lawrence, E. J., Shaw, P., Giampietro, V. P., Surguladze, S., Brammer, M. J., & David, A. S. (2006). The role of 'shared representations' in social perception and empathy: an fMRI study. *Neuroimage*, 29(4), 1173-1184. https://doi.org/10.1016/j.neuroimage.2005.09.001

Lazarus, S. A., Cheavens, J. S., Festa, F., & Rosenthal, M. Z. (2014). Interpersonal functioning in borderline personality disorder: A systematic review of behavioral and laboratory-based assessments. *Clinical psychology review*, *34*(3), 193-205. https://doi.org/10.1016/j.cpr.2014.01.007

Leany, B. D., Benuto, L. T., & Thaler, N. S. (2013). Neuropsychological assessment with Hispanic clients. In *Guide to psychological assessment with Hispanics* (pp. 351-376). Springer, Boston, MA. https://doi.org/10.1007/978-1-4614-4412-1_22

Levy, Barry S., and Victor W. Sidel. "Documenting the effects of armed conflict on population health." *Annual review of public health* 37 (2016): 205-218. https://doi.org/10.1146/annurev-publhealth-032315-021913

Lezak, M. D., Howieson, D. B., Loring, D. W., & Fischer, J. S. (2004). *Neuropsychological assessment*. Oxford University Press, USA.

Lieberman, M. D. (2007). Social cognitive neuroscience: a review of core processes. *Annual. Review of. Psychology. 58*, 259-289. https://doi.org/10.1146/annurev.psych.58.110405.085654

Litz, B. T., Stein, N., Delaney, E., Lebowitz, L., Nash, W. P., Silva, C., & Maguen, S. (2009). Moral injury and moral repair in war veterans: A preliminary model and intervention strategy. *Clinical psychology review*, 29(8), 695-706. https://doi.org/10.1016/j.cpr.2009.07.003

Liu, C. H., Chen, W., & Ward, J. (2015). Effects of exposure to facial expression variation in face learning and recognition. *Psychological research*, *79*(6), 1042-1053. https://doi.org/10.1007/s00426-014-0627-8

LoBue, V., & Rakison, D. H. (2013). What we fear most: A developmental advantage for threat-relevant stimuli. *Developmental Review*, *33*(4), 285-303. https://doi.org/10.1016/j.dr.2013.07.005

Lukens, E. P., & McFarlane, W. R. (2006). Psychoeducation as Evidence-Based Practice: Considerations for Practice, Research, and Policy. In A. R. Roberts & K. R. Yeager (Eds.), *Foundations of evidence-based social work practice* (p. 291–313). Oxford University Press.

Luo, W., Feng, W., He, W., Wang, N. Y., & Luo, Y. J. (2010). Three stages of facial expression processing: ERP study with rapid serial visual presentation. *Neuroimage*. 49(2), 1857-1867. https://doi.org/10.1016/j.neuroimage.2009.09.018

MacNamara, A., Foti, D., and Hajcak, G. (2009). Tell me about it: neural activity elicited by emotional pictures and preceding descriptions. *Emotion*. 9, 531-543. https://doi.org/10.1037/a0016251

MacNamara, A., Ferri, J., & Hajcak, G. (2011). Working memory load reduces the late positive potential and this effect is attenuated with increasing anxiety. *Cognitive, Affective, & Behavioral Neuroscience, 11*(3), 321-331.. https://doi.org/10.3758/s13415-011-0036-z

Maedl, A., Schauer, E., Odenwald, M., & Elbert, T. (2010). Psychological rehabilitation of ex-combatants in non-western, post-conflict settings. In *Trauma rehabilitation after war and conflict* (pp. 177-213). Springer, New York, NY. https://doi.org/10.1007/978-1-4419-5722-1_9

Magidson, J., & Vermunt, J. K. (2004). Latent class analysis. *The Sage handbook of quantitative methodology for the social sciences*, 175-198. http://dx.doi.org/10.4135/9781526421036883636

Manger, T., Eikeland, O. J., & Asbjørnsen, A. (2001). Effects of social-cognitive training on students' empathy. Swiss *Journal of Psychology*, 60(2), 82. https://doi.org/10.1024//1421-0185.60.2.82

Mar, R. A. (2011). The neural bases of social cognition and story comprehension. *Annual review of psychology*, 62, 103-134. http://dx.doi.org/10.1146/annurev-psych-120709-145406

Martz, E. (Ed.). (2010). Trauma rehabilitation after war and conflict: Community and individual perspectives. Springer Science & Business Media. https://doi:10.1007/978-1-4419-5722-1

Marx, B. P., Doron-Lamarca, S., Proctor, S. P., & Vasterling, J. J. (2009). The influence of pre-deployment neurocognitive functioning on post-deployment PTSD symptom outcomes among Iraq-deployed Army soldiers. *Journal of the International Neuropsychological Society*, 15(6), 840-852. https://doi.org/10.1017/S1355617709990488

Marzecová, A., Bukowski, M., Correa, Á., Boros, M., Lupiáñez, J., & Wodniecka, Z. (2013). Tracing the bilingual advantage in cognitive control: The role of flexibility in temporal preparation and category switching. *Journal of Cognitive Psychology*, 25(5), 586-604. https://doi:10.1080/20445911.2013.809348

Mazza, M., Lucci, G., Pacitti, F., Pino, M. C., Mariano, M., Casacchia, M., & Roncone, R. (2010). Could schizophrenic subjects improve their social cognition abilities only with observation and imitation of social situations?. *Neuropsychological rehabilitation*, *20*(5), 675-703. https://doi.org/10.1080/09602011.2010.486284

Mc Crea, M., Pliskin, N., Barth, J., Cox, D., Fink, J., French, L., ... & Powell, M. (2008). Official position of the military TBI task force on the role of neuropsychology and rehabilitation psychology in the evaluation, management, and research of military veterans with traumatic brain injury: APPROVED by: American Academy of Clinical Neuropsychology (AACN) American Psychological Association Division 40 (Neuropsychology) American Psychological Association Division 22 (Rehabilitation Psychology) National Academy of Neuropsychology (NAN). *The Clinical Neuropsychologist*, 22(1), 10-26. https://doi.org/10.1080/13854040701760981

McCarroll, J. E., Ursano, R. J., Liu, X., Thayer, L. E., Newby, J. H., Norwood, A. E., & Fullerton, C. S. (2010). Deployment and the probability of spousal aggression by US Army soldiers. *Military medicine, 175*(5), 352-356. https://doi.org/10.7205/MILMED-D-10-00048

Meaux, E., Hernandez, N., Carteau-Martin, I., Martineau, J., Barthélémy, C., Bonnet-Brilhault, F., & Batty, M. (2014). Event-related potential and eye tracking evidence of the developmental dynamics of face processing. *European Journal of Neuroscience*, *39*(8), 1349-1362. https://doi.org/10.1111/ejn.12496

Melloni, M., Lopez, V., & Ibanez, A. (2014). Empathy and contextual social cognition. *Cognitive, Affective, & Behavioral Neuroscience*, *14*(1), 407-425. https://doi.org/10.3758/s13415-013-0205-3

Meneses, J., Cardona, D. & Devia, M. (2010). Calidad de Vida de sujetos que pertenecen al programa nacional de desmovilización y reincorporación a la vida civil en el departamento del Quindío. *El Ágora*. *Universidad San Buenaventura* 10(1), 71-86

Mestre-Escrivá, V., Frías Navarro, M. D., & Samper García, P. (2004). La medida de la empatía: Análisis del Interpersonal Reactivity Index [The empathy measurement: analysis of the Interpersonal Reactivity Index]. *Psicothema*, 16, 255–260.

