Computational repeatability test of the results of the Kara Weisman (2021) study*

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Author Note

The authors made the following contributions. Shanshan Zhu: Data analysis, Summarize and organize; Lu Ao: Duplicate the attachment coden, PowerPoint presentation; Mengyao Yang: Duplicate the attachment code, Sort out the content of the report; Yueyang Yu: Participate in document writing, Make a PowerPoint; Huiling Zou: Make a PowerPoint, Proofread documents.

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Abstract

How do concepts of mental life vary across cultures? By asking simple questions about humans, animals, and other entities – for example, 'Do beetles get hungry? Remember things? Feel love?'

Yet there were substantial cultural and developmental differences in the status of social emotional abilities as part of the body, part of the mind, or a third category unto themselves. Such differences may have far-reaching social consequences, whereas the similarities identify aspects of human understanding that may be universal.

we reconstructed concepts of mental life from the bottom up among adults (N = 711) and children (ages 6–12 years, N = 693) in the USA, Ghana, Thailand, China, and Vanuatu. This revealed a cross-cultural and developmental continuity: in all sites, among both adults and children, cognitive abilities travelled separately from bodily sensations, suggesting that a mind–body distinction is common across diverse cultures and present by middle childhood.

Keywords: Calculate reproducibility, R, Cross-cultural, Mental lif

Word count: 3443

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1 Introduction

1.1 Selected Literature

Title: Similarities and differences in concepts of mental life among adults and children in five cultures.

Weisman, K., Legare, C. H., Smith, R. E., Dzokoto, V. A., Aulino, F., Ng, E., … & Luhrmann, T. M. (2021). *Similarities and differences in concepts of mental life among adults and children in five cultures*. Nature Human Behaviour, 5(10), 1358-1368. (APA)

We adopted the code from:
https://github.com/kgweisman/mental-life-culture-development.

1.2 Introduction to Literature

1.2.1 Research Background. The study found that cognitive abilities travelled separately from bodily sensations among both adults and children in all sites, suggesting that a mind–body distinction is common across diverse cultures and present by middle childhood. Yet there were substantial cultural and developmental differences in the status of social–emotional abilities – as part of the body, part of the mind or a third category unto themselves. These findings suggest that while some aspects of mental life may be universal, the influences of culture and development significantly shape the understanding of social-emotional abilities (Weisman et al., 2021).

1.2.2 Main Research Questions and Hypotheses. This study explores how adults and children from different cultural backgrounds understand concepts of mental life. It hypothesizes that these understandings have certain universal aspects but may show significant differences in social-emotional abilities (Weisman et al., 2021).

1.2.3 Research Results and Conclusions. The study found that adults and children universally distinguish between physiological sensations and cognitive abilities across all study sites, indicating that a mind-body distinction is common across cultures. However, there are significant differences in the classification of social-emotional abilities among different cultures. These findings suggest that while some aspects of mental life may be universal, cultural influences significantly shape the understanding of social-emotional abilities (Weisman et al., 2021).

2 Methods

2.1 Introduction to the Original Research Methods

2.1.1 Participants. The study involved participants from five diverse cultural settings: - San Francisco Bay Area, USA - Cape Coast, Ghana - Chiang Mai, Thailand - Shanghai, China - Port Vila and Malekula, Vanuatu.

The total sample consisted of 711 adults and 693 children aged 6–12 years. Adults were primarily recruited in public places, and children were recruited from elementary schools (Weisman et al., 2021).

2.1.2 Data Analysis. Exploratory factor analysis (EFA) was used to identify underlying constructs and the number of factors retained was determined by parallel analysis. Factor similarities between different cultures and age groups were compared by vector cosine (rc). The details are as follows: - Exploratory factor analysis (EFA) was used to identify latent constructs or core components of the concept of mental life within each cultural sample. - Parallel analysis determined the number of factors to retain, and oblique transformation was used to interpret factor loadings. - Comparisons across cultural sites and age groups were made using vector cosine (rc) calculations to gauge the similarity of factors (Weisman et al., 2021).

2.2 Reproduction Ideas and R Packages

2.2.1 R Packages. Install and load necessary R packages, including `dplyr` (Wickham, François, Henry, Müller, & Vaughan, 2023), `tidyr` (Wickham, Vaughan, & Girlich, 2023), `ggplot2` (Wickham, 2016), `papaja` (Aust & Barth, 2023), `tidyverse` (Wickham et al., 2019), `lubridate` (Grolemund & Wickham, 2011), `readxl` (Wickham & Bryan, 2023), `psych` (William Revelle, 2023), `cowplot` (Wilke, 2020), `here` (Müller, 2020), `reshape2` (Wickham, 2007), `sjstats` (Lüdecke, 2024), `lsa` (Wild, 2022), `langcog` (Braginsky, Yurovsky, & Frank, 2024), `GPArotation` (Bernaards & Jennrich, 2005), `irr` (Gamer, Lemon, & <puspendra.pusp22@gmail.com>, 2019), `kableExtra` (Zhu, 2024), and `janitor` (Firke, 2023).

2.2.2 Reproduction Ideas.

- **Clean and preprocess the data:** Since the author does not provide raw data, only the code for data preprocessing, there is no data preprocessing part in our reproduction.
- **Main Analysis:** Exploratory Factor Analysis (EFA) using Pearson correlation and oblique rotation (the analysis mentioned in the main text of the paper, which is our focus for replication).
- **Secondary Analyses (mentioned in the supplementary materials of the paper):**
- Using orthogonal rotation instead of oblique rotation.
- Equating “somewhat” responses to “yes” and using tetrachoric correlation.
- Excluding participants who provided the same answer (e.g., all “yes” or all “no”) in every trial.

- Using Principal Component Analysis (PCA) instead of Exploratory Factor Analysis (EFA).

- Incorporating demographic variables in the covariance model.

2.2.3 Verification and Comparison.

- Compare the replicated results with the original findings.
- Identify any discrepancies and investigate potential reasons for these differences.
- Document the replication process, including any challenges encountered and how they were addressed(Weisman et al., 2021).

2.2.4 Programming Environment. All analyses by the authors were conducted in the R version 4.0.0 environment, on the x86_64-apple-darwin17.0 (64-bit) platform, with macOS Catalina 10.15.7 as the operating system.

All our analyses were conducted in the R version 4.3.1 environment, on the arm64-apple-darwin platform, with macOS Sonoma 14.5 as the operating system (R Core Team, 2023).

3 Replication Results

In this section, we present the results of our replication study. The analyses were conducted following the methodologies described in the original research by Weisman et al. (2021). We compare our findings with the original results to assess the reproducibility of the study's conclusions.

3.1 Data preparation

3.2 Primary Analysis (Adults)

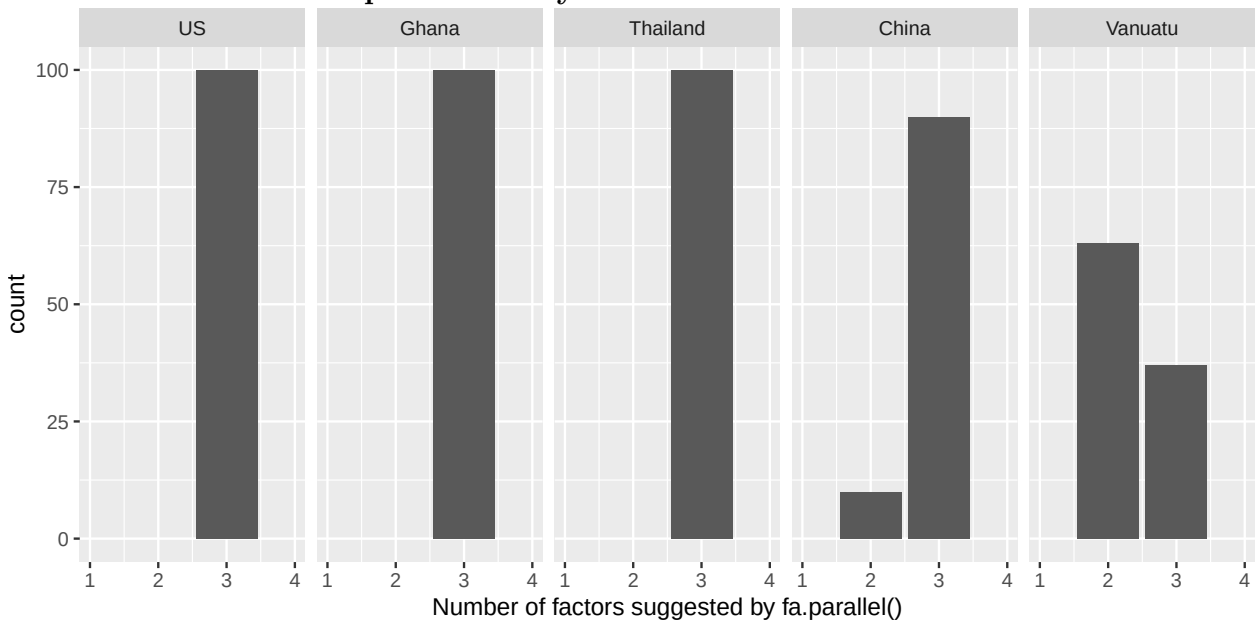
Samples.

