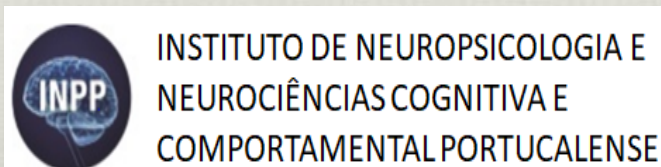


NeuroJustice

Miguel Pérez-García, PhD.

Encontro Ciência '18

Lisbon, 2-4 July



NeuroJustice (NJ): Definition and field of study

Definition: NJ is the application of Neuroscience to Justice/legal system.

How can Neuroscience and Neuropsychology help to the justice system?

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Providing neuroscientific knowledge to the study of criminal behavior	Studing the perception of justice from a neuroscientific point of view Are there brain structures involved in deciding what is just?
Applying Neuroscience in forensic settings → Forensic Neuropsychology	Are moral and legal norms differenciaded in our brain?

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Our Research Program in Neuroscience and IPV

(2009- present)

<u>Victims</u> <u>(Believe Project)</u>	<u>Perpetrators</u>
Assess neuropsychological damage in IPV victims	Help to understand the behavior of batterers in terms of neuropsychological variables
Design and implement neuropsychological rehabilitation programs	Help to understand brain functioning in batterers
Extend neuropsychology to victims of IPV in forensic settings	Help to predict relapse of batterers

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FORENSIC APPLICATIONS: A SINGLE CASE

Behavioral Psychology / Psicología Conductual, Vol. 24, Nº 2, 2016, pp. 361-376

NEUROPSICOLOGÍA FORENSE EN UN CASO DE VIOLENCIA DE GÉNERO

M^a Isabel Marín Torices¹, Natalia Hidalgo-Ruzzante²,
Vicente Tovar Sabio³ y Miguel Pérez García²

¹Alameda Salud, Granada; ²Universidad de Granada; ³VT abogados, Granada
(España)

BACKGROUND INFORMATION

- ❖ 51 years old
- ❖ Immigrated from Cuba
- ❖ Positive childhood and relationship with family
- ❖ High level of education
- ❖ No medical assistance

PARTNER ABUSE

- IPV victim during 3 years
 - Physical (direct hits, mostly to the head)
 - Sexual (rape, sexual abuse)
 - Psychological (deprivation of personal freedom, surveillance, isolation, death threats)
 - Economic (withdrawal of documents)
- 2 years spent in jail, accused of murdering her husband. Pled guilty, but in an act of self-defense.



Methodology

Comprehensive neuropsychological battery:
(Lezak, Howieson, and Loring, 2004)

Visuomotor Coordination	Attention	Memory
Language	Executive functioning	Effort

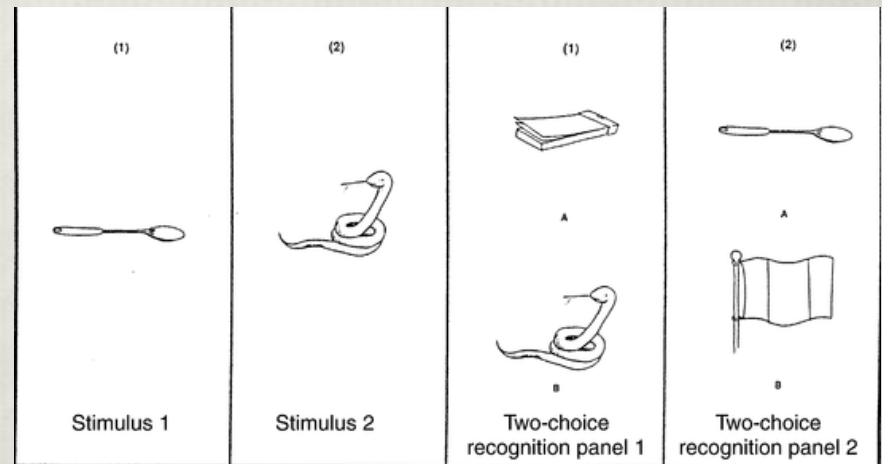
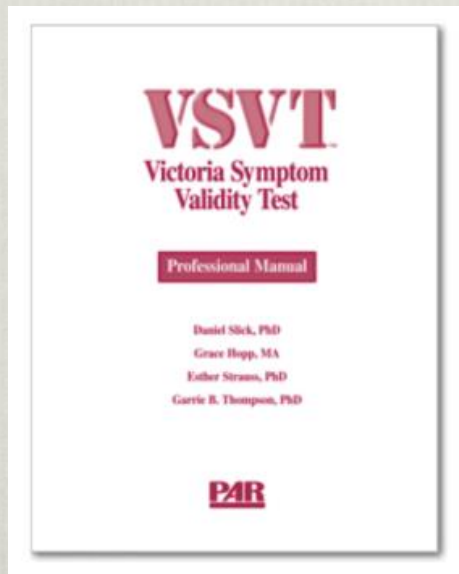
Results