Miller, K. E., & Rasmussen, A. (2010). War exposure, daily stressors, and mental health in conflict and post-conflict settings: bridging the divide between trauma-focused and psychosocial frameworks. *Social science & medicine*, 70(1), 7-16. https://doi:10.1016/j.socscimed.2009.09.029

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to

complex “frontal lobe” tasks: A latent variable analysis. *Cognitive psychology*, 41(1), 49-100. https://doi:10.1006/cogp.1999.0734

Montoya Ruiz, A. M. (2008). Niños y jóvenes en la guerra en Colombia: Aproximación a su reclutamiento y vinculación. *Revista Opinión Jurídica*, 7(13), 37-51.

Moran, J. K. (2015). *Neuropsychological and Psychophysiological Substrates of Appetitive Aggression* (Doctoral dissertation).

Morey, R. A., Petty, C. M., Cooper, D. A., LaBar, K. S., & McCarthy, G. (2008). Neural systems for executive and emotional processing are modulated by symptoms of posttraumatic stress disorder in Iraq War veterans. Psychiatry Research: *Neuroimaging*, 162(1), 59-72. https://doi:10.1016/j.pscychresns.2007.07.007

Morgan, A. B., & Lilienfeld, S. O. (2000). A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function. *Clinical psychology review*, 20(1), 113-136. https://doi.org/10.1016/S0272-7358(98)00096-8

Morgan, C. A. III, Wang, S., Southwick, S. M., Rasmusson, A., Hazlett, G., Hauger, R. L., & Charney, D. S. (2000). Plasma neuropeptide-Y concentrations in humans exposed to military survival training. *Biological Psychiatry*, 47, 902–909. http://dx.doi.org/10.1016/S0006-3223(99)00239-5

Nelson, H. E. (1976). A modified card sorting test sensitive to frontal lobe defects. *Cortex*, 12(4), 313-324. https://doi:10.1016/S0010-9452(76)80035-4

Nigg, J. T. (2000). On inhibition/disinhibition in developmental psychopathology: views from cognitive and personality psychology and a working inhibition taxonomy. *Psychological bulletin*, 126(2), 220. https://doi.org/10.1037/0033-2909.126.2.220

Nordgren, L. F., McDonnell, M. H. M., & Loewenstein, G. (2011). What constitutes torture? Psychological impediments to an objective evaluation of enhanced interrogation tactics. *Psychological Science,* 22, 689–694. http://dx.doi.org/10.1177/0956797611405679

Nussio, E. (2009). ¿Reincidir o no? Conceptos de la literatura internacional aplicados al caso de desarme, desmovilización y reintegración de las Autodefensas Unidas de Colombia. *Pensamiento jurídico*, (26), 213-236.

Nussio, E., Massé, F., Negrete, V., & Ugarriza, J. E. (2011). Presencia de desmovilizados e inseguridad en las ciudades. Casos de estudio: Villavicencio, Montería y Bogotá.

Nussio, E., and Oppenheim, B. (2013). Trusting the Enemy: Confidence in the state among ex-combatants. Available at *SSRN* 2246455. http://dx.doi.org/10.2139/ssrn.2246455

Öhman, A., Flykt, A., & Esteves, F. (2001). Emotion drives attention: detecting the snake in the grass. *Journal of experimental psychology: general*, *130*(3), 466. https://doi.org/10.1037/0096-3445.130.3.466

Olbrich, S., van Dinteren, R., & Arns, M. (2015). Personalized medicine: review and perspectives of promising baseline EEG biomarkers in major depressive disorder and attention deficit hyperactivity disorder. *Neuropsychobiology*, *72*(3-4), 229-240. https://doi.org/10.1159/000437435

Orcutt, H. K., King, L. A., and King, D. W. (2003). Male-perpetrated violence among Vietnam veteran couples: relationships with veteran's early life characteristics, trauma history, and PTSD symptomatology. *J. Trauma. Stress* 16, 381–390. doi: 10.1023/A:1024470103325

Pacheco-Unguetti, A., Acosta, A., Lupiáñez, J., Román, N., & Derakshan, N. (2012). Response inhibition and attentional control in anxiety. *Quarterly Journal of Experimental Psychology,* 65(4), 646-660. https://doi.org/10.1080/17470218.2011.637114

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research,* 42(5), 533-544. https://doi:10.1007/s10488-013-0528-y

Pantic, M., Valstar, M., Rademaker, R., & Maat, L. (2005, July). Web-based database for facial expression analysis. In *2005 IEEE international conference on multimedia and Expo* (pp. 5-pp). IEEE. DOI: 10.1109/ICME.2005.1521424

Partington, J. E., & Leiter, R. G. (1949). Partington's Pathways Test. *Psychological Service Center Journal*.

Penn, D.L., Roberts, D., Munt, E.D., Silverstein, E., Jones, N., Sheitman, B., (2005). A pilot study of Social Cognition and Interaction Training (SCIT) for schizophrenia. *Schizophrenia Research* 80, 357–359. https://doi.org/10.1016/j.schres.2005.07.011

Perez-Albeniz, A., & de Paul, J. (2004). Gender differences in empathy in parents at high- and low-risk of child physical abuse. *Child Abuse & Neglect,* 28, 289–300. http://dx.doi.org/10.1016/j.chiabu.2003.11.017

Pessoa, L., McKenna, M., Gutierrez, E., and Ungerleider, L. G. (2002). Neural processing of emotional faces requires attention. *Proc. Natl. Acad. Sci*. U.S.A. 99, 11458–11463. doi: 10.1073/pnas.172403899

Petroni, A., Canales-Johnson, A., Urquina, H., Guex, R., Hurtado, E., Blenkmann, A., von Ellenrieder, N., Manes, F., Sigman, M., and Ibanez, A. (2011). The cortical processing of facial emotional expression is associated with social cognition skills and executive functioning: a preliminary study. *Neuroscience letters*. 505, 41-46. https://doi.org/10.1016/j.neulet.2011.09.062

Peyroux, E., & Franck, N. (2014). RC2S: a cognitive remediation program to improve social cognition in schizophrenia and related disorders. *Frontiers in human neuroscience*, 8, 400. https://doi.org/10.3389/fnhum.2014.00400

Pineda, D. A., Aguirre-Acevedo, D. C., Trujillo, N., Valencia, A. M., Pareja, Á., Tobón, C., ... & Ibáñez, A. (2013). Dimensiones de la empatía en excombatientes del conflicto armado colombiano utilizando una escala estandarizada. *Revista Colombiana de Psiquiatría*, 42(1), 9-28. https://doi.org/10.1016/S0034-7450(14)60084-6

Pinkham, A. E., Penn, D. L., Green, M. F., Buck, B., Healey, K., & Harvey, P. D. (2014). The social cognition psychometric evaluation study: results of the expert survey and RAND panel. *Schizophrenia bulletin*, *40*(4), 813-823. https://doi.org/10.1093/schbul/sbt081

Plutchik, R. (2001). The nature of emotions: Human emotions have deep evolutionary roots, a fact that may explain their complexity and provide tools for clinical practice. *American scientist*, *89*(4), 344-350.

Polak, A. R., Witteveen, A. B., Reitsma, J. B., & Olff, M. (2012). The role of executive function in posttraumatic stress disorder: A systematic review. *Journal of affective disorders*, 141(1), 11-21. https://doi:10.1016/j.jad.2012.01.001

Popov, T. G., Carolus, A., Schubring, D., Popova, P., Miller, G. A., & Rockstroh, B. S. (2015). Targeted training modifies oscillatory brain activity in schizophrenia patients. *NeuroImage: Clinical*, *7*, 807-814. https://doi.org/10.1016/j.nicl.2015.03.010

Porter, R. J., Bourke, C., & Gallagher, P. (2007). Neuropsychological impairment in major depression: its nature, origin and clinical significance. *Australian & New Zealand Journal of Psychiatry*, 41(2), 115-128. https://doi.org/10.1080/00048670601109881

Posner, M. I., & Rothbart, M. K. (2018). Temperament and brain networks of attention. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *373*(1744), 20170254. https://doi.org/10.1098/rstb.2017.0254

Pratto, F., & John, O. P. (1991). Automatic vigilance: the attention-grabbing power of negative social information. *Journal of personality and social psychology*, *61*(3), 380. https://doi.org/10.1037/0022-3514.61.3.380

PRESEEA (2005). Estudios sociolingüísticos de Medellín. Fase. 1. Corpus sociolingüístico de Medellín. From http://comunicaciones.udea.edu.co/corpuslinguistico/web/corpus.pdf).