country	n
US	127
Ghana	150
Thailand	150
China	136
Vanuatu	148
Total	711

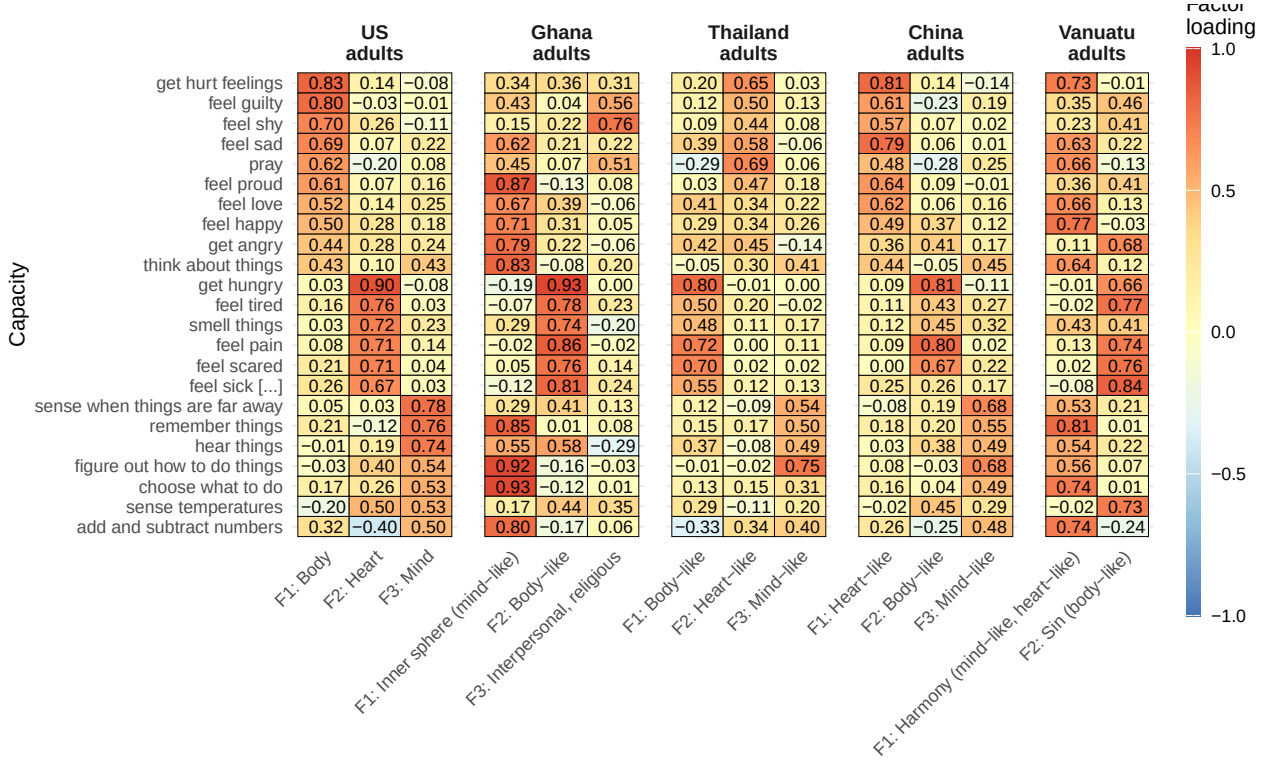
Scale use.

country	no	kind of	yes	missing data
US	41.73%	4.90%	53.30%	0.07%
Ghana	73.86%	0.99%	24.99%	0.17%
Thailand	34.32%	18.55%	47.07%	0.06%
China	41.08%	9.21%	49.42%	0.29%
Vanuatu	35.46%	4.99%	59.17%	0.38%

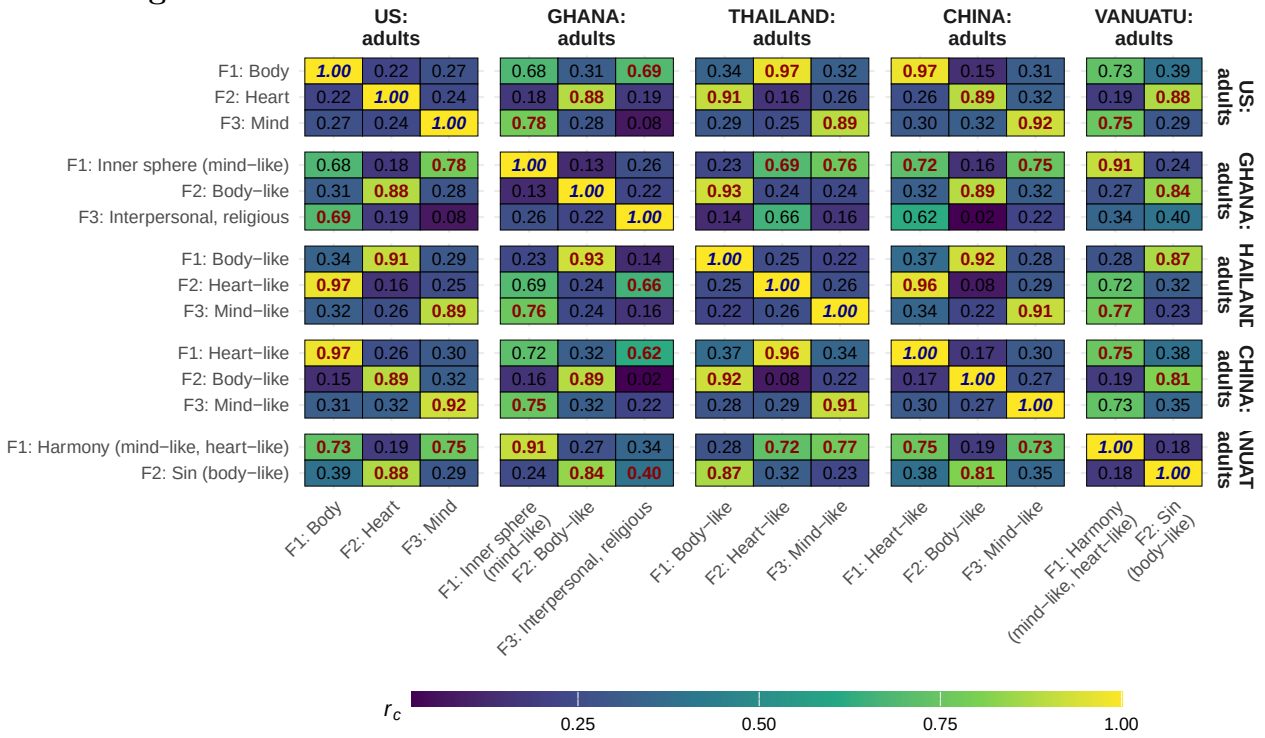
Factor retention: parallel analysis.



Exploratory factor analysis: Factor loadings.



Congruence.



Bootstrapped congruence.