- **Impairment in:**
 - visuomotor coordination
 - episodic visual memory
 - episodic verbal memory
 - executive functioning (working memory, inhibition, flexibility and abstract reasoning).

The alterations found in visuomotor coordination, episodic memory and executive functioning matched those found in the literature (Jackson et al., 2002; Kwako et al., 2011; Twamley et al., 2009; Valera & Kucyi 2016).

The possibility of simulation *was overruled...*

- Test of Memory Malinger (Tombaugh, 1996)
- Victoria Symptom Validity Test (Slick, Hopp, Strauss, & Thompson, 1997)



VERDICT

The court determined A.P. to be not imputable due to the neuropsychological impairment.



FORENSIC APPLICATIONS: A STUDY ON EFFORT TESTS

Original Articles

Validation of neuropsychological consequences in victims of intimate partner violence in a Spanish population using specific effort tests

M^a Isabel Marín Torices, Natalia Hidalgo-Ruzzante , Julia C. Daugherty, Pilar Jiménez-González & Miguel Pérez García

Pages 1-13 | Received 21 Feb 2017, Accepted 30 May 2017, Published online: 12 Jun 2017

 Download citation  <http://dx.doi.org/10.1080/14789949.2017.1339106>

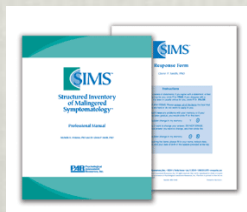


EFFORT TESTING AND IPV

- Despite the fact that .014% of female victims of IPV malingers (State Attorney General, 2016), effort testing must form a part of routine neuropsychological protocol in order to validate neuropsychological scores.

Symptom Validity

- Self-informed symptoms
- Structured Inventory of Malingered Symptomatology (SIMS; Smith & Burger, 1997)



Performance Validity

- Precision and performance
 - Embedded vs. Stand-alone (Heilbronner et al., 2009).
 - Test of Memory Malingering (TOMM; Tombaugh, 1996)




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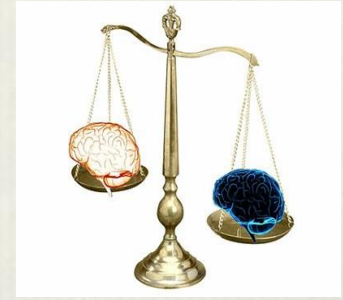
Participants

- ACTIVA Association
- 108 participants:
 - 68 female victims of IPV, 18-52 years old
 - 40 women who had not experienced IPV, 20-52 years old
- **Exclusion criteria:** psychotropic medication, psychological disorders, history of drug abuse, illiteracy, DSM5 criteria for simulation

Procedure

- Assessments for female victims:
 - CTS-2 (Straus, Hamby, Boney-McCoy, & Sugarman 1996)
 - Semi-structured interview about IPV (Echeburúa, Corral, Sarasua, Zubizarreta, & Sauca 1994)
- **Effort tests:**
 - TOMM (Tombaugh, 1996)
 - SIMS (Smith & Burger, 1997)

RESULTS & DISCUSSION



SIMS

Victims of IPV:

59.3% false positives in the total score.

Non-IPV group:

6.7-36% appeared to be malingering on different subtests.

TOMM

0% participants were determined to be malingering.

-
- 1st study to compare effort tests in female victims of IPV.
 - Significant implications considering the evidence that female victims may be suffering from neuropsychological sequelae (Ivany & Schminkey, 2016, Kwako et al., 2011; Valera & Kucyi, 2016).