Quadflieg, S., Todorov, A., Laguesse, R., & Rossion, B. (2012). Normal face-based judgements of social characteristics despite severely impaired holistic face processing. *Visual cognition*, *20*(8), 865-882. https://doi.org/10.1080/13506285.2012.707155

Quintero-Zea, A., Sepúlveda-Cano, L. M., Calvache, M. R., Orrego, S. T., Orrego, N. T., & López, J. D. (2017). Characterization framework for ex-combatants based on eeg and behavioral features. In *VII Latin American Congress on Biomedical Engineering CLAIB 2016, Bucaramanga, Santander, Colombia, October 26th-28th, 2016* (pp. 205-208).http://dx.doi.org/10.1007/978-981-10-4086-3_52

Rachman, S. (2015). The evolution of behaviour therapy and cognitive behaviour therapy. *Behaviour research and therapy*, *64*, 1-8. https://doi.org/10.1016/j.brat.2014.10.006

Raine, A. (2002). Biosocial studies of antisocial and violent behavior in children and adults: A review. *Journal of abnormal child psychology*, *30*(4), 311-326. https://doi.org/10.1023/A:1015754122318

Recio, G., Sommer, W., & Schacht, A. (2011). Electrophysiological correlates of perceiving and evaluating static and dynamic facial emotional expressions. *Brain research, 1376*, 66-75. https://doi.org/10.1016/j.brainres.2010.12.041

Rellecke, J., Palazova, M., Sommer, W., & Schacht, A. (2011). On the automaticity of emotion processing in words and faces: event-related brain potentials evidence from a superficial task. *Brain and cognition*, 77(1), 23-32. https://doi.org/10.1016/j.bandc.2011.07.001

Restrepo, J., & Aponte, A. C. (2009). *Guerra y violencias en Colombia: herramientas e interpretaciones*. Cerac.

Rincón, C. J. (2018). Salud mental en niños desplazados por conflicto armado-Encuesta Nacional de Salud Mental Colombia 2015. *Actas Esp Psiquiatr*, 46(2), 51-7.

Roberts, D. L., & Penn, D. L. (2009). Social cognition and interaction training (SCIT) for outpatients with schizophrenia: a preliminary study. *Psychiatry research*, 166(2), 141-147. https://doi.org/10.1016/j.psychres.2008.02.007

Robinson, M. D., & Bresin, K. (2014). Higher levels of psychopathy predict poorer motor control: implications for understanding the psychopathy construct. *Journal of psychopathology and behavioral assessment*, 36(2), 201-210. https://doi.org/10.1007/s10862-013-9388-8

Roca, J., Castro, C., López-Ramón, M. F., & Lupiánez, J. (2011). Measuring vigilance while assessing the functioning of the three attentional networks: the ANTI-Vigilance task. *Journal of Neuroscience Methods*, 198(2), 312-324. https://doi:10.1016/j.jneumeth.2011.04.014

Rodríguez, C. D. T. (2016). Importancia de la construcción de paz en un contexto de guerra: caso colombiano en el periodo 2000-2016. *Revista Internacional de Cooperación y Desarrollo*, 3(2), 130-149. https://doi.org/10.21500/23825014.2782

Rohr, L., & Rahman, R. A. (2015). Affective responses to emotional words are boosted in communicative situations. *Neuroimage*. 109, 273-282. https://doi.org/10.1016/j.neuroimage.2015.01.031

Rona, R. J., Jones, M., Hull, L., MacManus, D., Fear, N. T., & Wessely, S. (2015). Anger in the UK Armed Forces: strong association with mental health, childhood antisocial behavior, and combat role. *The Journal of nervous and mental disease*, *203*(1), 15-22. doi: 10.1097/NMD.0000000000000228

Rosen, C. S., Matthieu, M. M., Stirman, S. W., Cook, J. M., Landes, S., Bernardy, N. C., ... & Hamblen, J. L. (2016). A review of studies on the system-wide implementation of evidence-based psychotherapies for posttraumatic stress disorder in the Veterans Health Administration. *Administration and Policy in Mental Health and Mental Health Services Research*, *43*(6), 957-977. https://doi.org/10.1007/s10488-016-0755-0

Rosero, L. F. T. (2013). Colombia: una revisión teórica de su conflicto armado. *Revista Enfoques: Ciencia Política y Administración Pública*, *11*(18), 55-75.

Rossion, B., Joyce, C. A., Cottrell, G. W., & Tarr, M. J. (2003). Early lateralization and orientation tuning for face, word, and object processing in the visual cortex. *Neuroimage*. 20(3), 1609-1624. https://doi.org/10.1016/j.neuroimage.2003.07.010

Rossion, B., & Jacques, C. (2008). Does physical interstimulus variance account for early electrophysiological face sensitive responses in the human brain? Ten lessons on the N170. *Neuroimage*, *39*(4), 1959-1979. https://doi.org/10.1016/j.neuroimage.2007.10.011

Rossion, B. (2014). Understanding face perception by means of human electrophysiology. *Trends in cognitive sciences*, *18*(6), 310-318. https://doi.org/10.1016/j.tics.2014.02.013

Ryan, L. M., Zazeckis, T. M., French, L. M., & Harvey, S. (2006). Neuropsychological Practice in the Military. In C. H. Kennedy & E. A. Zillmer (Eds.), *Military psychology: Clinical and operational applications* (p. 105–129). The Guilford Press..

Savaskan, E., Müller, S. E., Böhringer, A., Philippsen, C., Müller-Spahn, F., and Schächinger, H. (2007). Age determines memory for face identity and expression. *Psychogeriatrics* 7, 49–57. https://doi.org/10.1111/j.1479-8301.2007.00179.x

Sawada, R., Sato, W., Uono, S., Kochiyama, T., & Toichi, M. (2014). Electrophysiological correlates of the efficient detection of emotional facial expressions. *Brain research*, *1560*, 60-72. https://doi.org/10.1016/j.brainres.2014.02.046

Schacht, A., & Sommer, W. (2009). Emotions in word and face processing: early and late cortical responses. *Brain and cognition*, *69*(3), 538-550. https://doi.org/10.1016/j.bandc.2008.11.005

Schulz, K. P., Fan, J., Magidina, O., Marks, D. J., Hahn, B., & Halperin, J. M. (2007). Does the emotional go/no-go task really measure behavioral inhibition? Convergence with measures on a non-emotional analog. *Archives of Clinical Neuropsychology*, *22*(2), 151-160. https://doi.org/10.1016/j.acn.2006.12.001

Schupp, H. T., Öhman, A., Junghöfer, M., Weike, A. I., Stockburger, J., and Hamm, A. O. (2004). The facilitated processing of threatening faces: An ERP analysis. *Emotion*. 4, 189–200. https://doi.org/10.1037/1528-3542.4.2.189

Schwager, S., & Rothermund, K. (2013). Counter-regulation triggered by emotions: Positive/negative affective states elicit opposite valence biases in affective processing. *Cognition & Emotion*, 27(5), 839-855. https://doi.org/10.1080/02699931.2012.750599

Sebastian, C., Viding, E., Williams, K. D., & Blakemore, S. J. (2010). Social brain development and the affective consequences of ostracism in adolescence. *Brain and cognition*, *72*(1), 134-145. https://doi.org/10.1016/j.bandc.2009.06.008

Sebastian, C. L., McCrory, E. J., Cecil, C. A., Lockwood, P. L., De Brito, S. A., Fontaine, N. M., & Viding, E. (2012). Neural responses to affective and cognitive theory of mind in children with conduct problems and varying levels of callous-unemotional traits. *Archives of general psychiatry*, *69*(8), 814-822. doi:10.1001/archgenpsychiatry.2011.2070

