Abstract:

The Triarchic Model (Patrick et al., 2009) provides a new definition for psychopathy, as it divides the concept into three different but intersecting phenotypic constructs: Boldness, Disinhibition, and Meanness. The aim of this study is to review current evidence on the relationship between these three triarchic constructs and executive functioning (EF). Based on the revision of Gao et al. (2009), it is expected to find impairments in executive functioning related to Disinhibition, but no clear hypotheses can be posited in relation to Meanness or Boldness. After a systematic review in Scopus using "executive functioning" and "psychopathy" as descriptors in the field of *article title-abstract-keywords*, 11 articles were finally selected. We found that Disinhibition is a construct associated with an impairment in EF, a deficit in cognitive control and an updating disfunction, and it is related to reduced P300 amplitudes. This could be related to a prefrontal dysregulation and an abnormal hippocampal asymmetry. Regarding Boldness, it is positively related to EF and could be a protective factor associated with better inhibitory capacities and an abnormal selective attention. It could be related to very specific abnormalities in amygdala, and to emotional information processing deficits. Meanness, however, does not seem to be related with EF, even though lack of inhibitory control and deficits in LPP response to aversive stimuli have been observed. Meanness has no clear neurophysiological explanation, and it could be related to early life experiences instead. In conclusion, due to contradictory results and lack of exhaustivity found in the literature, more research is needed to reach definitive conclusions.

Keywords: Triarchic Model of Psychopathy, Executive Functioning, Boldness, Meanness, Disinhibition

Resumen:

El Modelo Triárquico (Patrick et al., 2009) proporciona una nueva definición para la psicopatía, ya que divide el concepto en tres constructos fenotípicos diferentes pero relacionados: Audacia, Desinhibición y Maldad. El propósito de este estudio es revisar la evidencia actual que relaciona estos tres constructos triárquicos con el funcionamiento ejecutivo (FE). Basándonos en la revisión de Gao et al. (2009), se espera encontrar una relación entre los deterioros en el funcionamiento ejecutivo y Desinhibición, pero no se pueden plantear hipótesis claras con respecto a Maldad o Audacia. Después de una revisión sistemática en Scopus utilizando "funcionamiento ejecutivo" y "psicopatía" como descriptores en el campo *título-resumen-palabras clave*, se seleccionaron 11 artículos. Se vio que Desinhibición es un constructo asociado con un deterioro en las FE, con un déficit en el control cognitivo y una disfunción en la actualización, además de estar relacionado con una amplitud P300 reducida. Esto podría estar causado por una desregulación prefrontal y una asimetría hipocampal anormal. En cuanto a Audacia, está positivamente relacionada con la FE, y podría considerarse un factor protector asociado a una mejor capacidad inhibitoria y una atención selectiva anómala. Podría estar relacionada con anomalías muy específicas en la amígdala, y con déficits en el procesamiento de la información emocional. Maldad no parece estar relacionada con el FE, y sin embargo se ha observado una falta de control inhibitorio y déficits en la respuesta de LPP frente a estímulos aversivos. La Maldad no tiene una explicación neuropsicológica clara, y se plantea que pueda estar relacionada con experiencias de la vida tempranas. Como conclusión, debido a los resultados contradictorios que se han hallado en la literatura, se necesita más investigación para llegar a conclusiones definitivas.

Palabras clave: Modelo Triárquico de la Psicopatía, Funcionamiento Ejecutivo, Audacia, Maldad, Desinhibición

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Psychopathy: Executive Functioning and the Triarchic Model

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Introduction

The triarchic model (Patrick et al., 2009) provides a new conceptualization for psychopathy, as it understands this personality disorder into three different but intersecting phenotypic constructs:

- **Disinhibition:** Difficulty to regulate one's own affection and urges
- **Boldness:** Calmness in stressful situations, fearlessness
- **Meanness:** Low empathy, cruelty, rebelliousness

According to Gao et al. (2009), previous research on psychopathy has shown:

Brain Imaging:

↓ prefrontal grey matter volume: poor EF
↓ posterior hippocampus, bilateral amygdala volume, ↑ callosal white matter volume, hippocampal asymmetry
Abnormal frontotemporal circuit activation: ↓ Amygdala, medial PFC, posterior cingulate, angular gyrus response
↓ Blood flow: ↑affective-interpersonal facet
↑ orbital white matter volume, ↓ grey matter volume ventral & lateral PFC

Neurology:

FTD, PFC brain damages: psychopathic-like characteristics
Amygdala lesions ≠ psychopathic-like characteristics: specific anomalies

Neuropsycholgy:

↓ Response modulation, abnormal selective attention
↑ deficits on orbitofrontal tasks
↑ EF: successful psychopathy

Psychophisiology:

↓ Electrodermal response to emotional stimuli
↓ Potentiation of startle blink to unpleasant stimuli
↓ P300 amplitude, N275 amplitude, ERN
↓ Autonomic reactivity to stressful and aversive stimuli: Unsuccessful Psychopathy