- ❖ **Project Believe:** Neuropsychological, Brain Injury, Psychopathology, Violence (type, severity, duration), Simulation
- ❖ Coin in Hand-Extended Version
 - ❖ Forced choice (Schroeder, Peck, Buddin, Heinrichs, & Baade, 2012)
 - ❖ Various levels of difficulty (Heilbronner, Sweet, Morgan, Larrabee, Millis & Conference Participants, 2009)
 - ❖ Computerized
 - ❖ Translated into English, Spanish and Portuguese
 - ❖ Validating in USA, Spain, Colombia and Portugal

PILOT ANALOG STUDY



Participants

- 76 students (13 men and 63 women) between 18 and 39 years old, both groups (analog and control) were matched in education level.

Procedure

- Administration of the Coin in Hand with 4 additional effort tests (VSVT, Verbal Fluency, Digit Span, TOMM)
- 2 conditions
 - simulation vignette
 - perform as best as possible
 - ***condition assigned at random and blindly

PRELIMINARY FINDINGS

Area Under the Curve

Test Result Variable(s): Coin in Hand total correct answers

Area	Std. Error ^a	Asymptotic Sig. ^b	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.963	.032	.000	.901	1.000

The test result variable(s): Coin in Hand total correct answers has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

Cut-off	Sensitivity	Specificity
23.5	90.5%	95%
26.5	95.2%	95%
29.5	95.2%	81%

Our Research Program

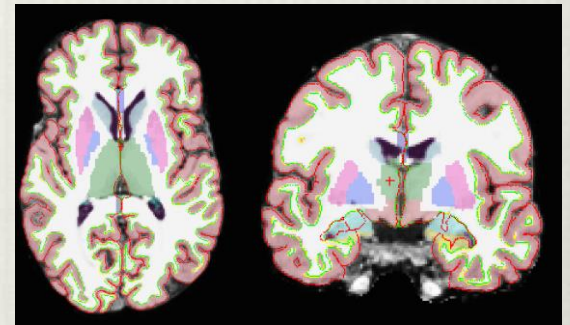
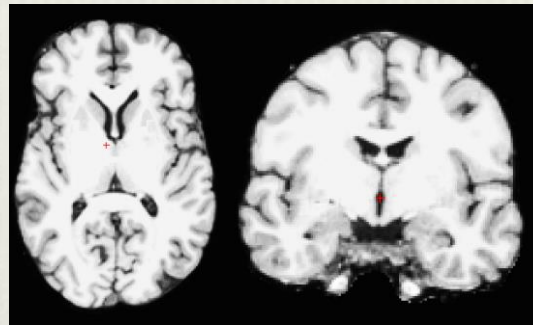
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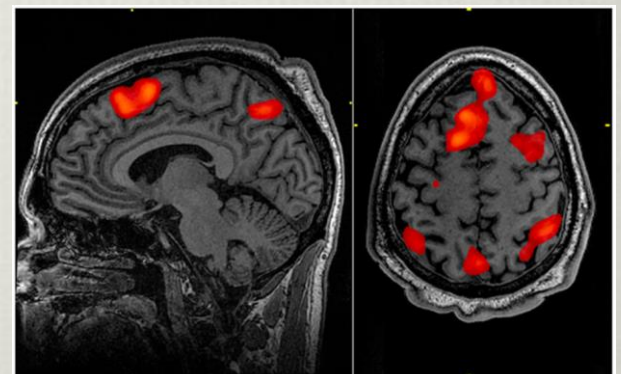
Brief notes on MRI



-Structural MRI



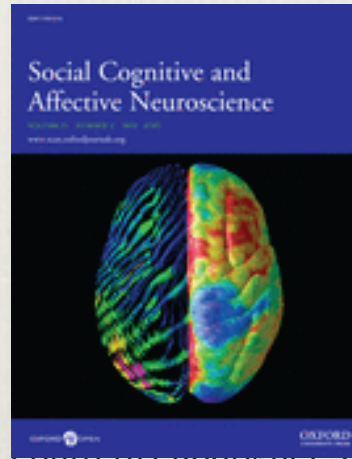
-Functional MRI



Aims

- ❖ To **compare** the **brain functioning** of batterers to that of other criminals when they are **exposed** to **IPV** or **general violence** pictures.
- ❖ To **compare** the cortical **grey matter** thickness of male batterers to that of other criminals in the brain areas related to emotional processing and regulation. We also aim to establish whether those differences **correlate** with **behavioural** measures of **emotional perception**.