Seehausen, M., Kazzer, P., Bajbouj, M., & Prehn, K. (2012). Effects of empathic paraphrasing–extrinsic emotion regulation in social conflict. *Frontiers in psychology*, *3*, 482. https://doi.org/10.3389/fpsyg.2012.00482

Seehausen, M., Kazzer, P., Bajbouj, M., Heekeren, H. R., Jacobs, A. M., Klann-Delius, G., ... & Prehn, K. (2014). Talking about social conflict in the MRI scanner: neural correlates of being empathized with. *NeuroImage*, *84*, 951-961. https://doi.org/10.1016/j.neuroimage.2013.09.056

Shamay-Tsoory, S. G., Shur, S., Barcai-Goodman, L., Medlovich, S., Harari, H., & Levkovitz, Y. (2007). Dissociation of cognitive from affective components of theory of mind in schizophrenia. *Psychiatry research*, 149(1-3), 11-23. https://doi.org/10.1016/j.psychres.2005.10.018

Shariff, A. F., & Tracy, J. L. (2011). What are emotion expressions for?. *Current Directions in Psychological Science*, *20*(6), 395-399. https://doi.org/10.1177/0963721411424739

Shea, M. T., Lambert, J., & Reddy, M. K. (2013). A randomized pilot study of anger treatment for Iraq and Afghanistan veterans. *Behaviour research and therapy*, *51*(10), 607-613. https://doi.org/10.1016/j.brat.2013.05.013

Sherman, M. D., Larsen, J., & Borden, L. M. (2015). Broadening the focus in supporting reintegrating Iraq and Afghanistan veterans: Six key domains of functioning. *Professional Psychology: Research and Practice*, *46*(5), 355. https://doi.org/10.1037/pro0000043

Siever, L. J. (2008). Neurobiology of aggression and violence. *American Journal of Psychiatry*, 165(4), 429-442. https://doi.org/10.1176/appi.ajp.2008.07111774

Sin, N. L., & Lyubomirsky, S. (2009). Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: A practice-friendly meta-analysis. *Journal of clinical psychology*, *65*(5), 467-487. https://doi.org/10.1002/jclp.20593

Singer, T., & Lamm, C. (2009). The social neuroscience of empathy. *Annals of the New York Academy of Sciences*, 1156(1), 81-96. DOI: 10.1111/j.1749-6632.2009.04418.x

Slep, A. M. S., Foran, H. M., Heyman, R. E., & Snarr, J. D. (2010). Unique risk and protective factors for partner aggression in a large scale Air Force survey. *Journal of community health*, *35*(4), 375-383. https://doi.org/10.1007/s10900-010-9264-3

Soloff, P. H. (2018). Emotional Regulation and Emotional Processing. *Handbook of Personality Disorders: Theory, Research, and Treatment*, 271.

Spisak, B. R., Dekker, P. H., Krüger, M., & Van Vugt, M. (2012). Warriors and peacekeepers: Testing a biosocial implicit leadership hypothesis of intergroup relations using masculine and feminine faces. *PloS one, 7*(1). doi: 10.1371/journal.pone.0030399

Sporer, S. L., Penrod, S., Read, D., & Cutler, B. (1995). Choosing, confidence, and accuracy: A meta-analysis of the confidence-accuracy relation in eyewitness identification studies. *Psychological Bulletin*, *118*(3), 315. https://doi.org/10.1037/0033-2909.118.3.315

Sprengelmeyer, R., Rausch, M., Eysel, U. T., & Przuntek, H. (1998). Neural structures associated with recognition of facial expressions of basic emotions. *Proceedings of the Royal Society of London. Series B: Biological Sciences*, *265*(1409), 1927-1931. https://doi.org/10.1098/rspb.1998.0522

Sreenivasan, K. K., Goldstein, J. M., Lustig, A. G., Rivas, L. R., & Jha, A. P. (2009). Attention to faces modulates early face processing during low but not high face discriminability. *Attention, Perception, & Psychophysics*, *71*(4), 837-846. https://doi.org/10.3758/APP.71.4.837

Stanislaw, H., & Todorov, N. (1999). Calculation of signal detection theory measures. *Behavior research methods, instruments, & computers*, 31(1), 137-149. https://doi:10.3758/BF03207704

Stanley, D. A., & Adolphs, R. (2013). Toward a neural basis for social behavior. *Neuron*. 80(3), 816-826. https://doi.org/10.1016/j.neuron.2013.10.038

Stark, E. A., Parsons, C. E., Van Hartevelt, T. J., Charquero-Ballester, M., McManners, H., Ehlers, A., ... & Kringelbach, M. L. (2015). Post-traumatic stress influences the brain even in the absence of symptoms: a systematic, quantitative meta-analysis of neuroimaging studies. *Neuroscience & Biobehavioral Reviews*, 56, 207-221 https://doi.org/10.1016/j.neubiorev.2015.07.007

Steenkamp, M. M., Litz, B. T., Hoge, C. W., & Marmar, C. R. (2015). Psychotherapy for military-related PTSD: A review of randomized clinical trials. *Jama*, *314*(5), 489-500. doi:10.1001/jama.2015.8370

Stein, M. B., Kennedy, C. M., & Twamley, E. W. (2002). Neuropsychological function in female victims of intimate partner violence with and without posttraumatic stress

disorder. *Biological psychiatry, 52*(11), 1079-1088. https://doi.org/10.1016/S0006-3223(02)01414-2

Strauss, E., Sherman, E. M., & Spreen, O. (2006). *A compendium of neuropsychological tests: Administration, norms, and commentary*. American Chemical Society.

Sundell, J. (2019). Psychopathic Personality Traits, Empathy, and Recognition of Facial Expressions of Emotions. (Dissertation)

Sutherland, R. J., Mott, J. M., Lanier, S. H., Williams, W., Ready, D. J., & Teng, E. J. (2012). A pilot study of a 12-week model of group-based exposure therapy for veterans with PTSD. *Journal of traumatic stress*, 25(2), 150-156. https://doi.org/10.1002/jts.21679

Taft, C. T., Vogt, D. S., Marshall, A. D., Panuzio, J., & Niles, B. L. (2007). Aggression among combat veterans: Relationships with combat exposure and symptoms of posttraumatic stress disorder, dysphoria, and anxiety. *Journal of Traumatic Stress*, *20*(2), 135-145. https://doi.org/10.1002/jts.20197

Ten Dam, C. (2015). The Limitations of Military Psychology: Combat-stress and Violence-values among the Chechens and Albanians. In *Studies on Iran and The Caucasus* (pp. 577-627). Brill. https://doi.org/10.1163/9789004302068_037

Teten, A. L., Miller, L. A., Bailey, S. D., Dunn, N. J., & Kent, T. A. (2008). Empathic deficits and alexithymia in trauma-related impulsive aggression. *Behavioral Sciences & the Law*, 26(6), 823-832. https://doi.org/10.1002/bsl.843

Theidon, K. (2007). Transitional subjects: The disarmament, demobilization and reintegration of former combatants in Colombia. *The International Journal of Transitional Justice*, *1*(1), 66-90.https://doi:10.1093/ijtj/ijm011

Tobón, C., Ibañez, A., Velilla, L., Duque, J., Ochoa, J., Trujillo, N, & Pineda, D. (2015). Emotional processing in Colombian ex-combatants and its relationship with empathy

and executive functions. *Social neuroscience*, 10(2), 153-165. https://doi.org/10.1080/17470919.2014.969406

Tobón, C., Aguirre-Acevedo, D. C., Velilla, L., Duque, J., Ramos, C. P., & Pineda, D. (2016). Psychiatric, Cognitive and Emotional Profile in Ex-combatants of Illegal Armed Groups in Colombia. *Revista colombiana de psiquiatria*, 45(1), 28-36. http://dx.doi.org/10.10167j.rcp.2015.07.004

