Cluster of insight seeking.

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1. Description

Insight, or the 'Aha' experience, has been suggested to play a key role in motivating learners and scientists. An insight is thought to be the sudden resolution of a problem that restructures previously acquired or intuitive mental representations. Insight is often preceded by an impasse, and leads to a pleasurable sensation, arguably selected by evolution for its reinforcement effect on the human motivation to make sense of the world. Previous studies suggest that insight is universally appreciated once the right stimulus is presented (Danek et al., 2014).

In this study, we would like to see if the consumption of insight-generating stimuli is consistent across cultural domains (fiction, educational content, games, etc.).

2. Predictions

Our hypothesis is that participants' reported enjoyment of insight-generating stimuli is consistent across various media. In order to statistically test this hypothesis, we predict that:

H1. The mean of all pairwise correlations will be significantly different from chance (see Analysis for bootstrap procedures).

Research questions:

RQ1. What pairwise correlations across media are significantly different from chance?

RQ2. Is childhood SES related to how much participants enjoy insightful materials?

RQ3. Is current SES related to how much participants enjoy insightful materials?

3. Design and Procedures

Participants will be first introduced with a definition of insight and asked to indicate if they understood it. Participants who do not understand the feeling of insight will be e

In what follows, you will be asked about your preferences for various activities, in particular activities that might generate "insight."

An insight is when you suddenly understand something or find the solution to a problem. This experience is different from just being surprised which doesn't have to be accompanied by a feeling of understanding. It is also different from simply solving a problem which can be done in a step-by-step manner, without any sudden realization.

Two classic examples would be when the detective reveals who the murderer is at the end of a crime novel, or when you get the solution to a logical riddle.

Then, participants will be asked the following questionnaire regarding their enjoyment of insight-generating stimuli in different media categories. For each category, the second question will be asked only if participants do not answer *'Never'* to the first question. The scales are the same for each category (see the first category Novel).

Please answer the following questions honestly, focusing on your genuine preferences. The examples provided are meant to illustrate the type of insights we're interested in, but they are not exhaustive.

Novel
How often do you read novels? [Never – Rarely – Sometimes – Often – Very often]
How interested are you in novels that elicit a feeling of insight? For instance novels in which a plot twist or a new revelation about a character helps make sense of the story. [Not at all interested – Not very interested – Neutral –Slightly interested – Moderately interested – Very interested – Extremely interested]

Film
How often do you watch movies?
How interested are you in watching movies that elicit a feeling of insight? For instance movies in which a plot twist or a new revelation about a character helps make sense of the story.

Scientific Research (Popular Science)

How often do you read popular science?

How interested are you in reading popular science that elicits a feeling of insight? For instance popular science writing that leads you to make sense of something.

Puzzle

How often do you tackle puzzles?

How interested are you in tackling puzzles that elicit a feeling of insight, when you find or read the answer? For instance brainteasers.

Video Games

How often do you play video games?

How interested are you in playing video games that elicit a feeling of insight? For instance video games in which you suddenly manage to find the solution to a problem.

Documentary

How often do you play documentaries?

How interested are you in watching documentaries that elicit a feeling of insight? For instance documentaries that help you make sense of things from a new point of view, by presenting the perspective of different people or providing you with new facts.

Then, they will be asked to answer the following socio-demographic questions.

What is your gender? [Male, Female, Other]

What is your age?

Indicate your agreement with the following statements [9-point scale from 'Strongly disagree' to 'Strongly agree']

Childhood SES
My family usually had enough money for things when I was growing up
I grew up in a relatively wealthy neighborhood
I felt relatively wealthy compared to the other kids in my school

Current SES
I have enough money to buy things I want
I don't need to worry too much about paying my bills
I don't think I'll have to worry about money too much in the future

4. Analysis

Exclusion criterion: Participants who do not understand insight will be excluded from the analysis.

Testing H1:

First, we will calculate pairwise correlations of the enjoyment questions for each pair of media. Because some participants never consome certain type of media, we will handle missing values by performing pairwise deletion. Then, we calculate the mean of these correlation coefficients.

```
# Calculate pairwise correlations
cor_matrix <- cor(media_ratings, use="pairwise.complete.obs")

# Extract lower triangle without the diagonal
cor_values <- cor_matrix[lower.tri(cor_matrix)]

# Calculate mean of these correlation coefficients
mean_cor <- mean(cor_values)
```

Then, we will randomly sample with replacement from the dataset to generate 1000 bootstrapped datasets. This resampling should maintain the structure of the original data, with each dataset containing participants' ratings on their enjoyment of insight-generating stimuli for each media they engage in. For each bootstrapped dataset, we will also compute pairwise correlations.

```
set.seed(123)  # Ensuring reproducibility
n_iterations <- 1000

# Initialize an empty data frame to store the results from all iterations
all_bootstrap_results <- data.frame(Iteration = integer(), Pair = character(),
Correlation = numeric(), stringsAsFactors = FALSE)

for (i in 1:n_iterations) {
  # Randomize dataset: shuffle the ratings within each column
  randomized_data <- as.data.frame(lapply(media_ratings, sample))
  # Temporary storage for this iteration's results
```

```
    iteration_results <- data.frame(Pair = character(), Correlation = numeric(),
stringsAsFactors = FALSE)

  var_names <- colnames(randomized_data)

  # Compute pairwise correlations
  for (m in 1:(length(var_names)-1)) {
    for (n in (m+1):length(var_names)) {
      # Ensure pair names are always in alphabetical order
      pair <- sort(c(var_names[m], var_names[n]))
      pair_name <- paste(pair[1], pair[2], sep="-")

      cor_value <- cor(randomized_data[[m]], randomized_data[[n]],
use="pairwise.complete.obs")

      # Temporarily store the pair, its correlation, and iteration number
      iteration_results <- rbind(iteration_results, data.frame(Pair = pair_name,
Correlation = cor_value))
    }
  }

  # Add iteration number to the iteration_results
  iteration_results$Iteration <- i
  # Combine this iteration's results with the main storage
  all_bootstrap_results <- rbind(all_bootstrap_results, iteration_results)
}
rm(n, n_iterations, pair, pair_name, var_names, m, i, cor_value,
randomized_data)
```

We then calculate the mean of pairwise correlations for each bootstrap iterations and compute if the true mean is outside of the 95% confidence interval of this randomly shuffled dataset. If it is, it suggests a significant consistency in insight-seeking behavior that is not attributable to random variation.

```
# Aggregate bootstrap results to find mean correlation per iteration
bootstrap_means <- all_bootstrap_results %>%
  group_by(Iteration) %>%
  summarise(MeanCorrelation = mean(Correlation, na.rm = TRUE))

# Calculate the 95% confidence interval for the bootstrap means
bootstrap_ci <- quantile(bootstrap_means$MeanCorrelation, probs = c(0.025,
0.975), na.rm = TRUE)

# Assuming mean_cor is the mean of actual correlations from correlation_table
is_significantly_higher <- mean_cor > bootstrap_ci[2]
```

5. Sample size

We choose a sample size of 200 based on financial constraints and due to the lack of past data on which to draw to estimate the effect size.

6. References:

Danek, A. H., Fraps, T., von Müller, A., Grothe, B., & Öllinger, M. (2014). It's a kind of magic—What self-reports can reveal about the phenomenology of insight problem solving. *Frontiers in Psychology*, 5. https://www.frontiersin.org/article/10.3389/fpsyg.2014.0140