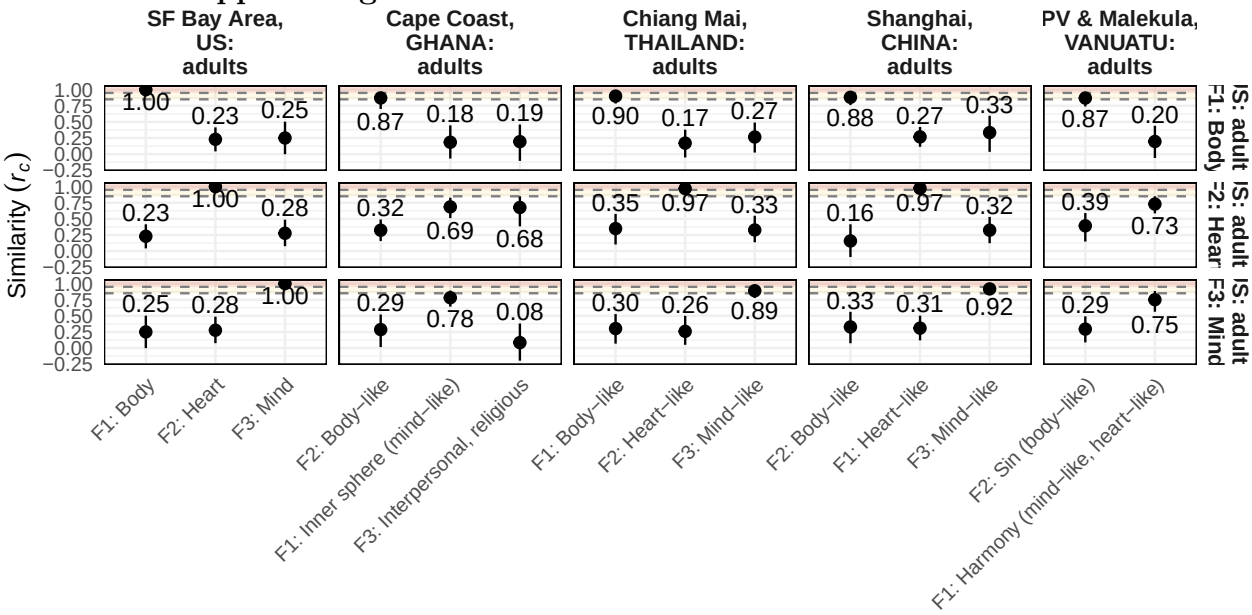
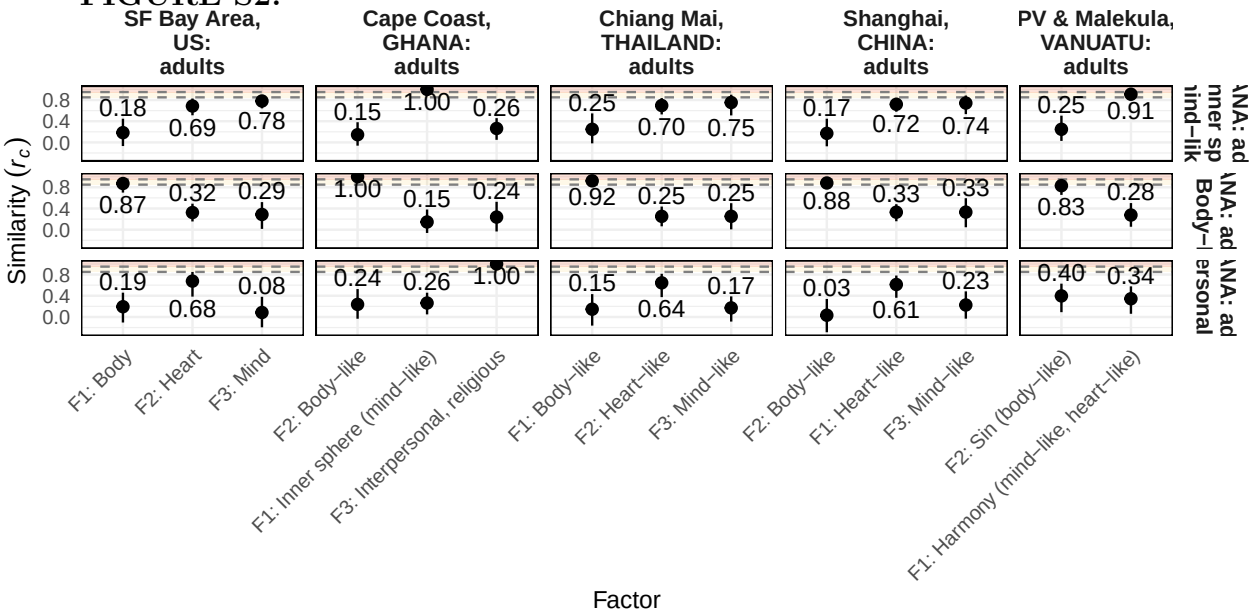
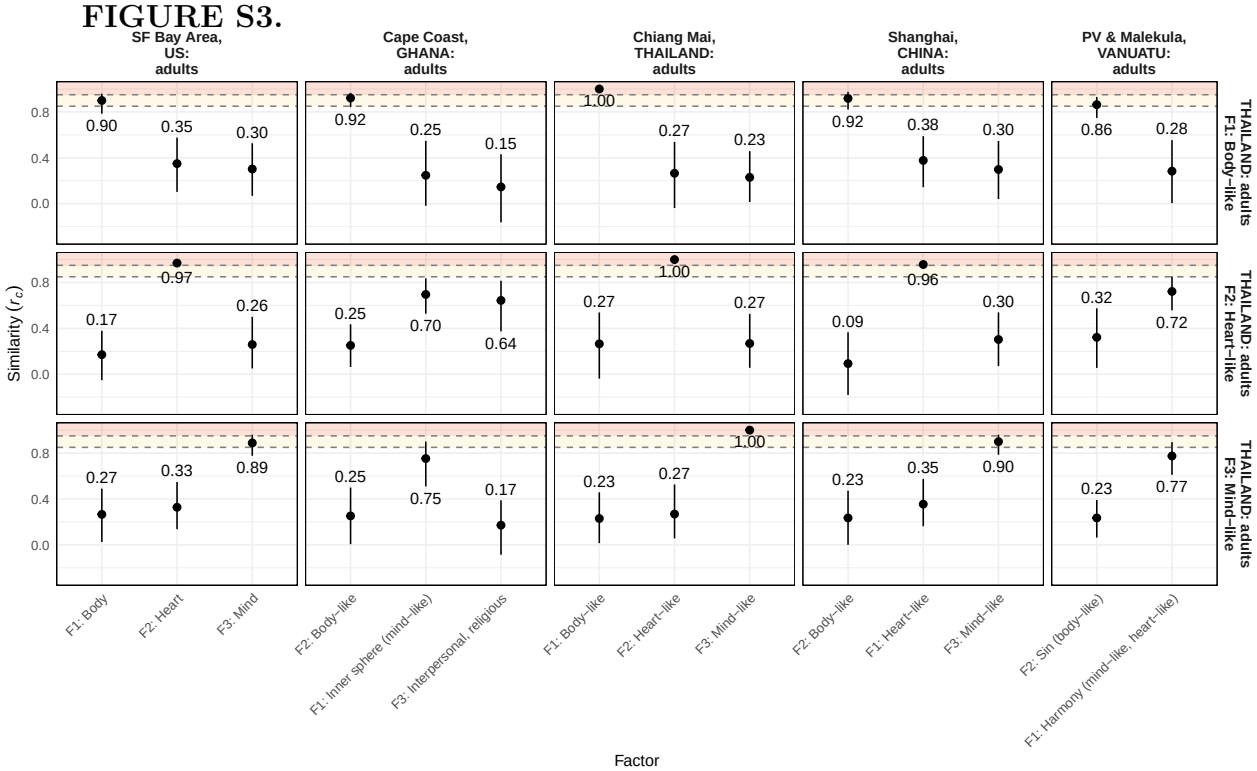


FIGURE S2.

