# Adverse childhood experiences and strategy preferences – A pilot study of a game-based approach

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# ACEs and development

Toxic stress models: Overwhelming experiences of stress disrupt normative and optimal development (Shonkoff et al., 2012)

E.g., dysregulated emotions and relationships (Panagou et al., 2022)

Evolution-based theories: ACEs shape development to optimize life strategies to fit the demands of harsh and unpredictable environments.

→Adaptive Calibration Model: Regarding threat responding, the impact of ACEs may be curvilinear (e.g., U curve): Cost-ratio of strategies under different conditions (Del Giudice et al., 2011)

→Hidden Talents framework: The stress-adaptive skills may show their benefits only in specific situations, such as, when being under threat (Ellis et al., 2022; Frankenhuis & de Weerth, 2013)

# Adaptations to stress

Personality

Enormous empirical support for the Big Five model (Zell & Lesik, 2021)

Neuroticism, Agreeableness, Conscientiousness, Extraversion, Openneness

ACEs and B5: Only +N and +psychopathic traits (k = 32; Crede et al., 2023)

→ The ideas of functions are clear, yet the benefits are challenging to assess empirically!

| | |
|---|---|
| N | Defensive responses to avoid dangers and hazards. *Costs in terms of health and relationships problems.* |
| A | Collaboration and avoidance of interpersonal hostility. *Costs in terms of potential exploitation.* |
| C | Self-control favoring long-term goals. *Costs in terms of increased rigidity.* |
| E | High reward sensitivity and sensation seeking. *Costs in terms of risk taking and dangers.* |
| O | Cognitive style involving making associations between disparate domains. *Costs in terms of impractical beliefs.* |

Adapted from: Nettle 2006; DeYoung, 2015

# Adaptations to stress

Cognitive functions (e.g., Ellis, Bianchi, Griskevicius & Frankenhuis, 2017)

- *Attention*: faster detection of threats
- *Problem solving*: higher risk taking and reward orientation
- *Memory*: better memory of dangers

→ Performance is relatively straightforward to assess, yet the functions are harder to understand?

# The key - to consider separate situations?

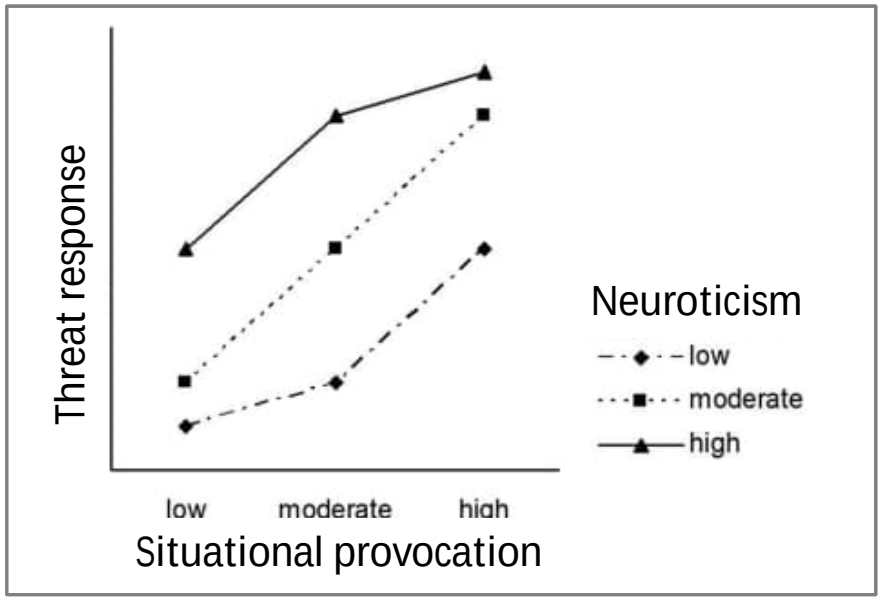
Person-situation –framework (Mischel & Shoda, 1995) posits that personality traits are expressed differently in different situations