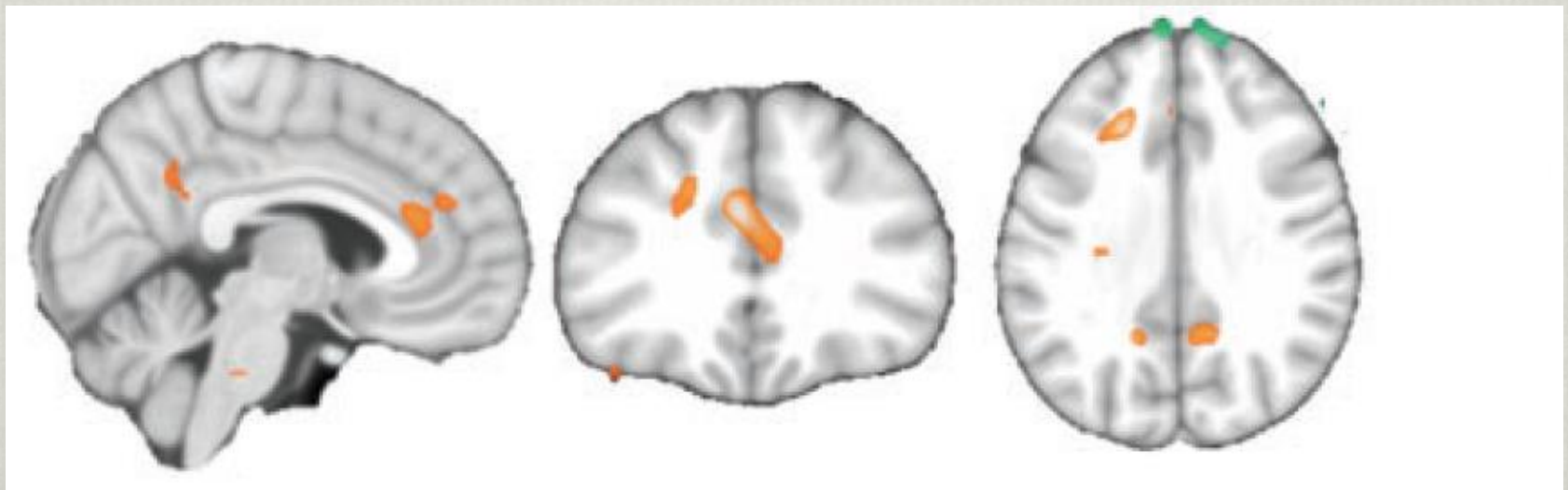
“Are batterers different from other criminals? An fMRI study”



Bueso-Izquierdo, N., Verdejo-Román, J., Contreras-Rodríguez, O., Carmona-Perera, M., Pérez-García, M., & Hidalgo-Ruzzante, N. (2016). Are batterers different from other criminals? An fMRI study. *Social cognitive and affective neuroscience*, 11(5), 852-862.