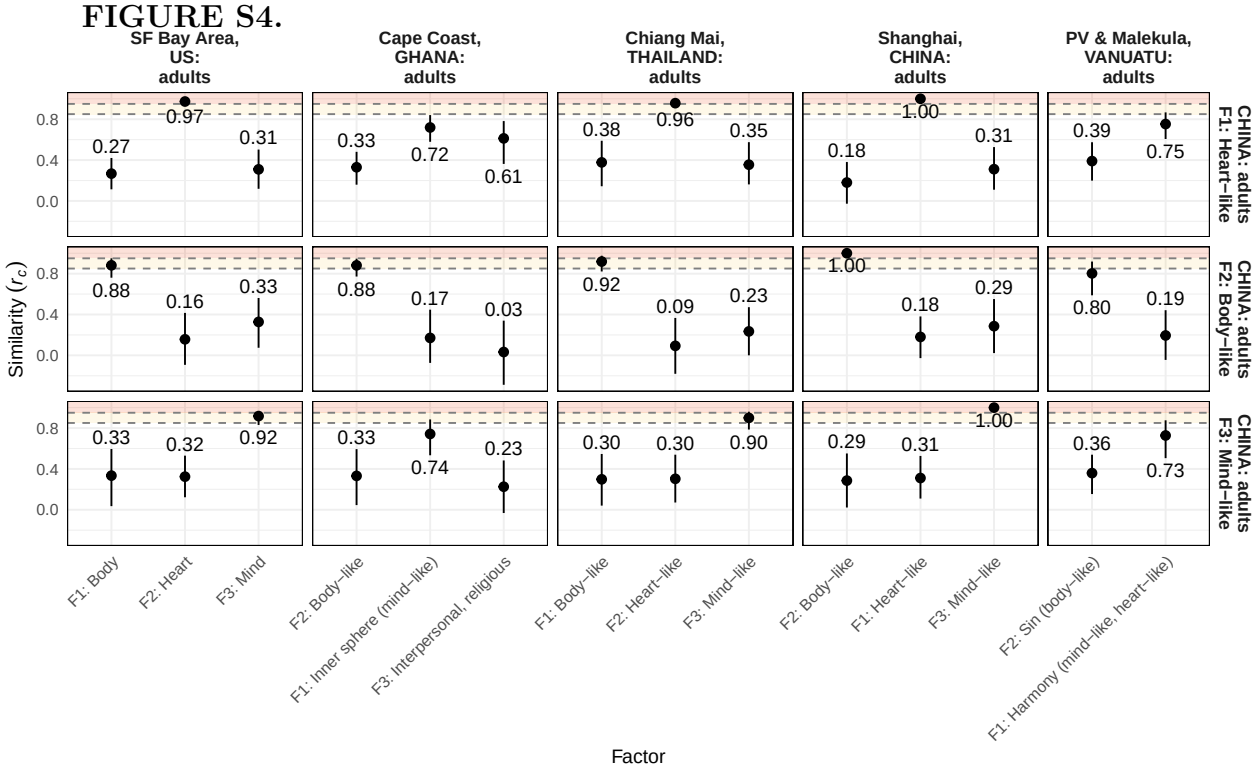


131 **FIGURE S3.**



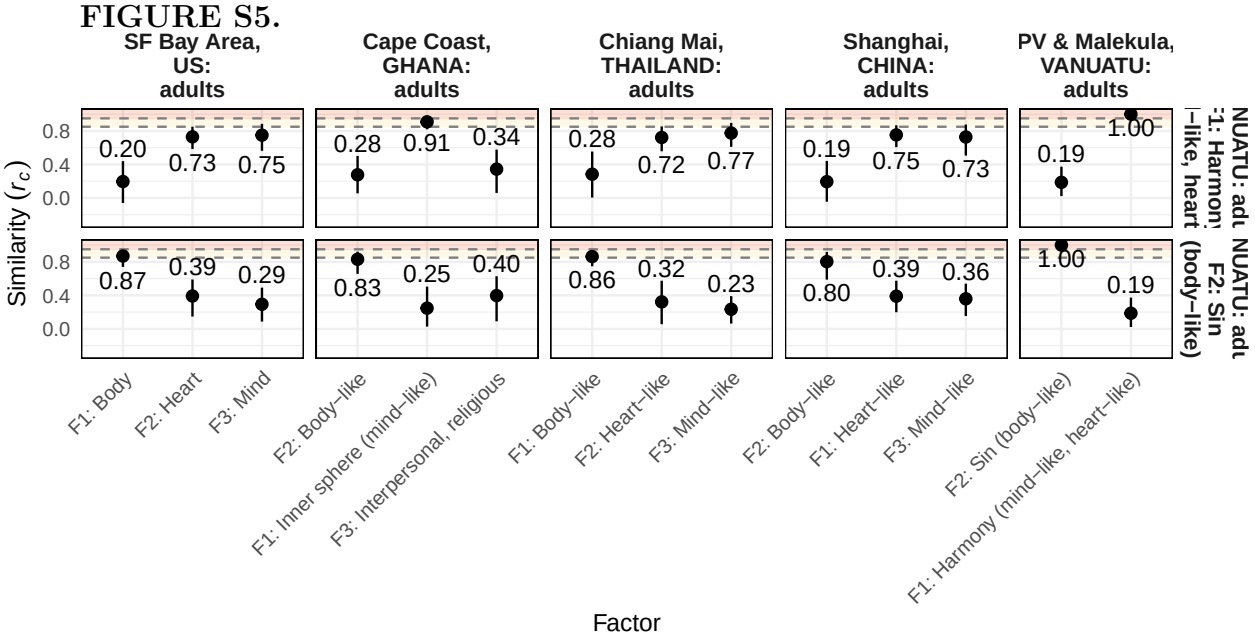
132 Factor

133 **FIGURE S4.**



134 Factor

FIGURE S5.




```
## # A tibble: 4 x 15
##   factor_A  factor_B  mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>     <chr>    <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chADULTS~ usADULT~ 0.881    0.760    0.950 adults      China     Ch. adults F~
## 2 ghADULTS~ usADULT~ 0.871    0.700    0.959 adults      Ghana     Gh. adults F~
## 3 thADULTS~ usADULT~ 0.900    0.785    0.959 adults      Thailand  Th. adults F~
## 4 vtADULTS~ usADULT~ 0.870    0.739    0.941 adults      Vanuatu   Va. adults F~
## # i 7 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
## #   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
## #   factor_descript_B <chr>, factor_labdescript_B <chr>

## # A tibble: 4 x 15
##   factor_A  factor_B  mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>     <chr>    <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chADULTS~ usADULT~ 0.327   0.0743    0.562 adults      China     Ch. adults F~
## 2 ghADULTS~ usADULT~ 0.287   0.0151    0.520 adults      Ghana     Gh. adults F~
## 3 thADULTS~ usADULT~ 0.302   0.0686    0.527 adults      Thailand  Th. adults F~
```

```
## 4 vtADULTS~ usADULT~ 0.294   0.0876    0.492 adults      Vanuatu   Va. adults F~
## # i 7 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
## #   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
## #   factor_descript_B <chr>, factor_labdescript_B <chr>

## # A tibble: 4 x 15
##   factor_A  factor_B  mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>     <chr>    <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chADULTS~ usADULT~ 0.917    0.830    0.962 adults      China     Ch. adults F~
## 2 ghADULTS~ usADULT~ 0.781    0.642    0.892 adults      Ghana     Gh. adults F~
## 3 thADULTS~ usADULT~ 0.889    0.777    0.960 adults      Thailand  Th. adults F~
## 4 vtADULTS~ usADULT~ 0.750    0.563    0.885 adults      Vanuatu   Va. adults F~
## # i 7 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
## #   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
## #   factor_descript_B <chr>, factor_labdescript_B <chr>

## # A tibble: 4 x 15
##   factor_A  factor_B  mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>     <chr>    <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chADULTS~ usADULT~ 0.334   0.0356    0.595 adults      China     Ch. adults F~
## 2 ghADULTS~ usADULT~ 0.184  -0.0690    0.447 adults      Ghana     Gh. adults F~
## 3 thADULTS~ usADULT~ 0.265   0.0244    0.490 adults      Thailand  Th. adults F~
## 4 vtADULTS~ usADULT~ 0.196  -0.0597    0.439 adults      Vanuatu   Va. adults F~
## # i 7 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
## #   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
## #   factor_descript_B <chr>, factor_labdescript_B <chr>

## # A tibble: 2 x 15
```

```
##   factor_A  factor_B  mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>     <chr>    <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chADULTS~ usADULT~ 0.973    0.949    0.987 adults      China     Ch. adults F~
## 2 thADULTS~ usADULT~ 0.969    0.947    0.986 adults      Thailand  Th. adults F~
## # i 7 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
## #   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
## #   factor_descript_B <chr>, factor_labdescript_B <chr>
```

```
## # A tibble: 4 x 15
##   factor_A  factor_B  mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>     <chr>    <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chADULTS~ usADULT~ 0.157  -0.0930    0.416 adults      China     Ch. adults F~
## 2 chADULTS~ usADULT~ 0.324   0.122     0.530 adults      China     Ch. adults F~
## 3 thADULTS~ usADULT~ 0.349   0.103     0.576 adults      Thailand  Th. adults F~
## 4 thADULTS~ usADULT~ 0.327   0.137     0.548 adults      Thailand  Th. adults F~
## # i 7 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
## #   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
## #   factor_descript_B <chr>, factor_labdescript_B <chr>
```