- Low situation provocation
- High situation provocation

What if we could study ACEs in …

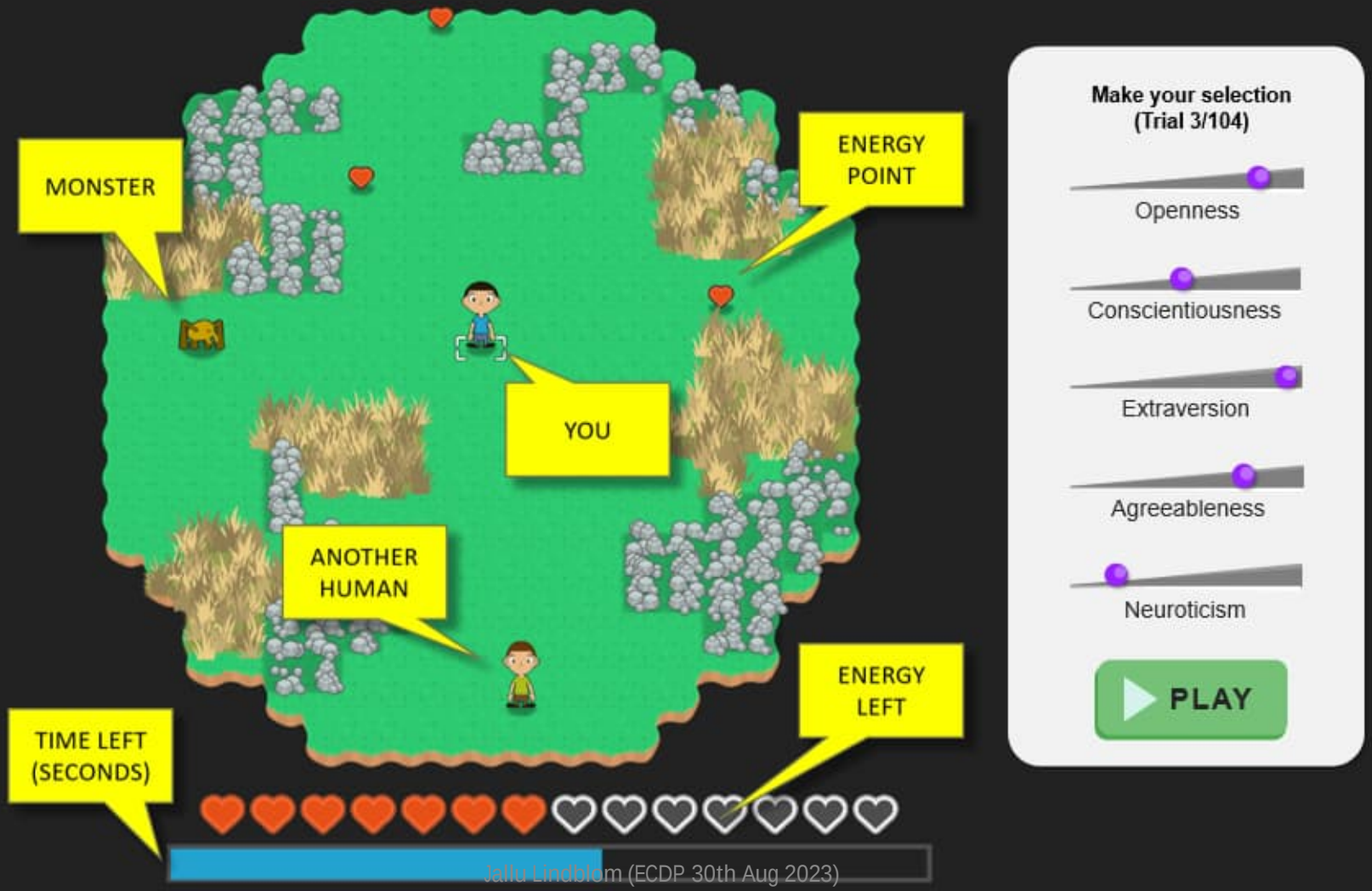
- Virtually generated situations
- that provocate different responses
- and allow objective assessment of performance?

Nonlinear Interaction of Person and Situation model (NIPS)




(Schmitt et al., 2013)

# GAB5: Game-based Assessment of Big Five



# Experimental design

Three experimental factors balance randomized in the trials

- Number of monsters (0-4)
- Number of other humans (0-4)
- Number of energy (0-5)

High number of repetitions of varying trials, e.g. 104 situations

- Duration max 13-20 seconds (some played “blinded” to save time)

Randomly generated fields (spatial configurations and terrain)

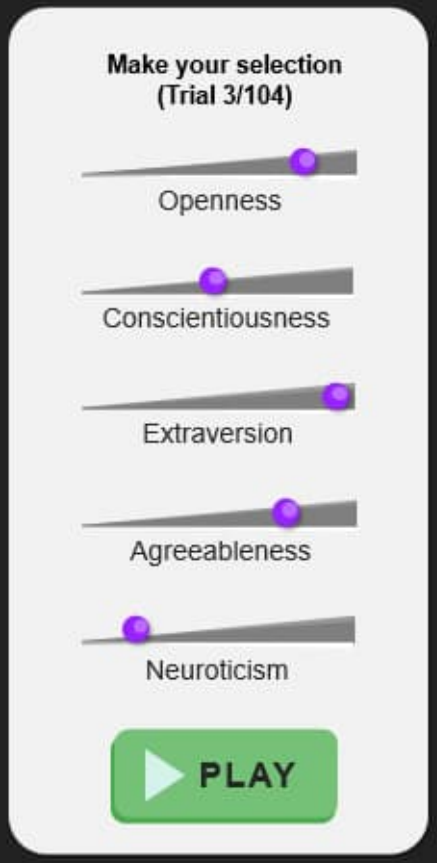
# Instructions for the participants

The player is instructed to stay alive and collect energy

- The game is presented as problem solving task (not to “have fun”)
- Each trial gains 0 to 1000 scores as a feedback

The player does not have real time control of the game character!

- In the beginning of each round the player defines the Big Five personality traits of own game character



# Instructions for the participants

Your character with ...