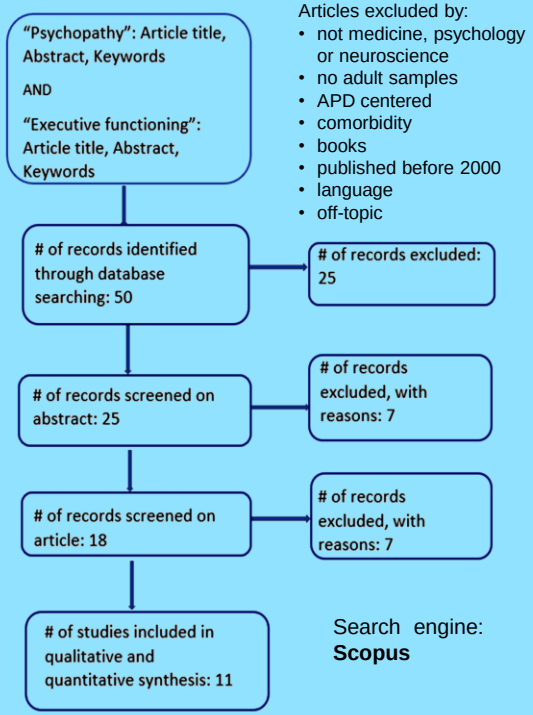
Hormones:

↓ Cortisol levels in teenagers
↓ Cortisol reactivity
↑ Testosterone levels

Objective

This study systematically reviewed the evidence on the relationship between the three triarchic constructs and executive functioning (EF). Based on literature, it is expected to find impairments in executive functioning related to Disinhibition, but no clear hypotheses can be posited in relation to Meanness or Boldness.

Method



Articles excluded by:
- not medicine, psychology or neuroscience
- no adult samples
- APD centered
- comorbidity
- books
- published before 2000
- language
- off-topic

Search engine: **Scopus**

Tasks:
- ✓ EF: N-back (updating & WM), TMT A and B, WCST, CANTAB (shifting), IGT (OFC disfunction), Flanker Task (cognitive control), Tower of London, WISC-III (planning), Go/No Go, COWAT, Stroop (inhibition), Digits backwards (WM), D-KEFS (WM, inhibition, planning, rule learning), Lavie's Cognitive Tasks (Perceptual load task, Cognitive control task)
- ✓ IAPS (emotional processing)
- ✓ FrSBe (apathy, disinhibition, executive disfunction)
- ✓ EEG, Resting-state fMRI (neuroimaging)

Assessment instruments:
- ✓ Psychopathic Personality Inventory (PPI)
- ✓ Psychopathy Checklist-Revised (PCL-R)
- ✓ Levenson Self-Report Psychopathy Scales (LSRP)
- ✓ Self-Report Psychopathy (SRP)
- ✓ TriPM

Adult male (10/10) — female (2/10); incarcerated (6/10) — non-incarcerated (6/10) — undergraduates (4/10) — institutionalized psychiatric (1/10) **samples**

Results

Disinhibition
PCL-R & SRP-III & LSRP (≈ Factor 2)
PPI (≈ impulsive antisociality factor)

OFC-associated dysfunction.
High-P, ↓ IGT performance & ↓ empathy
↑ Secondary psychopathy, ↑ executive disfunction & frontal dysregulation
No dorsolateral deficit? (Mol et al., 2009)

↑ Secondary psychopathy, ↓ response interference from distractors under low-working memory load, ↑response interference from distractors under high-working memory load, ↓ cognitive control

↑ Factor 2 = Antisocial facet, ↓ amplitude in P300 response
↑ disinhibition, ↑ updating dysfunction
Inhibition is not related to Disinhibition

Boldness
PPI (≈ fearless dominance factor)

↑ Primary psychopathy, ↓ executive disfunction

↑ Primary psychopathy, ↓ early perceptual processing capabilities, ↓ distractor processing, abnormal selective attention
↑ inhibitory capacities

Meanness
PCL-R & SRP-III & LSRP (≈ Factor 1)
PPI (≈ coldheartedness)

Cold-heartedness → unrelated to global executive functioning
↑ Factor 1, ↓ LPP response to aversive stimuli, ↓ emotional processing
↑ meanness, ↓ inhibitory control

↑ CU psychopathic traits, ↑ density between DMN and CEN → significant heterogeneity in neural network connectivity: no common connections

Discussion

Disinhibition is associated with…

… impaired EF (Baskin-Sommers et al., 2015; Ross et al., 2007)

… **deficits in cognitive control** (Sadeh & Verona, 2008; Zeier et al., 2012)

… **updating dysfunction** (Pasion et al., 2018)

… reduced P300 amplitudes (Venables et al., 2015)

It could be caused by a **prefrontal dysregulation** (OFC) and **abnormal hippocampal asymmetry** (Gao et al., 2009; Mahmut et al., 2007).

Boldness is associated with…

… overall EF (Ross et al., 2007) — boldness as a protective factor?