3.3 Primary Analysis (Children)

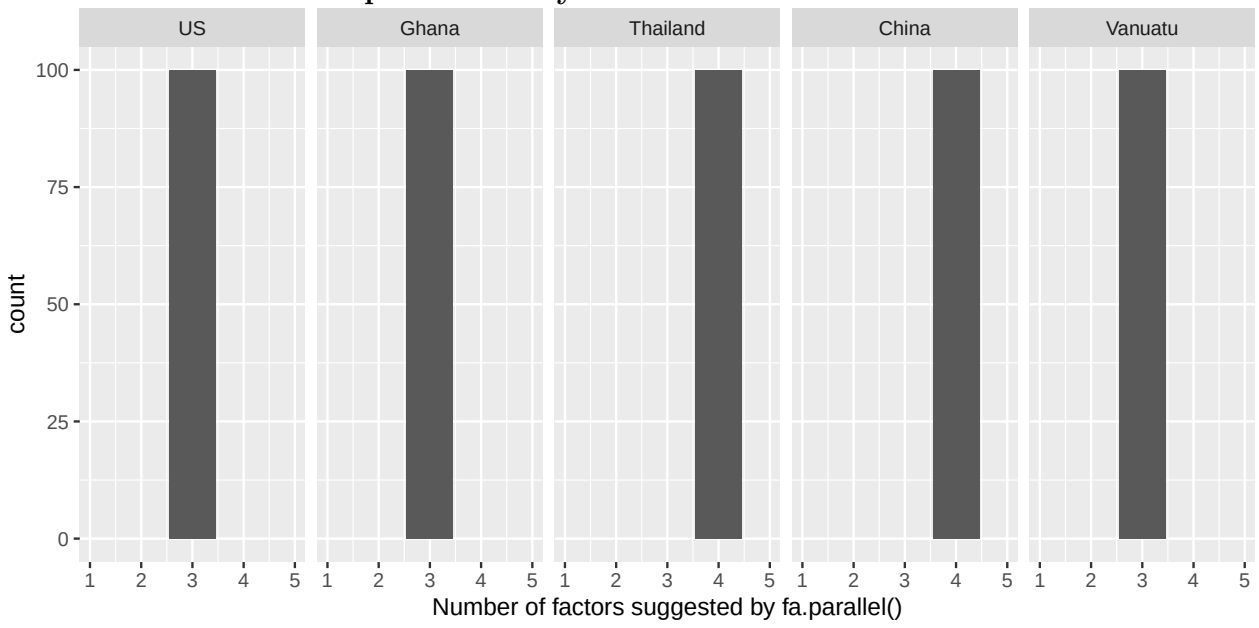
Samples.

country	n
US	117
Ghana	150
Thailand	152
China	131
Vanuatu	143
Total	693

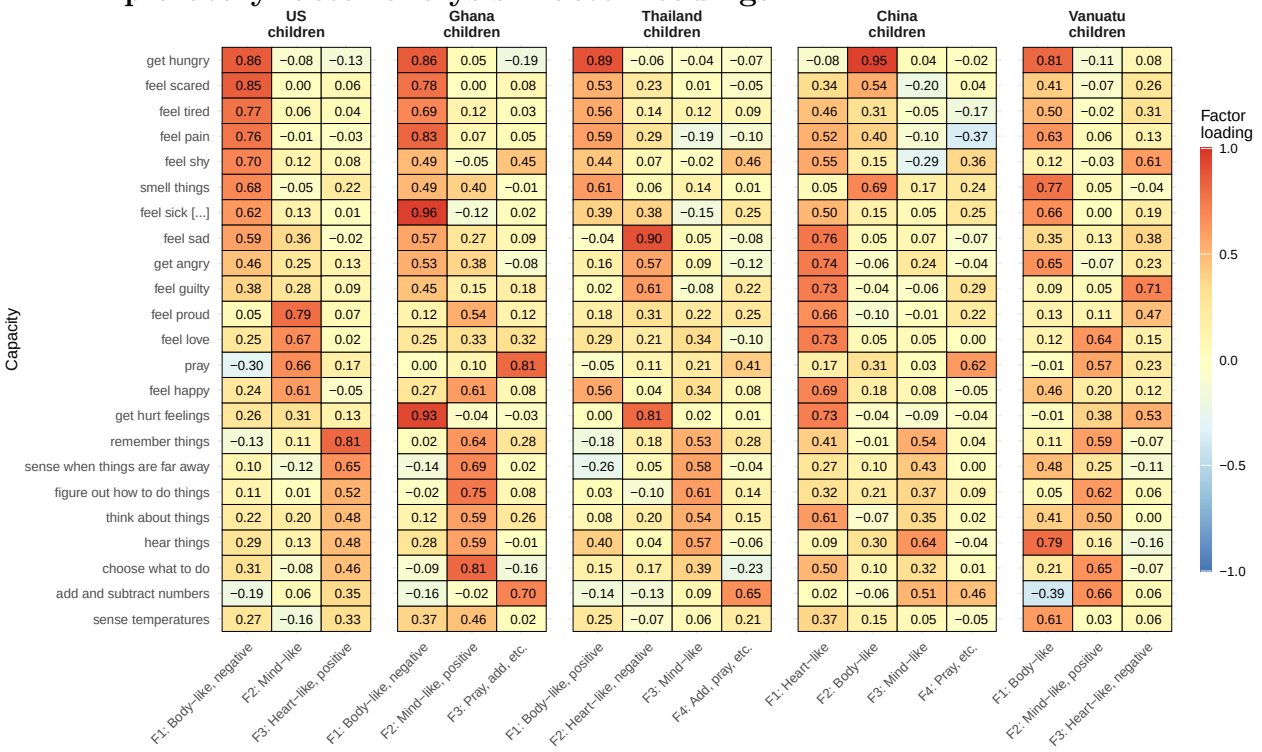
Scale use.

country	no	kind of	yes	missing data
US	42.14%	16.09%	40.88%	0.89%
Ghana	54.12%	1.48%	44.09%	0.32%
Thailand	37.99%	25.86%	35.90%	0.26%
China	35.01%	17.03%	47.00%	0.96%
Vanuatu	50.02%	3.89%	46.03%	0.06%

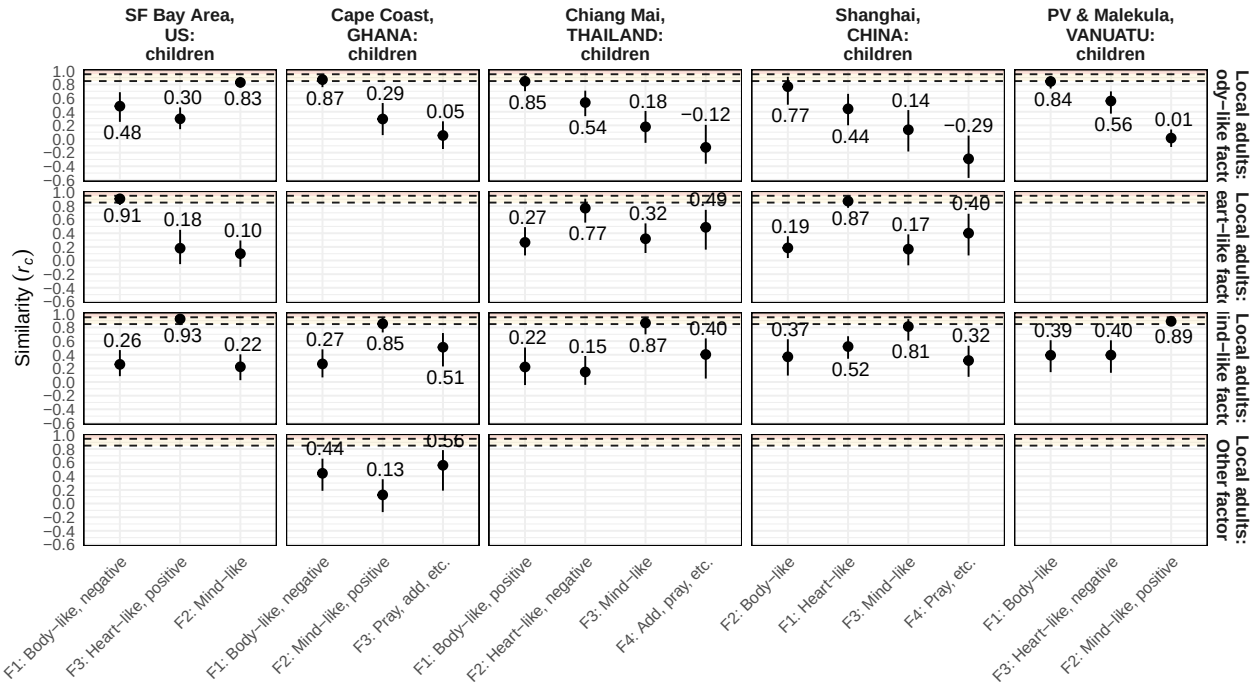
Factor retention: parallel analysis.