Torralva, T., Roca, M., Gleichgerrcht, E., López, P., & Manes, F. (2009). INECO Frontal Screening (IFS): A brief, sensitive, and specific tool to assess executive functions in dementia–CORRECTED VERSION. *Journal of the International Neuropsychological Society*, 15(5), 777-786. https://doi:10.1017/S1355617709990415

Trujillo, S. P., Trujillo, N., Ugarriza, J. E., Uribe, L. H., Pineda, D. A., Aguirre-Acevedo, D. C.,... & Garcia-Barrera, M. A. (2017). How empathic are war veterans? An examination of the psychological impacts of combat exposure. Peace and Conflict: *Journal of Peace Psychology*, 23(4), 422. http://dx.doi.org/10.1037/pac0000255

Trujillo, S. P., Valencia, S., Trujillo, N., Ugarriza, J. E., Rodríguez, M. V., Rendón, J., ... & Parra, M. A. (2017). Atypical Modulations of N170 Component during Emotional Processing and Their Links to Social Behaviors in Ex-combatants. *Frontiers in human neuroscience*, 11, 244. https://doi:10.3389/fnhum.2017.00244

Trujillo, S., Trujillo, N., Lopez, J. D., Gomez, D., Valencia, S., Rendon, J.,... & Parra, M. A. (2017). Social cognitive training improves emotional processing and reduces aggressive attitudes in ex-combatants. *Frontiers in psychology*, 8, 510. https://doi:10.3389/fpsyg.2017.00510

Turner-Brown, L. M., Perry, T. D., Dichter, G. S., Bodfish, J. W., & Penn, D. L. (2008). Brief report: Feasibility of social cognition and interaction training for adults with high

functioning autism. *Journal of autism and developmental disorders*, *38*(9), 1777-1784. https://doi.org/10.1007/s10803-008-0545-y

Ugarriza, J. E. (2013). La dimensión política del postconflicto: discusiones conceptuales y avances empíricos. *Colombia internacional*, (77), 141-176. https://doi.org/10.7440/colombiaint77.2013.06

Ugr.es. (2018). Download. [online] Available at: http://www.ugr.es/~anti/Download.html [Accessed 13 May 2018].

Vasterling, J. J., Proctor, S. P., Amoroso, P., Kane, R., Heeren, T., & White, R. F. (2006). Neuropsychological outcomes of army personnel following deployment to the Iraq war. *Jama*, 296(5), 519-529. https://doi:10.1001/jama.296.5.519

Vasterling, J. J., Verfaellie, M., & Sullivan, K. D. (2009). Mild traumatic brain injury and posttraumatic stress disorder in returning veterans: perspectives from cognitive neuroscience. *Clinical psychology review*, *29*(8), 674-684. https://doi.org/10.1016/j.cpr.2009.08.004

Vasterling, J. J., Brailey, K., Proctor, S. P., Kane, R., Heeren, T., & Franz, M. (2012). Neuropsychological outcomes of mild traumatic brain injury, post-traumatic stress disorder and depression in Iraq-deployed US Army soldiers. *The British Journal of Psychiatry*, 201(3), 186-192. https://doi:10.1192/bjp.bp.111.096461

Veen, G., & Arntz, A. (2000). Multidimensional dichotomous thinking characterizes borderline personality disorder. *Cognitive Therapy and Research*, *24*(1), 23-45. https://doi.org/10.1023/A:1005498824175

Verona, E., Sprague, J., & Sadeh, N. (2012). Inhibitory control and negative emotional processing in psychopathy and antisocial personality disorder. *Journal of abnormal psychology*, *121*(2), 498. https://doi.org/10.1037/a0025308

Villa Gómez, J. D., Arroyave Pizarro, L., Montoya Betancur, Y., & Muñoz, A. (2017). Vicisitudes de los proyectos institucionales de atención psicosocial a víctimas del conflicto armado colombiano. *El Ágora* USB, 17(1), 157-175.

Vuilleumier, P., Armony, J. L., Driver, J., & Dolan, R. J. (2001). Effects of attention and emotion on face processing in the human brain: an event-related fMRI study. *Neuron*, *30*(3), 829-841. https://doi.org/10.1016/S0896-6273(01)00328-2

Vuilleumier, P. (2005). How brains beware: neural mechanisms of emotional attention. *Trends in cognitive sciences*, *9*(12), 585-594. https://doi.org/10.1016/j.tics.2005.10.011

Vuilleumier, P., & Pourtois, G. (2007). Distributed and interactive brain mechanisms during emotion face perception: evidence from functional neuroimaging. *Neuropsychologia*, *45*(1), 174-194. https://doi.org/10.1016/j.neuropsychologia.2006.06.003

Wagner, A. W., & Linehan, M. M. (1999). Facial expression recognition ability among women with borderline personality disorder: implications for emotion regulation?. *Journal of personality disorders*, *13*(4), 329-344. https://doi.org/10.1521/pedi.1999.13.4.329

Weierstall, R., Castellanos, C. P. B., Neuner, F., & Elbert, T. (2013). Relations among appetitive aggression, post-traumatic stress and motives for demobilization: a study in former Colombian combatants. *Conflict and health*, 7(1), 9. https://doi:10.1186/1752-1505-7-9

Weierstall, R., Haer, R., Banholzer, L., & Elbert, T. (2013). Becoming cruel: Appetitive aggression released by detrimental socialisation in former Congolese soldiers. *International Journal of Behavioral Development*, *37*(6), 505-513. https://doi.org/10.1177/0165025413499126

Weymar, M., Löw, A., Öhman, A., & Hamm, A. O. (2011). The face is more than its parts—Brain dynamics of enhanced spatial attention to schematic threat. *Neuroimage*, *58*(3), 946-954. https://doi.org/10.1016/j.neuroimage.2011.06.061

Williams, K., Staub, M. E., and Enderwitz, U. (2006). Jung, weiblich, in der Army: ich war Soldatin im Krieg. München: DVA.

Yamada, M., & Decety, J. (2009). Unconscious affective processing and empathy: an investigation of subliminal priming on the detection of painful facial expressions. *Pain*, *143*(1-2), 71-75. https://doi.org/10.1016/j.pain.2009.01.028

Zhang, D., He, W., Wang, T., Luo, W., Zhu, X., Gu, R., ... & Luo, Y. J. (2014). Three stages of emotional word processing: an ERP study with rapid serial visual presentation. *Social cognitive and affective neuroscience*, *9*(12), 1897-1903. https://doi.org/10.1093/scan/nst188

Zhang, Q., Ting-Toomey, S., & Oetzel, J. G. (2014). Linking emotion to the conflict face-negotiation theory: A US-China investigation of the mediating effects of anger, compassion, and guilt in interpersonal conflict. *Human Communication Research*, *40*(3), 373-395. https://doi.org/10.1111/hcre.12029

Zinchenko, A., Kanske, P., Obermeier, C., Schröger, E., & Kotz, S. A. (2015). Emotion and goal-directed behavior: ERP evidence on cognitive and emotional conflict. *Social cognitive and affective neuroscience*, *10*(11), 1577-1587. https://doi.org/10.1093/scan/nsv050

ANEXOS

1. Supplementary Material Capítulo 2

Executive and behavioral characterization of chronic exposure to armed conflict among war victims and veterans

Sandra Trujillo, Natalia Trujillo [*], Stella Valencia [2], Juan Esteban Ugarriza., Alberto Acosta Mesas

Supplementary Material

Supplementary Table 1. (S1)

One-way ANOVA for Intelligence and executive function neuropsychological tests

Neuropsychological Test	ANOVA F (p)
Brief IQ	6.30 (0.00)
TMT Hits	1.41 (0.25)
TMT Index time	5.67 (0.01)
TMT A Hits	3.48 (0.04)
TMT A Time	0.98 (0.38)
TMT B Hits	2.35 (0.10)
TMT B Time	4.82 (0.01)
INECO Total	3.69 (0.03)
WCST Hits	3.22 (0.04)

Abbreviated intellectual coefficient questionnaire (Brief IQ). Trail Making Test version A, numeric sequence (TMT A). Trail Making Test version B, alphanumeric sequence (TMT B). Total hits Wisconsin Card Sorting Test (WCST). Total score of INECO Frontal Screening (INECO Total).