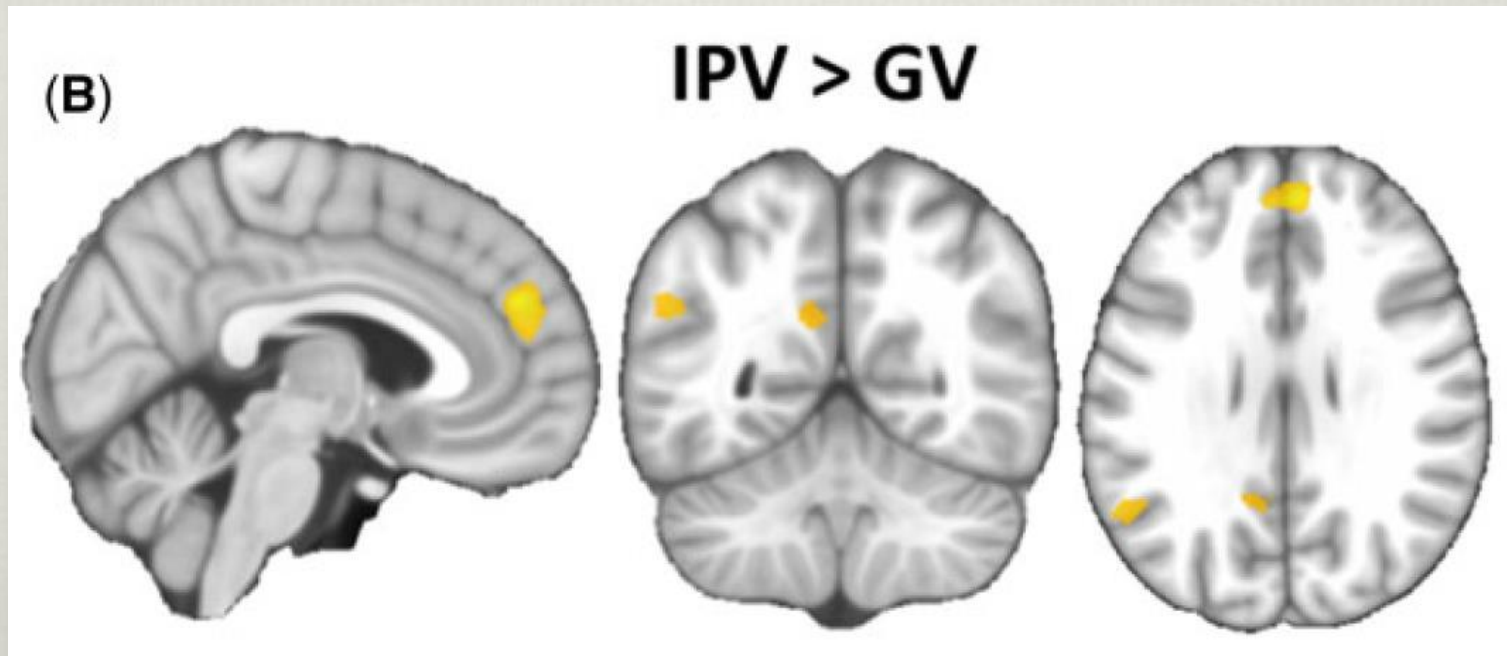
functional MRI

We replicated the frontal and midline (anterior and posterior cingulate) hyper-activations in batterers while viewing IPV images compared to other criminals (Bueso-Izquierdo et al., 2016).

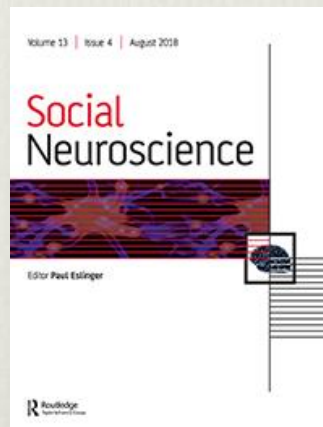


functional MRI

We also found specific hyper-activations in the frontal and midline cortices (anterior and posterior cingulate) and angular gyrus in batterers while viewing IPV images compared to general violence images (Bueso-Izquierdo et al., 2016)