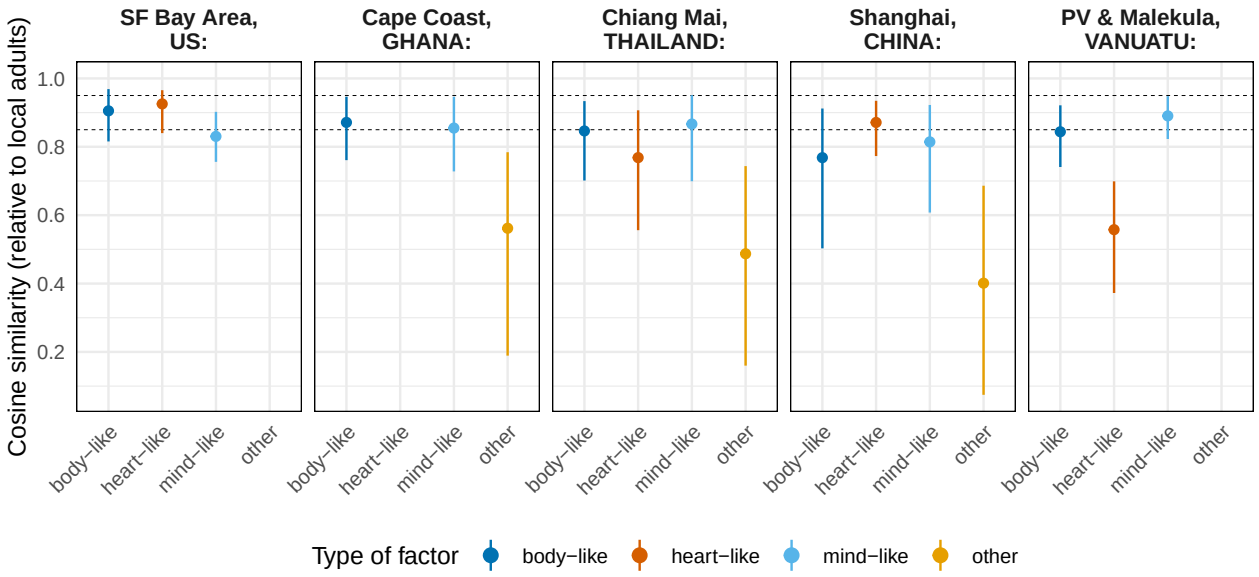


Exploratory factor analysis: Factor loadings.

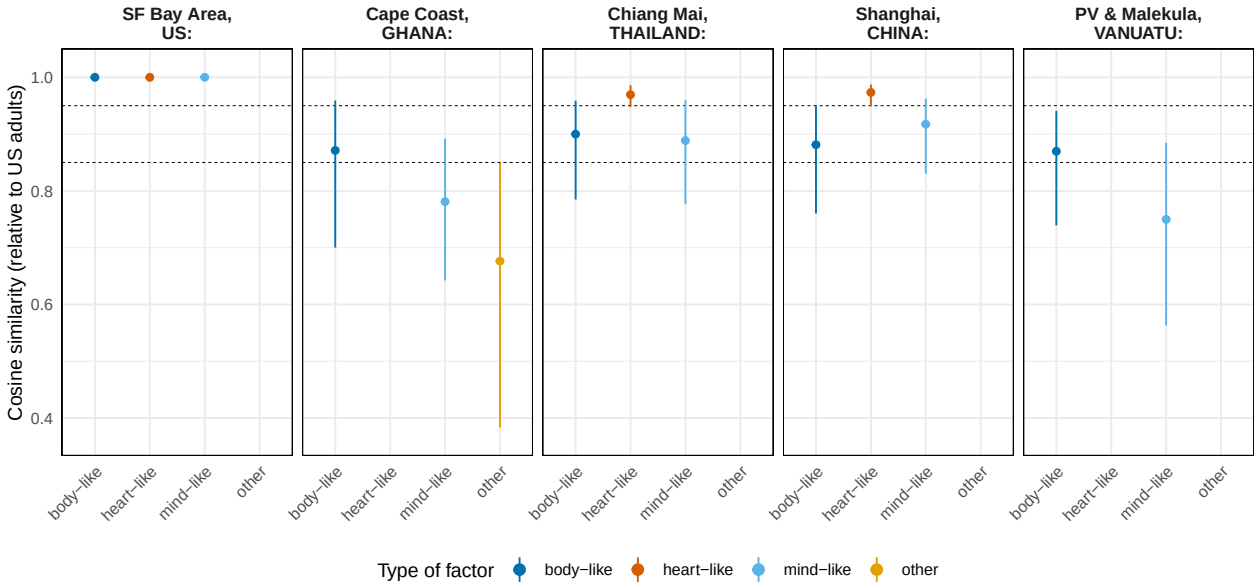


Congruence: Bootstrapped congruence





Error bars are bootstrapped 95% CIs



Error bars are bootstrapped 95% CIs

```
## # A tibble: 5 x 17
##   factor_A  factor_B  mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>     <chr>    <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chCHILDR~ chADULT~ 0.768    0.503    0.912 children    China     Ch. children~
## 2 ghCHILDR~ ghADULT~ 0.871    0.761    0.946 children    Ghana     Gh. children~
## 3 thCHILDR~ thADULT~ 0.846    0.701    0.934 children    Thailand  Th. children~
## 4 usCHILDR~ usADULT~ 0.482    0.252    0.687 children    US        US children ~
```

```
## 5 vtCHILDR~ vtADULT~ 0.844    0.741    0.921 children    Vanuatu   Va. children~
## # i 9 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
##   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
##   factor_descript_B <chr>, factor_labdescript_B <chr>, factor_bhm_A <chr>,
##   factor_bhm_B <chr>

## # A tibble: 5 x 17
##   factor_A  factor_B  mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>     <chr>    <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chCHILDR~ chADULT~ 0.370   0.0946    0.628 children    China     Ch. children~
## 2 ghCHILDR~ ghADULT~ 0.266   0.0680    0.480 children    Ghana     Gh. children~
## 3 thCHILDR~ thADULT~ 0.221  -0.0443    0.507 children    Thailand  Th. children~
## 4 usCHILDR~ usADULT~ 0.259   0.0863    0.469 children    US        US children ~
## 5 vtCHILDR~ vtADULT~ 0.393   0.145     0.613 children    Vanuatu   Va. children~
## # i 9 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
##   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
##   factor_descript_B <chr>, factor_labdescript_B <chr>, factor_bhm_A <chr>,
##   factor_bhm_B <chr>

## # A tibble: 5 x 17
##   factor_A  factor_B  mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>     <chr>    <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chCHILDR~ chADULT~ 0.814   0.608     0.922 children    China     Ch. children~
## 2 ghCHILDR~ ghADULT~ 0.855   0.728     0.946 children    Ghana     Gh. children~
## 3 thCHILDR~ thADULT~ 0.867   0.699     0.951 children    Thailand  Th. children~
## 4 usCHILDR~ usADULT~ 0.223   0.0275    0.406 children    US        US children ~
## 5 vtCHILDR~ vtADULT~ 0.890   0.823     0.948 children    Vanuatu   Va. children~
## # i 9 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
```