The results evidenced that cognitive flexibility derivate from TMT A-B test did not report significant values in hits category for both test.

Supplementary Table 2. (S2)

ANTI-V Interactions by conditions by group from attentional networks and vigilance for both Response Time (RT) and Accuracy (ACC)

	ANOVA
RT	**F (p), n2, B**
Alert	**31.18 (0.00), 0.54, 1.00**
Alert * Group	0.26 (0.77), 0.08, 0.09
Orienting	**25.03 (0.00), 0.50, 1.00**
Orienting * Group	0.83 (0.51), 0.15, 0.26
Executive Control	**298.99 (0.00), 0.90, 1.00**
Executive Control * Group	2.74 (0.07), 0.26, 0.52
Alert * Orienting	2.64 (0.07), 0.19, 0.52
Alert * Orienting * Group	0.49 (0.74), 0.11, 0.16
Alert * Executive Control	0.91 (0.34), 0.11, 0.16
Alert * Executive Control * Group	0.62 (0.54), 0.13, 0.15
Orienting * Executive Control	**9.27 (0.00), 0.33, 0.98**
Orienting * Executive Control * Group	0.57 (0.68), 0.12, 0.19
Alert * Orienting * Executive Control	**4.80 (0.01), 0.25, 0.79**
Alert * Orienting * Executive Control * Group	**2.54 (0.04), 0.25, 0.71**
Vigilance	**1.00 (0.00), 0.77, 1.00**
Vigilance*Grupo	2.00 (0.31), 0.20, 0.25
ACC	
Alert	2.34 (0.13), 0.18, 0.33
Alert * Group	1.01 (0.37), 0.16, 0.22
Orienting	**5.58 (0.00), 0.26, 0.85**
Orienting * Group	1.32 (0.27), 0.19, 0.40
Executive Control	**118.35 (0.00), 0.78, 1.00**
Executive Control * Group	0.14 (0.87), 0.06, 0.07
Alert * Orienting	0.18 (0.84), 0.05, 0.08
Alert * Orienting * Group	2.29 (0.06), 0.24, 0.66

Alert * Executive Control	0.00 (0.98), 0.00, 0.05
Alert * Executive Control * Group	0.45 (0.64), 0.11, 0.12
Orienting * Executive Control	1.33 (0.27), 0.13, 0.28
Orienting * Executive Control * Group	0.78 (0.54), 0.14, 0.25
Alert * Orienting * Executive Control	0.42 (0.66), 0.08, 0.12
Alert * Orienting * Executive Control * Group	1.90 (0.11), 0.22, 0.56
Vigilance	**366.85 (0.00), 0.91, 1.00**
Vigilance*Group	**3.71 (0.03), 0.30, 0.66**

RT= reaction time, ACC= accuracy

The results evidenced two and three- way interactions between conditions. Interactions by group only were observed between three attentional networks (Alert, orientation and executive control) by group in Response Time (RT). For Accuracy values, only Vigilance by group was reported to be significant.

Supplementary Table 3. (S3)

Repeated Measures ANOVA model for Social Categorization Switching Task (SCST) and Go-No-Go Task conditions and indexes

SCST	**ANOVA**
ACC	**F (p), n2, B**
Task	2.97 (0.09), 0.23, 0.39
Task* Group	1.88 (0.16), 0.26, 0.37
Taskswitch	**37.56 (0.00), 0.64, 1.00**
Taskswitch*Group	1.57 (0.22), 0.23, 0.32
Task*Taskswitch	0.76 (0.39), 0.12, 0.14
Task*Taskswitch*Group	0.23 (0.80), 0.09, 0.08
RT	
Task	0.19 (0.66), 0.06, 0.07
Task* Group	0.05 (0.95), 0.04, 0.06
Taskswitch	**139.93 (0.00), 0.85, 1.00**
Taskswitch*Group	0.06 (0.94), 0.05, 0.06
Task*Taskswitch	**32.46 (0.00), 0.61, 1.00**

Task*Taskswitch*Group	1.69 (0.19), 0.24, 0.34
Go No Go	
d`	
Emotion	**4.68 (0.01), 0.22, 0.78**
Emotion*Group	0.24 (0.92), 0.07, 0.10
Load	0.97 (0.33), 0.10, 0.16
Load*Group	0.32 (0.73), 0.08, 0.10
Emotion* Load	0.07 (0.93), 0.03, 0.06
Emotion*Load*Group	0.31 (0.87), 0.08, 0.12
Beta(β)	
Emotion	0.84 (0.43), 0.10, 0.19
Emotion*Group	1.15 (0.33), 0.16, 0.36
Load	0.04 (0.83), 0.02, 0.05
Load*Group	0.47 (0.63), 0.10, 0.13
Emotion* Load	0.08 (0.93), 0.03, 0.06
Emotion*Load*Group	1.51 (0.20), 0.18, 0.46
RT	
Emotion	**5.04 (0.01), 0.23, 0.81**
Emotion*Group	0.77 (0.55), 0.13, 0.24
Load	**10.51 (0.00), 0.32, 0.89**
Load*Group	0.70 (0.50), 0.12, 0.16
Emotion* Load	0.12 (0.89), 0.04, 0.07
Emotion*Load*Group	0.78 (0.54), 0.13, 0.25

RT= reaction time, ACC= accuracy, d`=perceptual sensitivity, β= response bias.

The results evidenced two and three- way interactions between conditions. Interactions by conditions were observed between in Task*Taskswitch conditions for SCST. In the Go-No Go Task, we observed significant effects in main effect of the conditions, but not interactions for conditions by groups.

2. Supplementary material-integral Capítulo 4

Atypical modulations on emotional processing and their impact on social behaviors in ex-combatants

Supplementary material 1

This material present the pilot study performed in healthy university students in order to adapt the task for it use on the population.

Pilot Study

We adapt an Emotional recognition task using face and word stimuli (Ibanez et al, 2011). Our goal were to evaluate in a set a healthy adults its accuracy, variation on the reaction times across the task and electrophysiological modulation during faces and word processing (Stimulus Type Effect-STE). Our hypothesis is that accuracy on the emotional and neutral conditions will be overall larger than 80%. We also assumed that variation on the reaction time during emotional recognition task is an indicator of emotional valence processing. We expect that reaction time variation will reach significant effect for face conditions. Finally, we explore the presences of stimulus type effect on the EEG signal.

Methods

Participants

Fifteen volunteers with mean age of 22 (SD = 3) and average education of 16 (SD = 3) entered this pilot study in order to validate the valence of images and words. Participants were students enrolled in University Courses who took part in the study on volunteer basis. None

of them reported having had psychiatric or neurological problems, or symptoms of anxiety. They all signed a consent form prior participations.

Task

Emotional recognition task

A task for identifying faces and words with emotional content was designed in E-prime (Psychology Software Tools, Pittsburg, USA). Faces images were taken from the MMI Facial Expression Database (Pantic et al., 2005). This database control perceptual condition of the images, such as luminosity, intensity and face position (eg. Frontal, lateral). For the MMI Database student and staff from Delft University were instructed for an expert on FACS Coder to express different basic emotion and neutral expression on the face. After the collection of the dataset, two expert in FACS coder selected the images that best capture the emotional and neutral expressions. In addition, the pictures were presented to two observed in order to select the emotion or neutral expression that the faces were showing. If controversy appears the final decision of the inclusion of the image were taken by a third FACS expert (for details see Pantic et al., 2005).

From MMI Facial Expression Database we selected 120 images expressing happy, neutral or angry expression in frontal position. We presented the images to two university observers who were instructed to classify them as happy, angry or neutral. If both observers correctly categorize the image its was included. If controversies appear a member of the research group took the final decision. The final set includes 90 pictures of female and male faces (30 happy, 30 neutral and 30 angry). All the images were cropped oval shaped and standardized under the same parameters of color, brightness and size according to the criteria used previously reported (Hurtado et al., 2009, Ibanez et al., 2011). In order to avoid strange cues such as hair and ears, all face images.