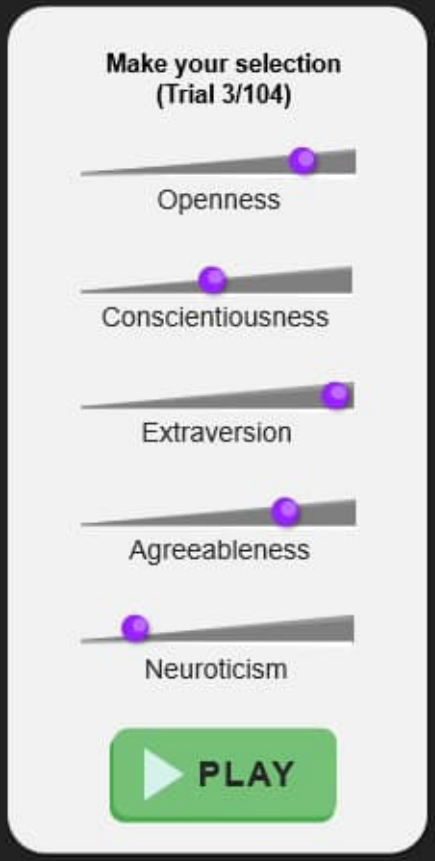
OPENNESS
- ... high O reacts to and considers things that are far from themselves. They also actively explore their environment.
- ... low O focuses only on their immediate surroundings.

CONSCIENTIOUSNESS
- ... high C sticks to their decisions and goals.
- ... low C can be absent-minded but responds quickly to changing situations.

EXTRAVERSION
- ... high E approaches things that provide or can provide energy with enthusiasm.
- ... low E does not get excited about much and may prefer being alone.

AGREEABLENESS
- ... high A willingly cooperates with others and acts kindly.
- ... low A may attack others and act deceitfully in cooperative situations.

NEUROTICISM
- ... high N is fearful, easily angered, and prone to fighting.
- ... low N is calm, fearless, and unconcerned about dangers.




https://projects.tuni.fi/game-based-assessment/


https://youtu.be/ze-vvWLQnMU

# Aim: To explore how ACEs associate with game responses in GAB5

RQ1: Do ACEs predict average level B5 responses in the game?

RQ2: Do ACEs moderate the effects of the situations on B5 responses?

*Hypothesis*: Yes, ACEs moderate especially the function between threat (i.e., monsters) and neurotic (N) responses (i.e., avoidance and aggression.

RQ3: Do ACEs predict objective game performance?

*Hypothesis*: Participants with ACEs select better (or worse) responses in the game. E.g., more effort to learn how to cope with dangers?

→ Considering Adaptive Calibration and NIPS models, both linear and curvilinear associations are tested

# Study design and participants

Participants
- N = 165 university students
- Age: M = 23.5, range: 19 - 56
- 76% female

Adverse Childhood Experiences Revised inventory of Adverse Childhood Experiences (Finkelhor et al., 2015) and added items on interparental aggression and violence (Ellonen et al., 2008).

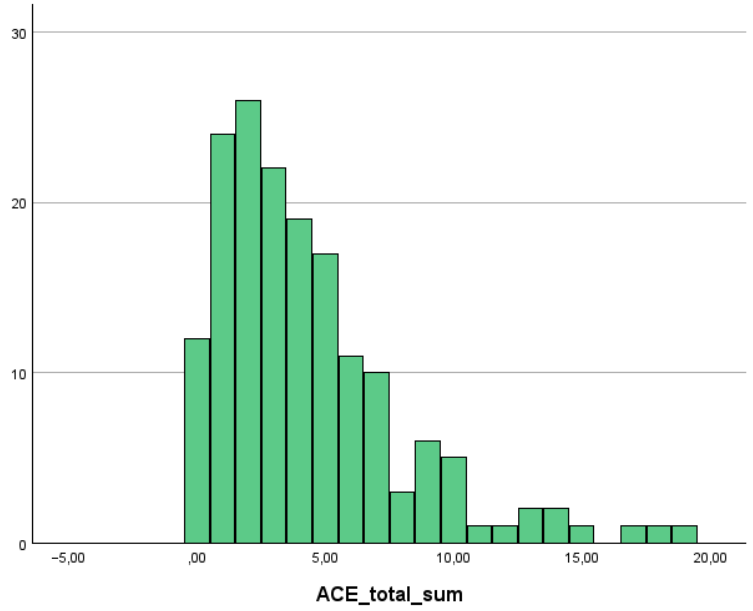
Game-based Assessment of Big Five (GAB5 v1.0 with Gameset 1.0)
- 104 trials (50% small & 50% large)
- Randomized: humans, monsters, energy
- Participants played from home using web-browser

- GAB5 is under development but freely available from: http://bit.ly/gab5

# Adverse Childhood Experiences

| | M | SD |
|---|---|---|
| Mental health issues in the family | 0,40 | 0,49 |
| Being bullied by peers | 0,36 | 0,32 |
| Parents' divorce or separation | 0,31 | 0,46 |
| Feeling lonely or isolated | 0,31 | 0,34 |
| Parents verbally fighting with each other | 0,28 | 0,33 |
| Being ignored or given the silent treatment | 0,27 | 0,31 |
| Experiencing verbal abuse | 0,27 | 0,34 |
| Absence of emotional support within the family | 0,24 | 0,35 |
| Parent being insulted or belittled | 0,23 | 0,32 |
| Being spanked or physically disciplined | 0,18 | 0,27 |
| Substance abuse issues within the family | 0,16 | 0,37 |
| Risk of physical harm | 0,16 | 0,28 |
| Feeling unloved or neglected | 0,15 | 0,30 |
| Mild physical assault | 0,12 | 0,25 |
| Growing up in poverty | 0,10 | 0,30 |
| Parent victim of severe physical assault (e.g., hit with fist) | 0,08 | 0,28 |
| Death or loss of a parent | 0,08 | 0,27 |
| Parent was threatened with violence | 0,08 | 0,20 |
| Parent was assaulted (e.g., pushed) | 0,07 | 0,19 |
| Suicide of a family member | 0,06 | 0,24 |
| Severe sexual abuse | 0,05 | 0,22 |
| Neglect of basic needs | 0,05 | 0,17 |
| Not receiving care when sick or injured | 0,04 | 0,18 |
| Parent was assaulted severely (e.g., kicked) | 0,02 | 0,12 |
| Experiencing violent physical assault | 0,02 | 0,10 |
| Parents life was threatened | 0,01 | 0,08 |
| Incarceration of a family member | 0,01 | 0,08 |
| Living in a high-risk or dangerous neighborhood. | 0,00 | 0,00 |