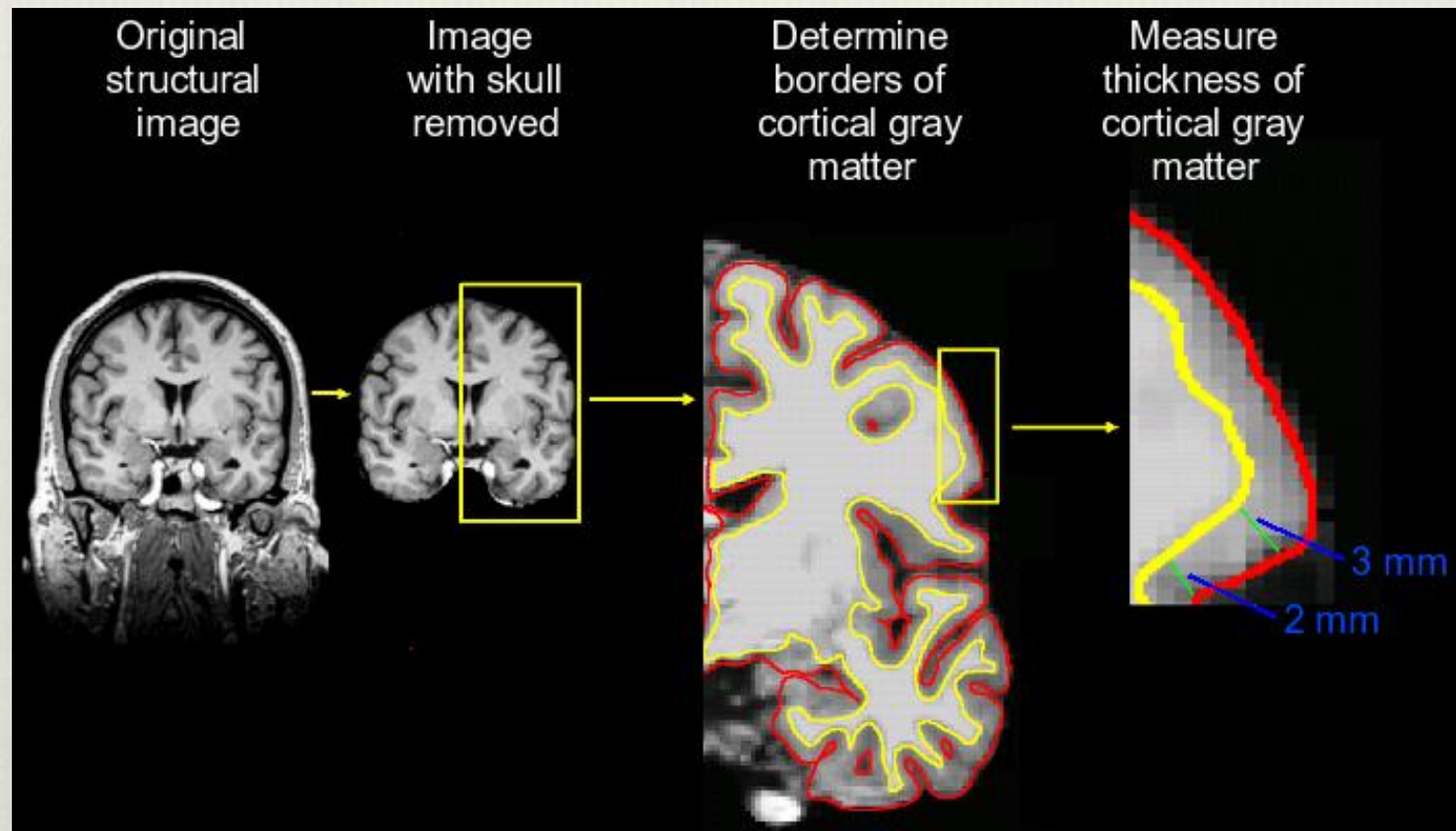


“Structural brain differences in emotional processing and regulation areas between male batterers and other criminals: A preliminary study”