Words were selected from a linguistic corpus created by the Faculty of Communication of Universidad de Antioquia [http://comunicaciones.udea.edu.co/corpuslinguistico/?opcion=4] which contain the most frequent words use in Antioquia´s region, Colombia. This corpus is part of a large Spanish project in order to establish different characteristics of the production of the idiom around different Spanish spoken countries (PRESEEA, 2005). In Medellin, a 119 interviews was performed in a sample with difference socio-economic condition (González and Grajales 2012). Using the expertise of the linguistic group from communication faculty at University of Antioquia, we select 90 words (30 pleasant, 30 neutral and 30 unpleasant) whit high frequency expression across Medellin´s population. Stimuli were displayed in a 17 inches screen. The stimuli were presented 23 inches away from the participant´s eye field. Both faces and words were adapted following Ibanez et al. (2010), Petroni et al. (2011), Ibanez et al. (2011), and Hurtado et al. (2009). Faces and words shown in screen were controlled in brightness, color and intensity. They were presented in a 17 inches screen, 60 cm apart from the participant.

2.3.2 Emotion processing assessment

The task compressed 360 trials. Each trial started with a 1000-miliseconds fixation cross, followed by a 200-miliseconds stimulus (face or word), and finally a 700-1000 milliseconds inter-stimulus interval (ISI) (black screen) was displayed. For error-trials, a 100-miliseconds red cross was displayed between the response notice and the ISI in order to provide a negative feedback and to encourage attention to the task. No feedback was provided in correct-trials. We measured accuracy and response time. The task was sync to collect electrophysiological signal associated with task performance.

Data recording

Behavioral and electrophysiological data recording and signal processing follows the same methodology presented in the paper.

Data analysis

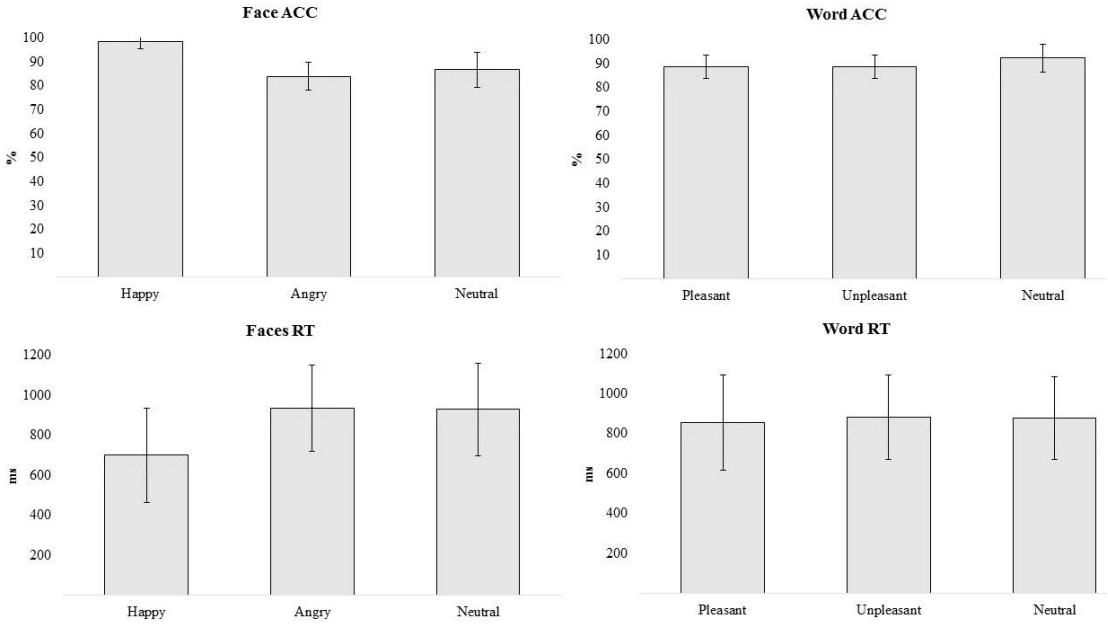
A repeat measure ANOVA was used to evaluate accuracy and reaction time for faces and words. Post hoc analysis per condition was carry out using paired t test.

Repeat measure ANOVA was also used for the analysis of electrophysiological stimulus type on this sample. This model has three level integrated for Category (faces and words) per condition (e.g. face: Happy, neutral, angry, words: pleasant, unpleasant, neutral) per hemisphere (eg. right and left).

Results

Accuracy: There were difference on face conditions [$F(2, 13)=32$, $p= 0.00$; $\eta 2 = 0.83$, $\beta=1$]. Happy faces describe a larger accurate performance in comparison with neutral and angry faces [$t= 5.94$, $p=0.00$; $t= 10.11$, $p=0.00$]. No differences were found for the other combination [$t= 1.32$, $p= 0.21$]. A statistical tendency was identify for words [$F(2,13)=3,1$, $p=0.06$; $\eta 2 = 0.42$, $\beta=0.55$].

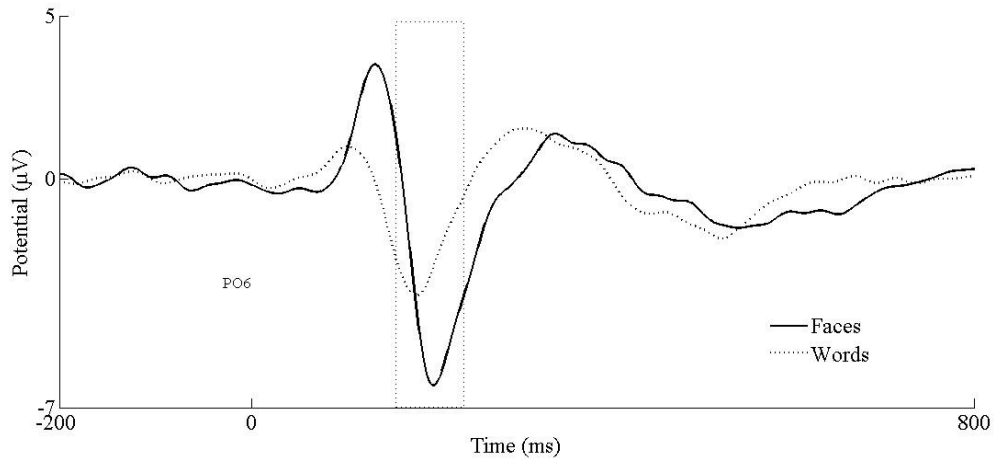
Reaction time: Statistical difference were identified for reaction time performance during face condition [$F(2,13)=42,52$, $p=0.00$; $\eta 2 = 0.87$, $\beta=1$]. Specifically, happy faces reach faster responses than neutral and angry respectively [$t= 6,9$, $p= 0.00$; $t= 7,3$, $p= 0.00$], whereas, no difference were observed for the comparison between neutral and angry stimulus [$t= 0.36$, $p= 0.72$]. No difference were observed on the reaction time of the word conditions [$F(2,13)=0.59$, $p= 0.51$; $\eta 2 = 0.31$, $\beta=0.15$]



Supplementary Fig.1. Boxes and bars indicate of means and standard deviation on face and word accuracy (ACC) and reaction time (RT) condition in the Emotional Recognition Task (ERT).

Stimulus type effect

Greater neural activation was found for the faces in comparison with words conditions [F(1,14)= 13,49, *p*=0.00, η2 =0.7, β=0.93]. This effect between categories describe a differential expression across hemispheres [F(1,14)= 36.47, *p*=0,00 η2 = 0.85, β=1]. Specifically, Post hoc test indicated that faces recruit more neural resources for the right than for the left hemisphere (t= 5.18, *p*=0.00). There were no differential use of neural resources across hemisphere for words (t=0.94, *p*=0.37).



Supplementary figure 2. Stimulus type condition for word and face stimuli in healthy population.