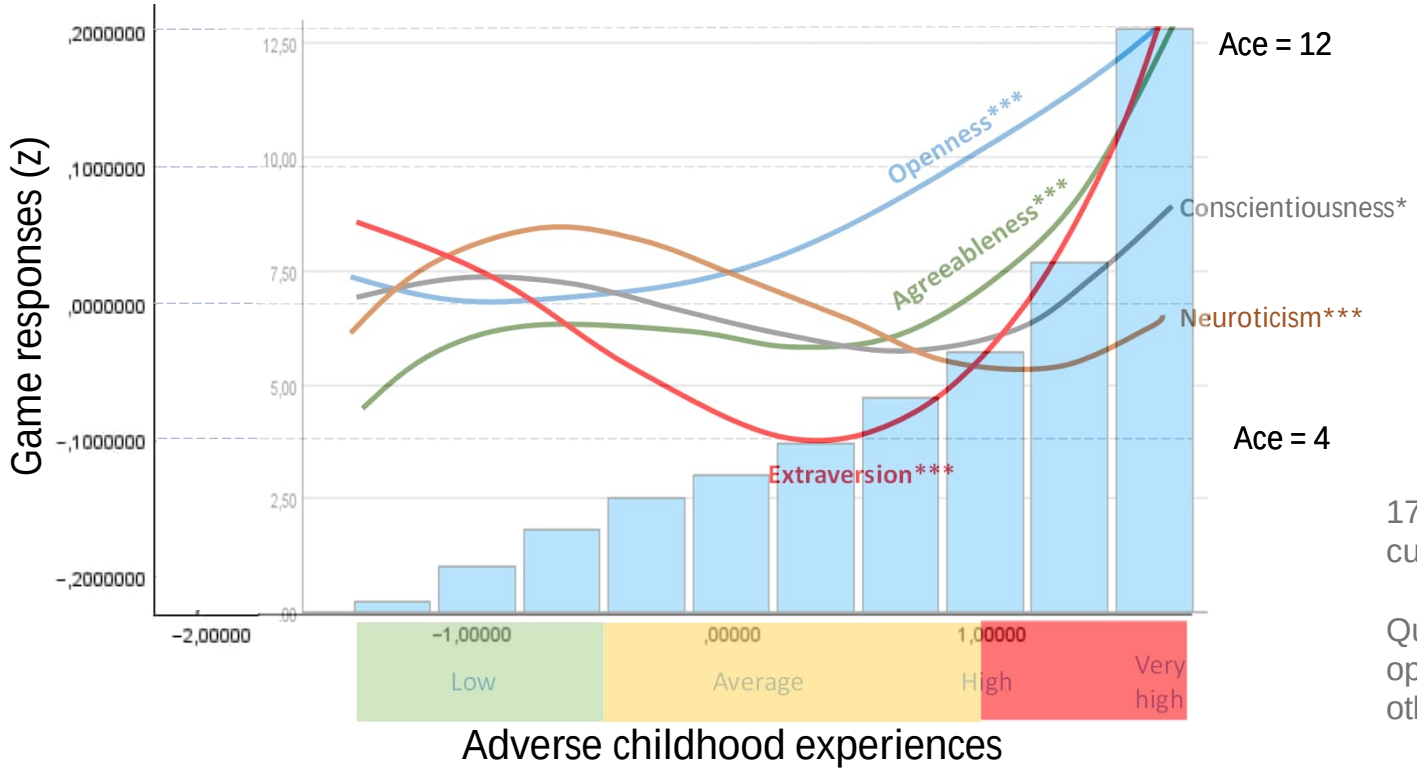
Range: 0 to 19 (of 28)
M = 4.01 (SD = 3.66)