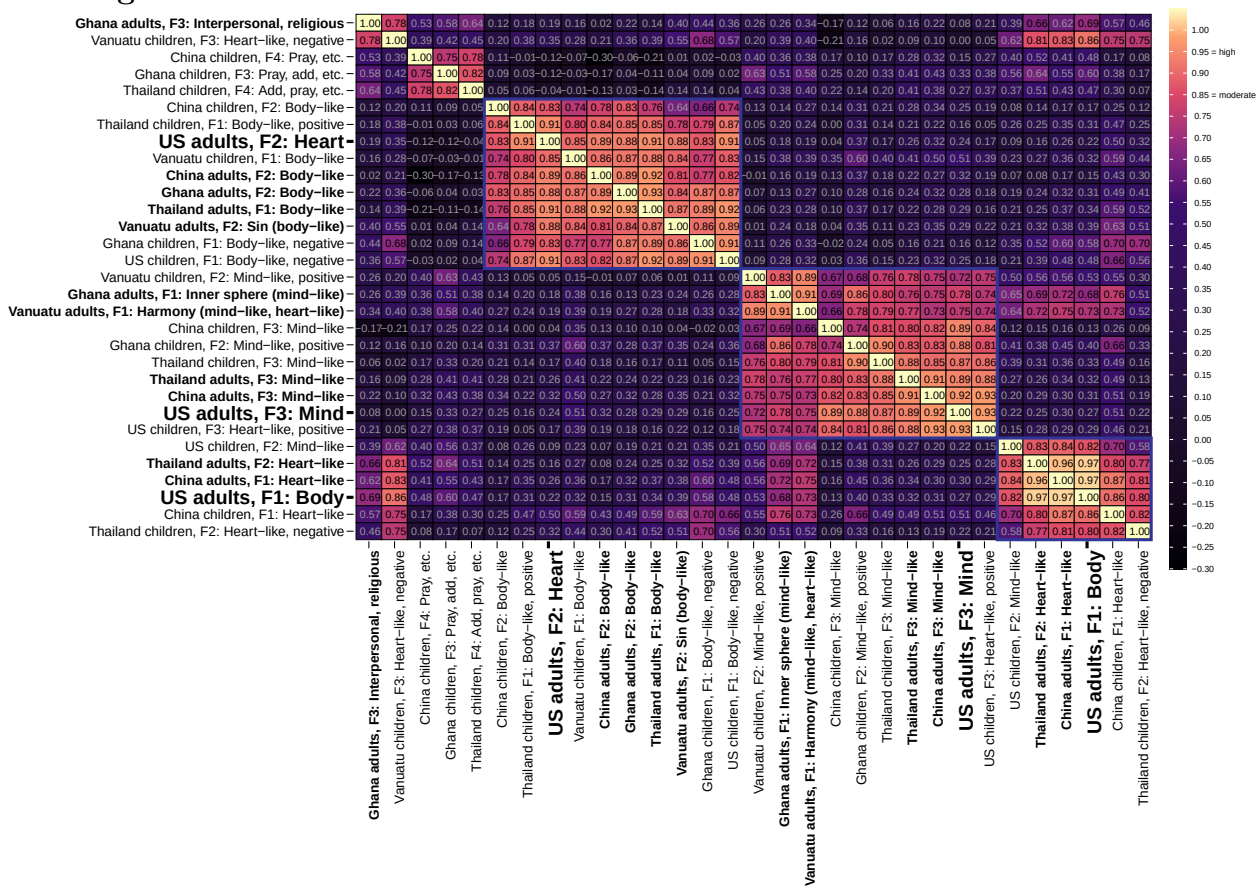
```
## #   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
## #   factor_descript_B <chr>, factor_labdescript_B <chr>, factor_bhm_A <chr>,
## #   factor_bhm_B <chr>
```

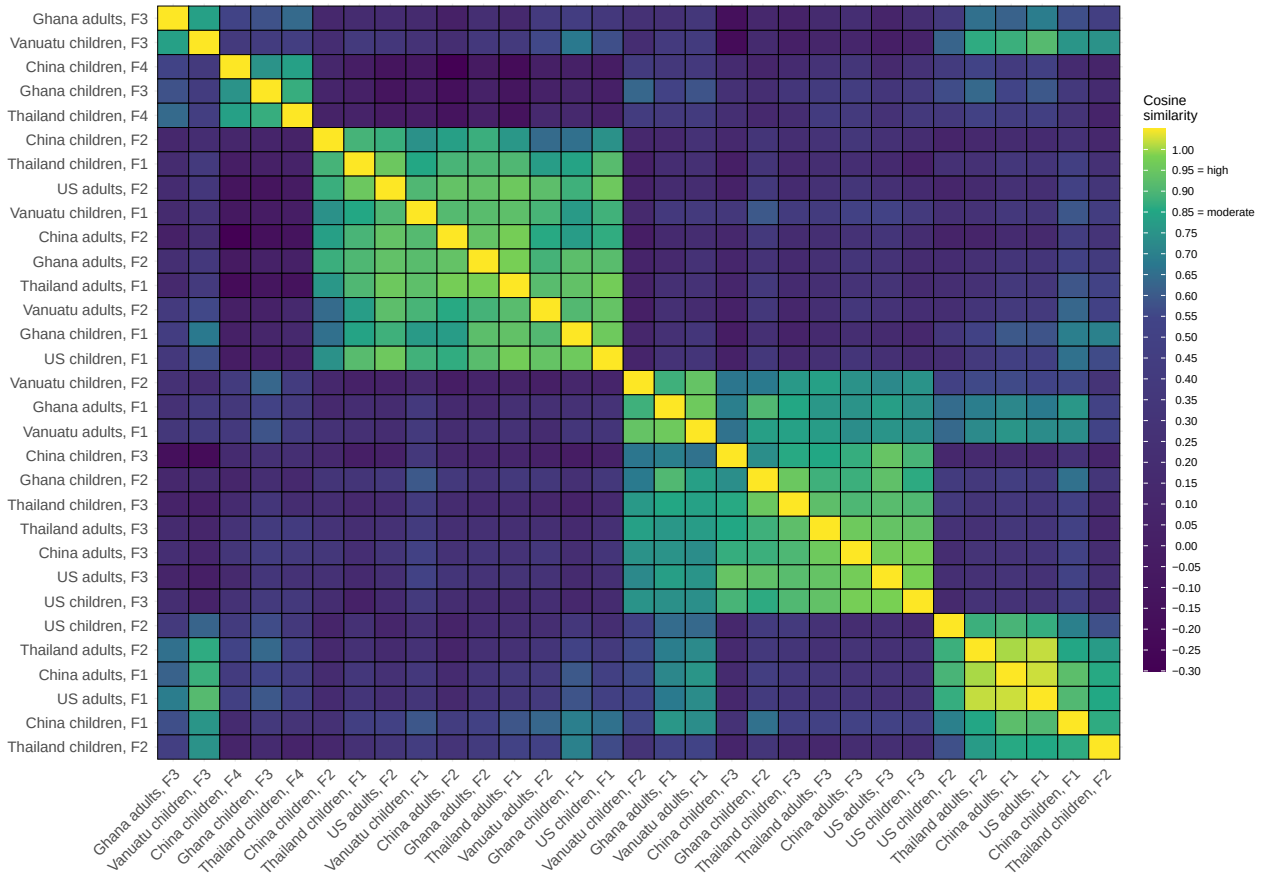
```
## # A tibble: 5 x 17
##   factor_A factor_B   mean ci_lower ci_upper age_group_A country_A factor_name_A
##   <chr>    <chr>     <dbl>    <dbl>    <dbl> <chr>       <fct>     <chr>
## 1 chCHILD~ chADULT~ 0.136   -0.183     0.424 children    China     Ch. children~
## 2 ghCHILD~ ghADULT~ 0.294    0.0574    0.528 children    Ghana     Gh. children~
## 3 thCHILD~ thADULT~ 0.178   -0.0564    0.411 children    Thailand  Th. children~
## 4 usCHILD~ usADULT~ 0.830    0.756     0.902 children    US        US children ~
## 5 vtCHILD~ vtADULT~ 0.0137  -0.117     0.140 children    Vanuatu   Va. children~
## # i 9 more variables: factor_descript_A <chr>, factor_labdescript_A <chr>,
## #   age_group_B <chr>, country_B <fct>, factor_name_B <chr>,
## #   factor_descript_B <chr>, factor_labdescript_B <chr>, factor_bhm_A <chr>,
## #   factor_bhm_B <chr>
```

3.4 Primary Analysis (All Samples)

Congruence.

Figure 2.