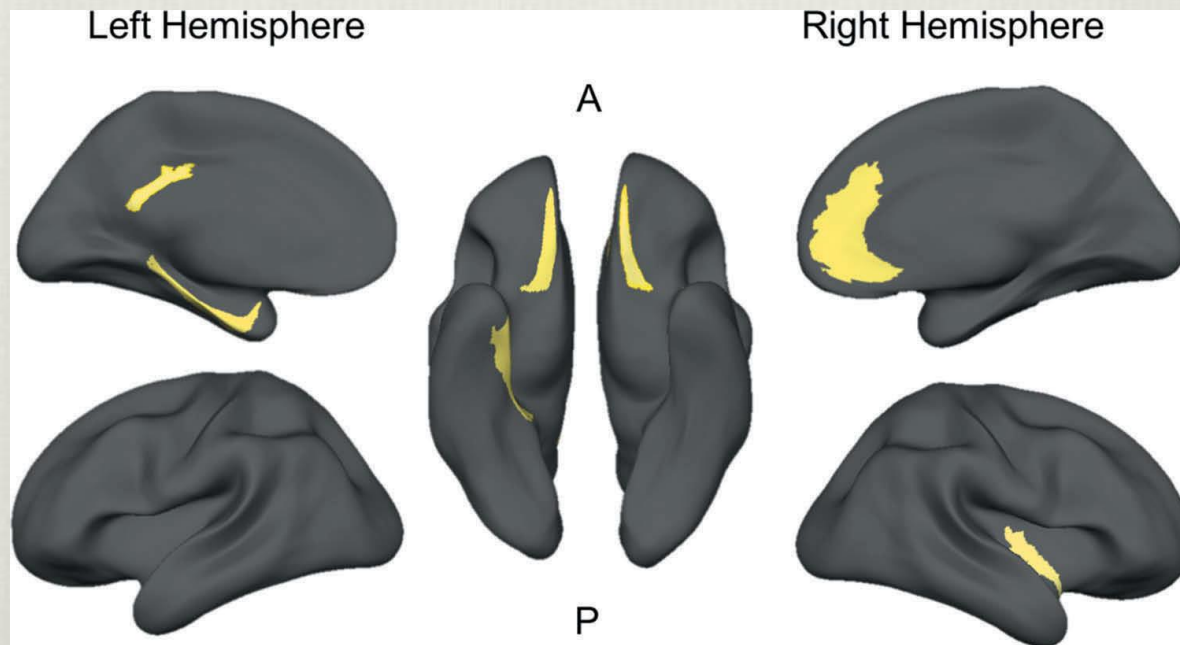
Verdejo-Román, J., Bueso-Izquierdo, N., Daugherty, J. C., Pérez-García, M., & Hidalgo-Ruzzante, N. (2018). Structural brain differences in emotional processing and regulation areas between Male Batterers and Other Criminals: A preliminary study. *Social neuroscience*

Cortical thickness



Structural MRI

We found significantly thinner cortices in prefrontal, midline, and limbic regions in male batterers. (Verdejo-Román et al., 2018)



EKMAN



Fearful



Angry



Sad



Happy



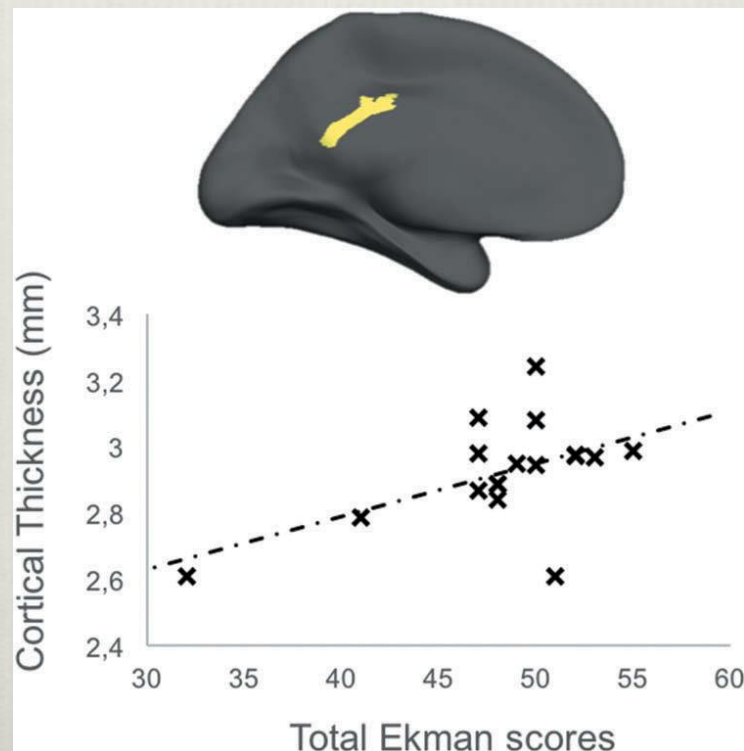
Disgusted



Surprised

Structural MRI

Specifically, the thickness of the posterior cingulate cortex also correlated with the performance on an emotional perception task (Verdejo-Román et al., 2018)



Forensic Implications

Do batterers suffer “brain damage”?

Forensic Implications

Do batterers suffer “brain damage”?

If so, is this related with their behavior?