No = 0 / Yes = 1

Never = 0, Sometimes = 0.5, Often = 1

# RQ1: ACEs and average level B5 responses

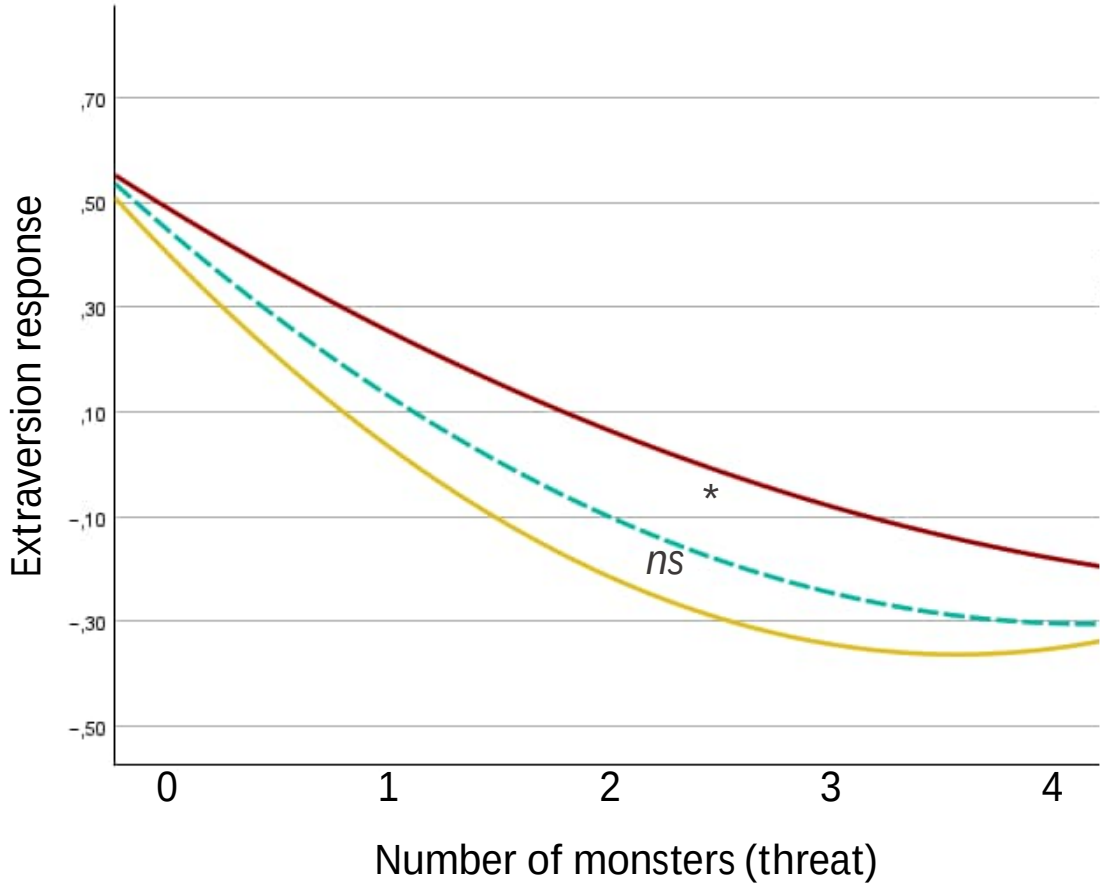



17160 datapoints for each curve (85800 altogether)

Quadratic effect for openness. Qubic for all others.

Analyses were run with Linear Mixed Models (AR1), controlling for sex, game experience and age. The figure is plotted using model estimated values.

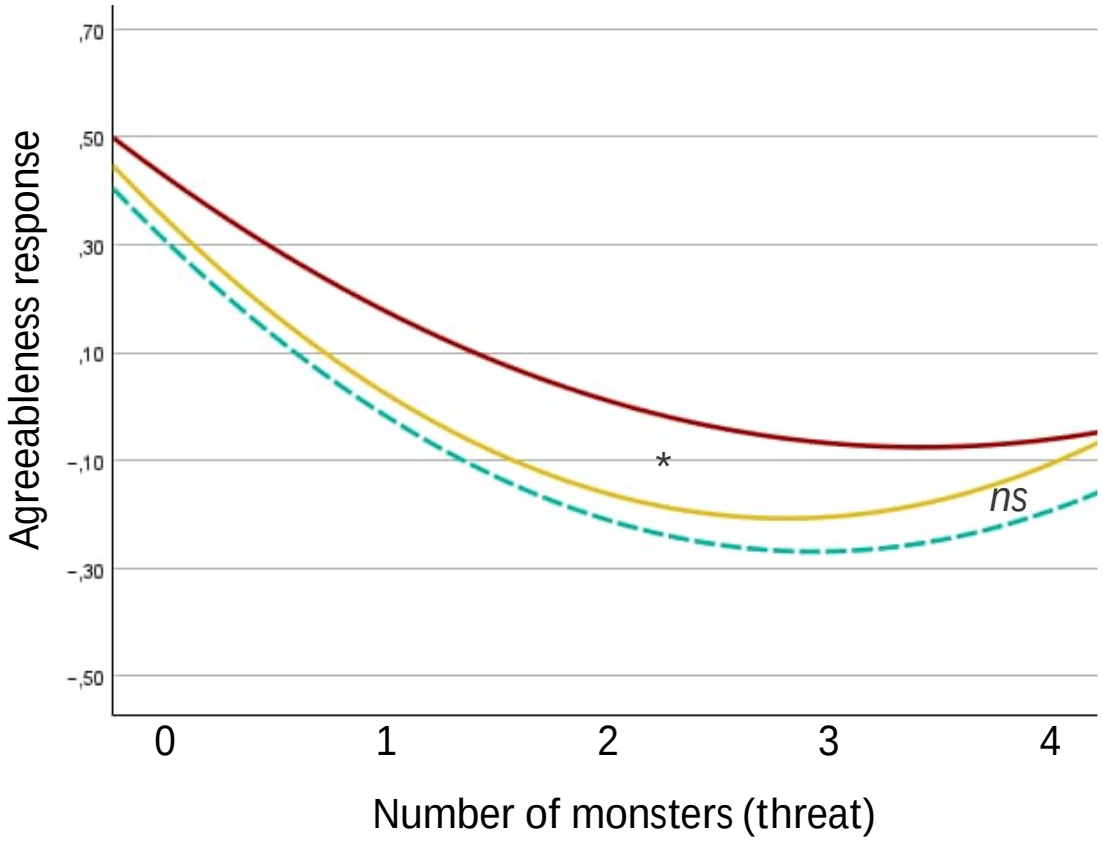
# RQ2: ACEs and responses to threat → Extraversion