Comments

The main goal of the pilot study was to identify behavioral performance in the task, in order to determine the utility of the task during emotional recognition discrimination, due to the analysis of accuracy, reaction time and stimulus type effect. On that sense, as we expected the average accuracy were overall close to 90%. In previous studies using emotional recognition task average accuracy was 80% or higher (Citron et al, 2012; Ibanez, et al 2011). That finding suggest that images selected were overall categorized with precision for subjects in the sample. Complementary, accuracy modulation for face condition describe variability similar that previously reported by Sawada et al., (2014). Similar tendencies in accuracy for word conditions has been report previously (Citron et al., 2013)

Reaction time has been describe as a reflex of valence modulation. In our results, difference observed was for happy faces. This faster response has been interpreted as a facilitation for faces with positive content (Leppänen et al., 2003). For word, reaction time variation is overall less stable (Ibanez et al, 2011).

There was found Stimulus Type effect differences between word and face conditions. Specifically, variation on this has been describe previously as a marker distribution of differential neural resources for word and faces in emotional processing task (Rossion et al, 2003). Our data found larger right hemisphere distribution for face than for word conditions. In summary, this pilot study identify an overall accurate response, modulation of some of the core conditions of the reaction time associated with emotional valence and the electrophysiological Stimulus Type Effect modulation, indicate that in general term the task has replicate the core effect previous associated with other adaptations.

References

Citron, F. M. (2012). Neural correlates of written emotion word processing: a review of recent electrophysiological and hemodynamic neuroimaging studies. *Brain and Language, 122*(3), 211-226.

Citron, F. M., Weekes, B. S., & Ferstl, E. C. (2013). Effects of valence and arousal on written word recognition: Time course and ERP correlates. *Neuroscience Letters, 533*, 90-95.

González, M. C., & Grajales, R. (2012). La clase social en el Corpus Preseea-Medellín.

Hurtado, E., Haye, A., González, R., Manes, F., & Ibáñez, A. (2009). Contextual blending of ingroup/outgroup face stimuli and word valence: LPP modulation and convergence of measures. *BMC Neuroscience, 10*(1), 69.

Ibanez, A., Gleichgerrcht, E., Hurtado, E., González, R., Haye, A., & Manes, F. F. (2010).

Early neural markers of implicit attitudes: N170 modulated by intergroup and evaluative contexts in IAT. *Frontiers in Human Neuroscience*, *4*, 188.

Ibanez, A., Hurtado, E., Riveros, R., Urquina, H., Cardona, J. F., Petroni, A., Lobos-Infante, A., Barutta, J., Baez, S., & Manes, F. (2011). Facial and semantic emotional interference: a pilot study on the behavioral and cortical responses to the Dual Valence Association Task. *Behavioral and Brain Functions*, *7*(8).

Leppänen, J. M., Tenhunen, M., & Hietanen, J. K. (2003). Faster choice-reaction times to positive than to negative facial expressions: The role of cognitive and motor processes. *Journal of Psychophysiology*, *17*(3), 113.

Pantic, M., Valstar, M., Rademaker, R., & Maat, L. (2005). Web-based database for facial expression analysis. In *2005 IEEE international conference on multimedia and Expo* (pp. 317-321). IEEE. (www.mmifacedb.com)

Petroni, A., Canales-Johnson, A., Urquina, H., Guex, R., Hurtado, E., Blenkmann, A., von Ellenrieder N., Manes F., Sigman, M., & Ibanez, A. (2011). The cortical processing of facial emotional expression is associated with social cognition skills and executive functioning: a preliminary study. *Neuroscience Letters*, *505*(1), 41-46

PRESEEA (2005). Estudios sociolingüísticos de Medellín. Fase. 1. Corpus sociolingüístico de Medellín. From http://comunicaciones.udea.edu.co/corpuslinguistico/web/corpus.pdf

Rossion, B., Joyce, C.A., Cottrell, G.W., Tarr, M.J. (2003). Early lateralization and orientation tuning for face, word, and object processing in the visual cortex. *Neuroimage*, 20(3), 1609–24.

Sawada, R., Sato, W., Uono, S., Kochiyama, T., & Toichi, M. (2014). Electrophysiological correlates of the efficient detection of emotional facial expressions. *Brain Research, 1560,* 60-72.

Supplementary material 2

This material provides the main effect results for the two way ANOVA model. Condition by Group interactions are reported on the main manuscript.

Results

Experimental task: Behavioral analysis

Regarding accuracy, a main effect for condition was found for faces [F(2,45)=26.4, *p*=0.00, η2=0.6, β=1]. Happy faces reach accurate responses than angry and neutrals (t=6,6, *p*=0.00)(t=7,2, p=0.00). No differences was found for neutral vs. angry (t=1,3, *p*=0.19). Differences were also found for the accuracy in words [F(2,45)=15,1, *p*=0.00, η2=0.57, β=0.99]. Where pleasant word describe larger performance differences in comparison with neutral and unpleasant (t=4,7, *p*=0.00), (t=2,1, *p*=0.05) whereas, unpleasant describe larger accuracy than neutrals (t=3,4, *p*=0.01)]. No main effect was informed for group [face F(2,45)=1.36, *p*=0.25, η2=0.17, β=0.21; words F(2,45)=5.16, *p*=0.03, η2=0.32, β=0.60]

For reaction time reach significance just for words but not for faces [F(2,45)=2.79, P=0.07, η2=0.33, β=0.52; Words: F(2,45)=4.14, P=0.02, η2=0.39, β= 0.70]. For the reaction time pleasant word describe shorter reaction time than neutral and unpleasant (t=2,0 *p*=0.05) (t=2,7 *p*=0.01), no presented for the neutral and unpleasant conditions (t=0,1, p=0.89). Group main effect yielded no difference face [F(2,45)=7.34, *p*=0.01, η2=0.37, β=0,76] for words [F(2,45)=3.89, *p*=0.05, η2=0.28, β=0,49].

For the Error Type on face condition, difference were found for the main effect on neutral Error Type [F(1,47)=4.37, *p*=0.04, η2=0.29, β=0.54] (neutral error angry > neutral error happy) (MSE= 4.75, *p*=0.04, IC= 0.18 to 9.33) nor for the main effect in group [F(1,47)=0.18, *p*=0.67, η2=0.06, β=0.07]. For angry condition main effect on the Error Type were found [F(1,47)=16.93, *p*=0.00, η2=0.51, β=0.98] (angry error neutral > angry error happy) (MSE= 12.80, *p*=0.00, IC= 6.49 to 19.11) and for group [F(1,47)=5.10, *p*=0.03, η2=0.31, β=0.60] (ex-combatants >controls) (MSE= 6.38, *p*= 0.03, IC= 0.70 to 12.06). No difference were found for happy [Error Type F(1,47)=0.35, *p*=0.56, η2=0.08, β=0.09; Group F(1,47)=0.97, *p*=0.33, η2=0.14, β= 0.16].

For word condition, main effect on the error type of pleasant condition was identity [F(1,47)=5.84, *p*=0.02, η2=0.32, β=0.63] (pleasant error neutral > pleasant error unpleasant) (MSE= 5.29, *p*= 0.02, IC= 0.75 to 9.83) and group [F(1,47)=5.70, *p*=0.02, η2=0.32, β=0.65] (ex-combatants >controls) (MSE= 6.23, *p*= 0.02, IC= 0.98 to 11.48) was identified. Neutral word inform main effect on the error type [F(1,47)=76.14, *p*=0.00, η2=0.79, β=1] (neutral error pleasant > neutral error unpleasant) (MSE= 20.06, *p*= 0.00, IC= 15.43 to 24.68) no for group [F(1,47)=1.99, *p*=0.17, η2=0.20, β=0.28]. For unpleasant no difference were found for the main effects of Error Type nor Group [F(1,47)=0.27, *p*=0.60, η2=0.08, β=0.08; F(1,47)=3.83, *p*=0.06, η2=0.27, β=0.48].