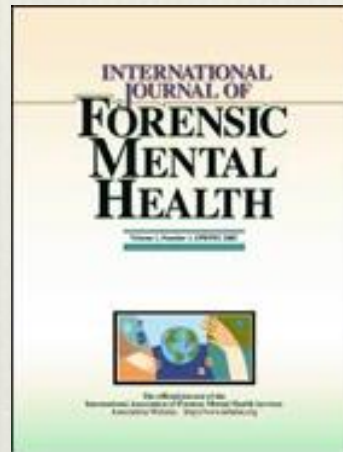
Forensic Implications

Do batterers suffer “brain damage”?

If so, is this related with their behavior?

If so, could this be used as an exempt of their legal responsibility?

“Prevalence and nature of structural brain abnormalities in batterers: a magnetic resonance imaging study”



Bueso-Izquierdo, N., Verdejo-Román, Martínez-Barbero, J.C., Pérez-Rosillo, M.A., Pérez-García, M., Hidalgo-Ruzzante, N., & Hart, S. (2018). Prevalence and Nature of Structural Brain Abnormalities in batterers: A magnetic resonance imaging study. *International Journal of Forensic Mental Health*.

Methodology

All images were evaluated for findings by two experienced neuroradiologists.

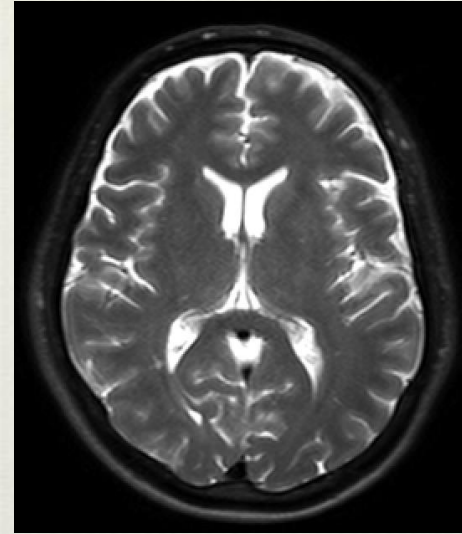
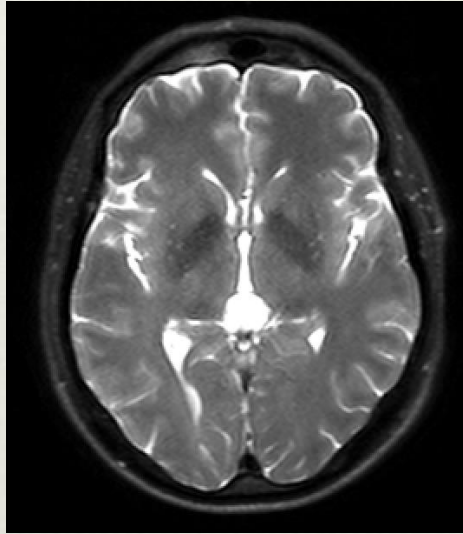
They diagnosed all brain images independently and group-blinded, then reached a consensus in cases of discrepancy ($k = 0.84$).

They identify major and minor brain abnormalities.

Major abnormalities

Major Abnormalities	Overall (N = 62)	Batterers (N = 21)	Other Offenders (N = 20)	Healthy Controls (N = 21)
Solid tumors	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Ischemic lesions	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Demyelinating disease	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Intracranial cyst (> 10 mm)	1 (2%)	1 (5%)	0 (0%)	0 (0%)
Intracranial haemorrhage	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Post traumatic injuries	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Severe brain atrophy	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Hypertensive hydrocephalus	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Vascular malformations	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Any Major Abnormality	1 (2%)	1 (5%)	0 (0%)	0 (0%)

One case of major brain abnormality



But even when some major abnormalities was found this can not explain the violent behaviour.

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Conclusions

Neuroscience and justice system have a long way to do together and we are at the very beginning.

More research is needed from the applied and fundamental point of view.



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INSTITUTO DE NEUROPSICOLOGIA E
NEUROCIÊNCIAS COGNITIVA E
COMPORTAMENTAL PORTUCALENSE

Thank you!

Miguel Pérez-García, PhD.

mperezg@ugr.es