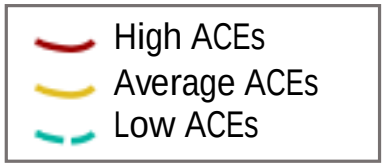



ACE x Monsters^2
$F(2, 15259.92) = 5.03$, $p = .007$

High vs Average, $p = .001$***
High vs Low, $p = .028$*
Average vs Low, $p = .262$

# RQ2: ACEs and responses to threat → Agreeableness

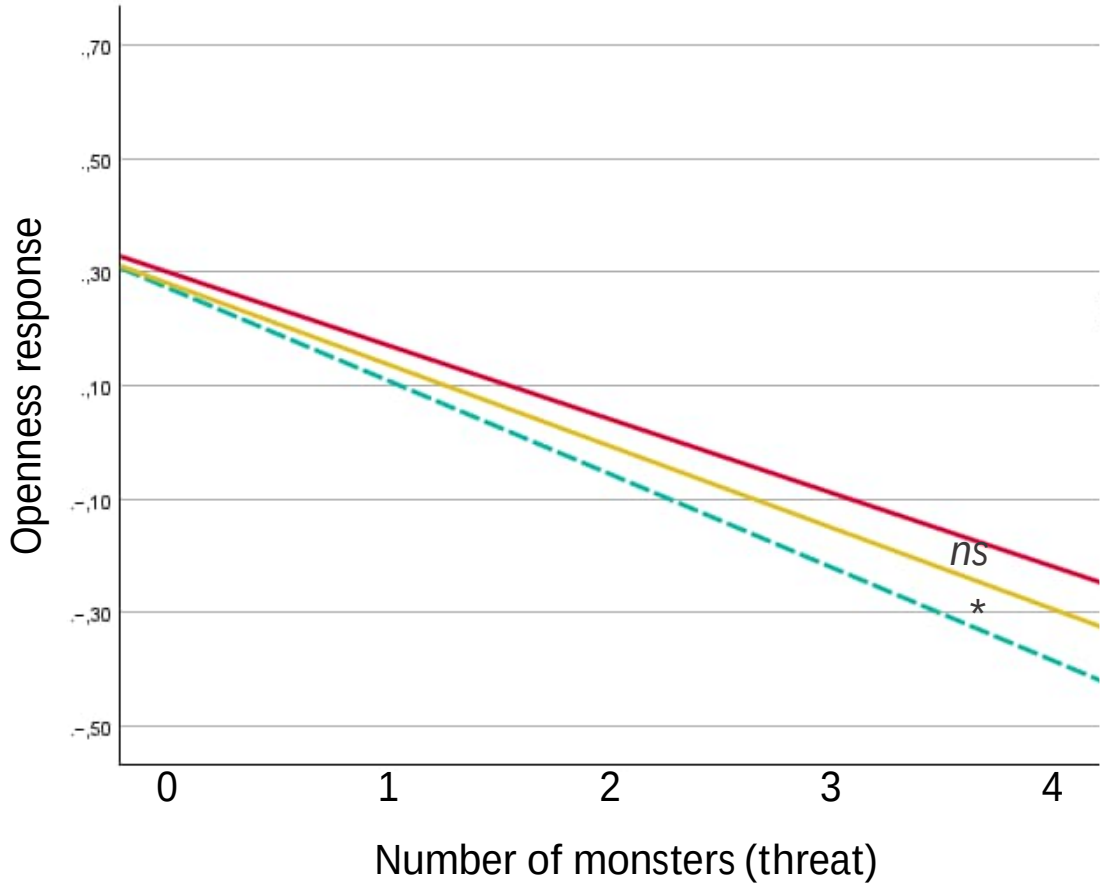


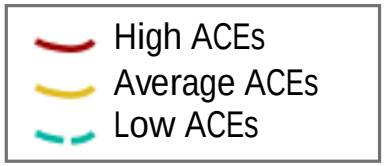




ACE x Monsters^2
F(2, 14980.68) = 3.46, *p* = .031

High vs Average, *p* = .009**
High vs Low, *p* = .027*
Average vs Low, *p* = .726