… better inhibitory capacities (Maes & Brazil, 2013)

… **abnormal selective attention** (Sadeh & Verona, 2008)

… reduced amplitudes in electrodermal response during anticipation and reaction to aversive stimuli and abnormal startle reflex potentiation (Gao et al., 2009)

It could be related to specific **abnormalities in amygdala**, and to emotional information processing deficits (Gao et al., 2009).

Meanness is not associated with EF (Ross et al., 2007), though it could be related to…

… lack of inhibitory control (Pasion et al., 2018)

… **deficits in emotional processing** and modulation of LPP responses to aversive stimuli (Venables et al., 2015)

… increased positive density between DMN and CEN (Dotterer et al., 2020)

There is **no clear neurophysiological explanation** (more research is needed) for meanness. It could be related to an abnormal frontotemporal circuitry activation which involves activity in the amygdala, medial PFC, posterior cingulate and/or angular gyrus (Gao et al., 2009).

Conclusions

Disinhibition seems to be related to impairments in EF and Boldness is linked to preserved EF, whereas Meanness could be related to early life experiences and not to a biological disfunction per se.

Due to contradictory results and lack of exhaustivity in the literature, more research is needed (main limitations found: imbalanced female vs. male samples, validity of tasks, few neuroimaging studies, non-replicable results…).

References:

Note. Asterisks denote studies included in the systematic review.

Baskin-Sommers, A. R., Brazil, I. A., Ryan, J., Kohlenberg, N. J., Neumann, C. S., & Newman, J. P. (2015). Mapping the association of global executive functioning onto diverse measures of psychopathic traits. *Personality Disorders: Theory, Research, and Treatment*, *6*(4), 336-346. https://doi.org/10.1037/per0000125 *

Dotterer, H. L., Hyde, L. W., Shaw, D. S., Rodgers, E. L., Forbes, E. E., & Beltz, A. M. (2020). Connections that characterize callousness: Affective features of psychopathy are associated with personalized patterns of resting-state network connectivity. *NeuroImage: Clinical*, *28*, Article 102402. https://doi.org/10.1016/j.nicl.2020.102402 *

Gao, Y., Glenn, A. L., Schug, R. A., Yang, Y., & Raine, A. (2009). The neurobiology of psychopathy: A neurodevelopmental perspective. *Canadian Journal of Psychiatry*, *54*(12), 813-823. https://doi.org/10.1177/070674370905401204 *

Maes, J. H. R, & Brazil, I. A. (2013). No clear evidence for a positive association between the interpersonal-affective aspects of psychopathy and executive functioning. *Psychiatry Research*, *210*(3), 1265-1274. https://doi.org/10.1016/j.psychres.2013.09.028 *

Mahmut, M. K., Homewood, J., & Stevenson, R. J. (2008). The characteristics of non-criminals with high psychopathy traits: Are they similar to criminal psychopaths? *Journal of Research in Personality*, *42*(3), 679-692. https://doi.org/10.1016/j.jrp.2007.09.002 *

Mol, B., Van Den Bos, P., Derks, Y., & Egger, J. (2009). Executive functioning and the two-factor model of psychopathy: No differential relation? *International Journal of Neuroscience*, *119*(1), 124-140. https://doi.org/10.1080/00207450802324861 *

Pasion, R., Cruz, A. R., & Barbosa, F. (2018). Dissociable effects of psychopathic traits on executive functioning: Insights from the Triarchic Model. *Frontiers in Psychology*, *9*, Article 1713. https://doi.org/10.3389/fpsyg.2018.01713 *

Patrick, C. J., Fowles, D. C., & Krueger, R. F. (2009). Triarchic conceptualization of psychopathy: Developmental origins of disinhibition, boldness, and meanness. *Development and Psychopathology*, *21*(3), 913-938. https://doi.org/10.1017/S0954579409000492

Ross, S. R., Benning, S. D., & Adams, Z. (2007). Symptoms of executive dysfunction are endemic to secondary psychopathy: An examination in criminal offenders and noninstitutionalized young adults. *Journal of Personality Disorders*, *21*(4), 384-399. https://doi.org/10.1521/pedi.2007.21.4.384 *

Sadeh, N., & Verona, E. (2008). Psychopathic personality traits associated with abnormal selective attention and impaired cognitive control. *Neuropsychology*, *22*(5), 669-680. https://doi.org/10.1037/a0012692 *

Venables, N. C., Hall, J. R., Yancey, J. R., & Patrick, C. J. (2015). Factors of psychopathy and electrocortical response to emotional pictures: Further evidence for a two-process theory. *Journal of Abnormal Psychology*, *124*(2), 319-328. https://doi.org/10.1037/abn0000032 *

Zeier, J. D., Baskin-Sommers, A. R., Hiatt Racer, K. D., & Newman, J. P. (2012). Cognitive control deficits associated with antisocial personality disorder and psychopathy. *Personality Disorders: Theory, Research, and Treatment*, *3*(3), 283-293. https://doi.org/10.1037/a0023137 *