# RQ2: ACEs and responses to threat → Openness

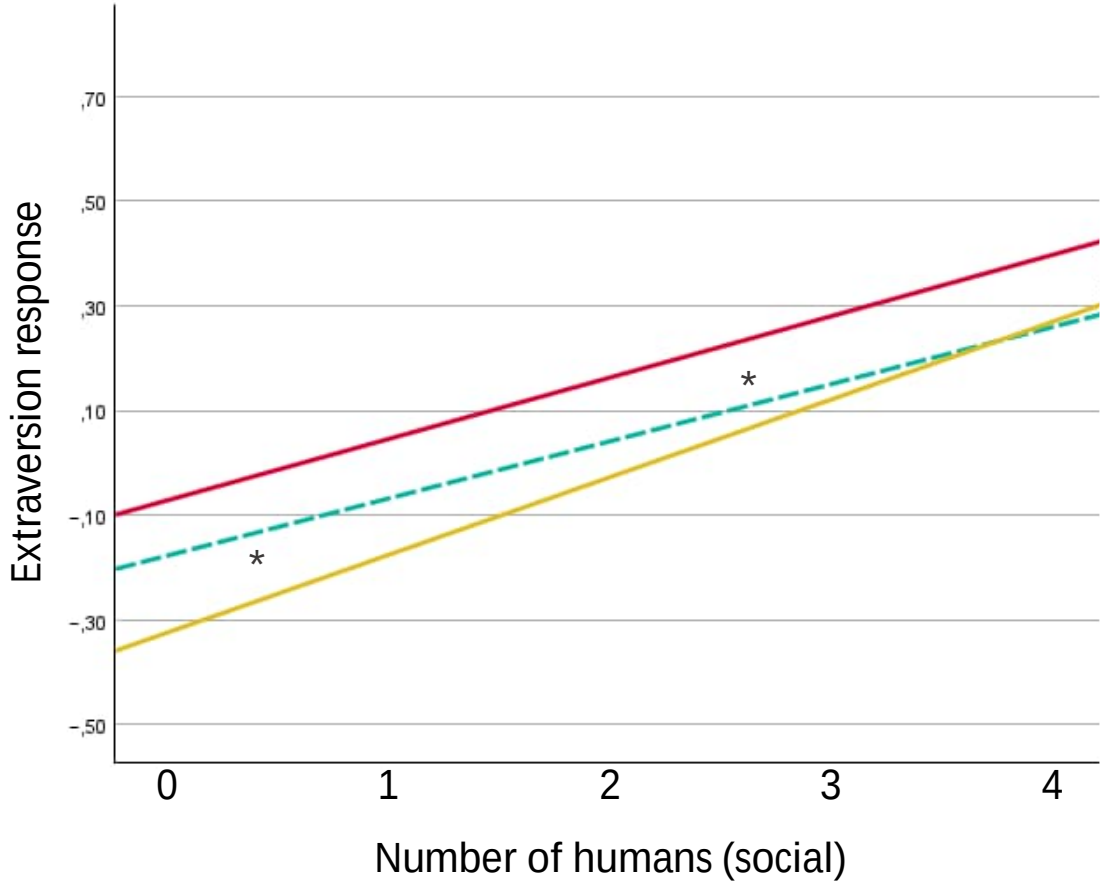


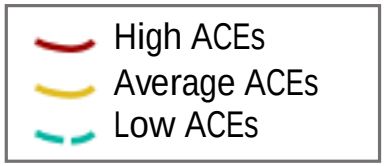




ACE x Monsters
$F(2, 15148.75) = 2.99$, $p = .050$

High vs Average, $p = .479$
High vs Low, $p = .034$*
Average vs Low, $p = .038$*

# RQ2: ACEs and responses to humans → Extraversion



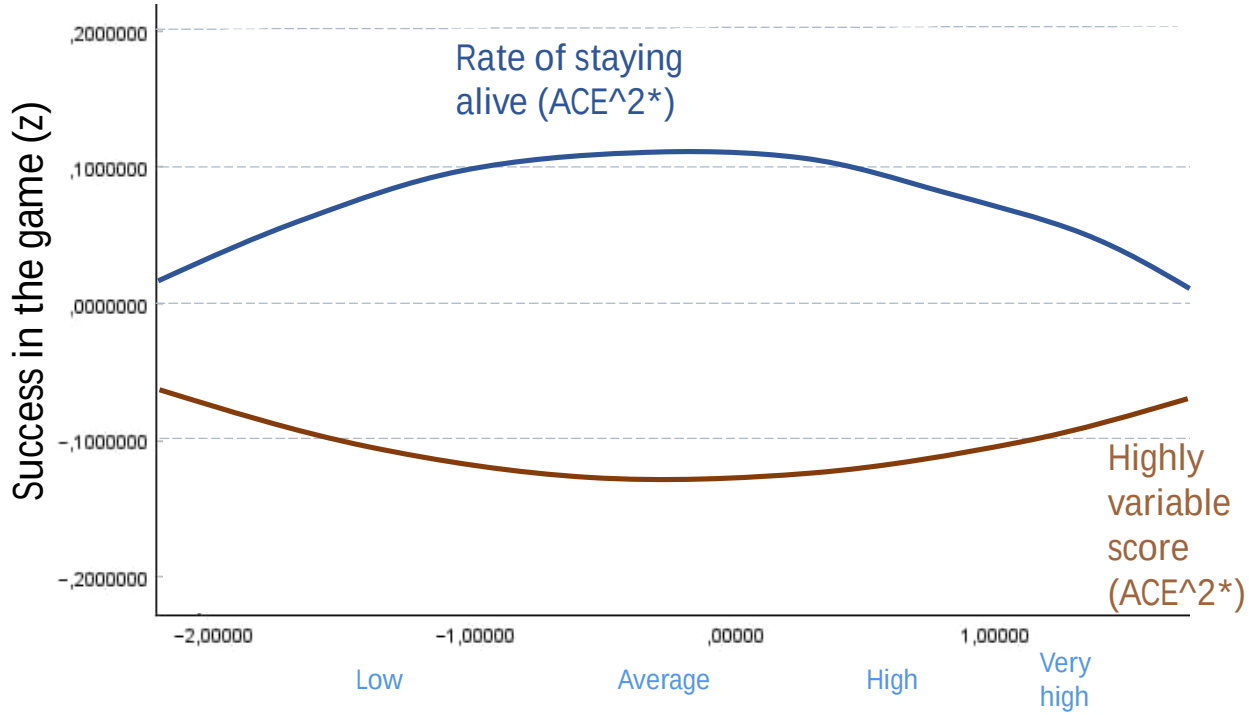




ACE x Humans
$F(2, 15287.79) = 3.21$, $p = .040$

High vs Average, $p = .745$
High vs Low, $p = .038$*
Average vs Low, $p = .029$*

# RQ3: ACEs and objective performance

No differences in actual scores




Half of the levels were ran in simulation to obtain better estimates of the scores for each response pattern.

Reponse patterns (4*4*4*4*4) for each situation (52) with 10 runs resulted in 53 2481 simulated runs.

- Actual scores for each situation
- Variance of scores for each sitation
- Rate of staying alive (vs dying)

Using the 10 categorized ACE score (to avoid outliers). Analyses were run with Linear Mixed Models (AR1), controlling for sex, game experience and age. The figure is plotted using model estimated values.

# Conclusions

In certain ways the results align with the U-curve (or S) idea of Adaptive Calibration Model, yet, with some deviations.

- Low and High ACEs → High extraversion: Heightened reward responsivity?
- Average ACEs → High neuroticism: Threat and protection orientation?
- See also Tammilehto (this symposium)!

Responses to situations provide more cues of processes underlying average level differences (e.g., similarity between low and high)

- Low ACE → High adaptation of responses to changes in threat: more flexible use of strategies (sensitive to situations)?
- High ACE → Low adaptation of responses to changes in threat: more fixed (schema driven) use of strategies?

# Conclusions

Yes, but who won? – Participants with *average ACEs!*

- Most succesfull in terms of staying alive and giving predictive responses
- Blunted excitement and exploration, high use of neurotic responses
- Realistic strategies of how to cope with dangers?

Potential explanations

- Average ACEs: know how to manage threats, but does not come overexcited?
- Low ACEs failed because they applied – *rules assuming security* - that did not align with the occurence of the harsh and dangerous gameworld?
- High ACEs failed because they had difficulties in learning the rules of the gameworld due to some kind of emotional overarousal?
  - Nonrespondence to threat (and low use on N responses) due to automatized avoidance of threat provoking information?

# Limitations and further research

- This was a pilot of GAB5 to study ACEs
  - The work has to start from somewhere!
  - A replication sample of about 400 participants is waiting final analysis
- GAB5 is under development
  - Validation? A and E correspond with trait level self-reports of the same traits
  - N and O are more difficult…
  - Would the results replicate if the game parameters were changed?
- Further steps
  - Consider the subdomains of our ACE assessment
  - Consider more specific and complex situations (e.g., Monsters * Food)
  - To validate with other state approaches: EMA and experiments

→ Novel method to assess person-situation interactions in virtual game-like environment: Tons of new possibilities!

# Thank you!

http://bit.ly/gab5

Tampere University

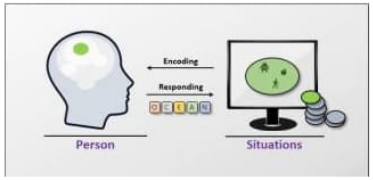
Game-based Assessment of Dynamic Personality

A research project using a virtual game environment to study person-situation interactions

SEARCH...

HOME | FRAMEWORK | DEMOS | MATERIALS | PUBLICATIONS | THE RESEARCH TEAM

The GADP (Game-Based Assessment of Dynamic Personality) project introduces a novel research method aimed at assessing behaviors within different situations. Moving beyond the traditional focus on stable personality traits, this approach aims to capture individuals' "personality signatures" characterized by complex *if...then* contingencies (Mischel & Shoda, 1995). By considering the dynamic parameters of one's personality (such as distribution of states; Sosnowska et al., 1996), this method offers a deeper understanding of the functional nature of personality and adaptation to changing circumstances.




The project extends the traditional trait approach to personality by incorporating novel approach. *First*, we utilize game-like virtual environment that allows full experimental control of situations. This help to sidestep the problem of situation selection present in observational designs (e.g., Ecological Momentary Assessment). *Second*, in the virtual game-like environment the game character is controlled by using the terminology of the Big Five (B5) personality model. In other words, the game program automatically translates the B5 responses to automatic actions of the game character. If this approach proves to be valid and reliable, it can open new research avenues, allow collection of large data, and can be easily adjusted to various research settings.

The project has developed Game-Based Assessment of Big Five (GAB5), which is available for researchers. You can see how the game works in Demos-section and download it Materials-section.

Pilot data has already been collected (see Materials) and preliminary analyses are underway (see Publications and Presentations).

In this project we apply the new approach to the study of personality, attachment dynamics, and psychopathology (for more information, see Framework). Through the innovative methodology, the project holds the potential to enhance our understanding of personality functions and provide valuable insights into the complex dynamics between individuals and their environments.

Try it yourself!

Contact if interested using, networking and collaboration!

Please send funding!

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