Ghana adults, F3: Interpersonal, religious
Vanuatu children, F3: Heart−like, negative
China children, F4: Pray, etc.
Ghana children, F3: Pray, add, etc.
Thailand children, F4: Add, pray, etc.
China children, F2: Body−like
Thailand children, F1: Body−like, positive
US adults, F2: Heart
Vanuatu children, F1: Body−like
China adults, F2: Body−like
Ghana adults, F2: Body−like
Thailand adults, F1: Body−like
Vanuatu adults, F2: Sin (body−like)
Ghana children, F1: Body−like, negative
US children, F1: Body−like, negative
Vanuatu children, F2: Mind−like, positive
Ghana adults, F1: Inner sphere (mind−like)
Vanuatu adults, F1: Harmony (mind−like, heart−like)
China children, F3: Mind−like
Ghana children, F2: Mind−like, positive
Thailand children, F3: Mind−like
Thailand adults, F3: Mind−like
China adults, F3: Mind−like
US adults, F3: Mind
US children, F3: Heart−like, positive
US children, F2: Mind−like
Thailand adults, F2: Heart−like
China adults, F1: Heart−like
US adults, F1: Body
China children, F1: Heart−like
Thailand children, F2: Heart−like, negative
1.00
0.95 = high
0.90
0.85 = moderate
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
−0.20
−0.25
−0.30


Ghana adults, F3
Vanuatu children, F3
China children, F4
Ghana children, F3
Thailand children, F4
China children, F2
Thailand children, F1
US adults, F2
Vanuatu children, F1
China adults, F2
Ghana adults, F2
Thailand adults, F1
Vanuatu adults, F2
Ghana children, F1
US children, F1
Vanuatu children, F2
Ghana adults, F1
Vanuatu adults, F1
China children, F3
Ghana children, F2
Thailand children, F3
Thailand adults, F3
China adults, F3
US adults, F3
US children, F3
US children, F2
Thailand adults, F2
China adults, F1
US adults, F1
China children, F1
Thailand children, F2
Cosine similarity
1.00
0.95 = high
0.90
0.85 = moderate
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
−0.20
−0.25
−0.30

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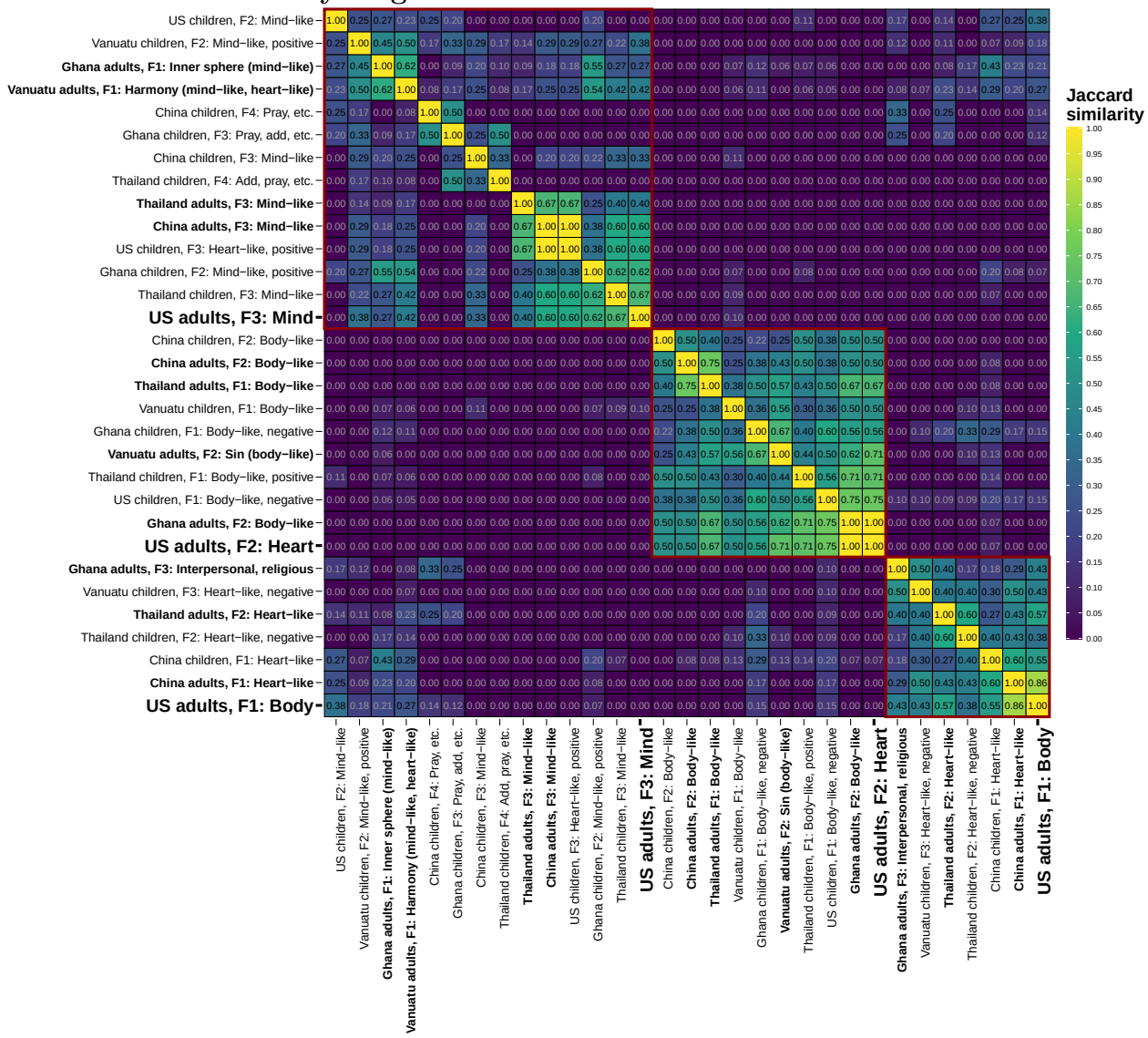
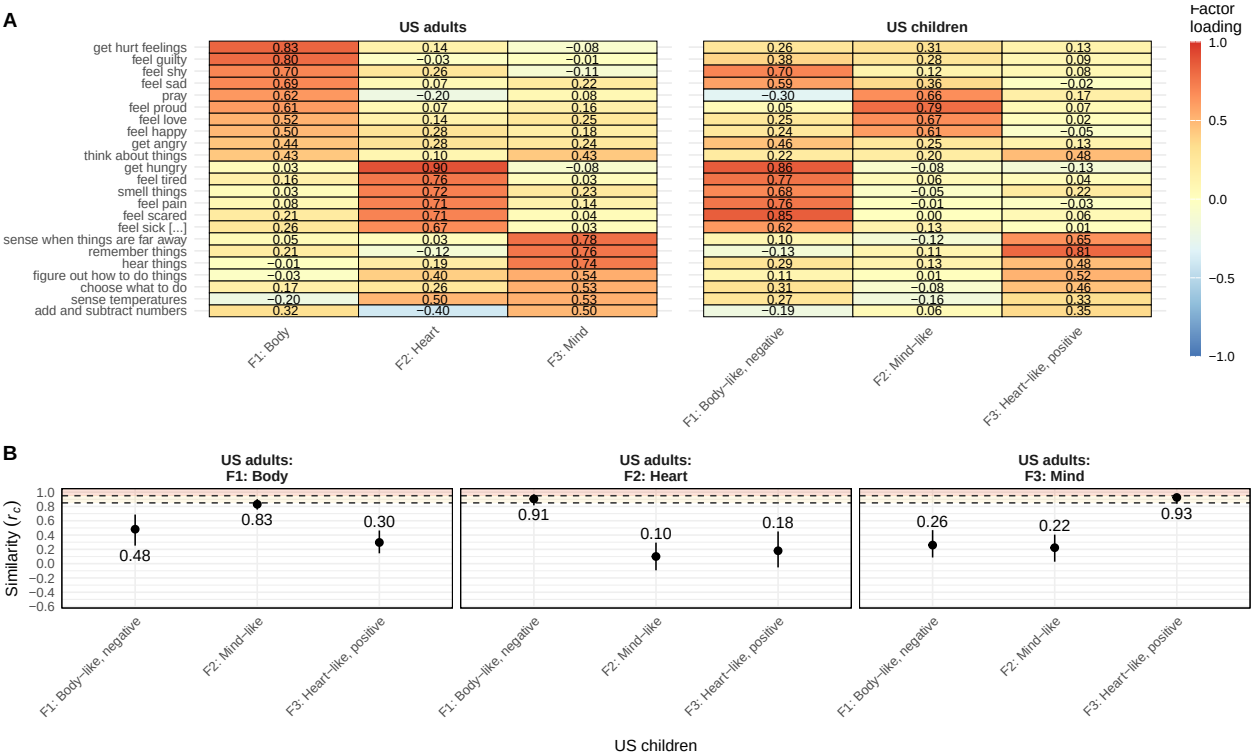
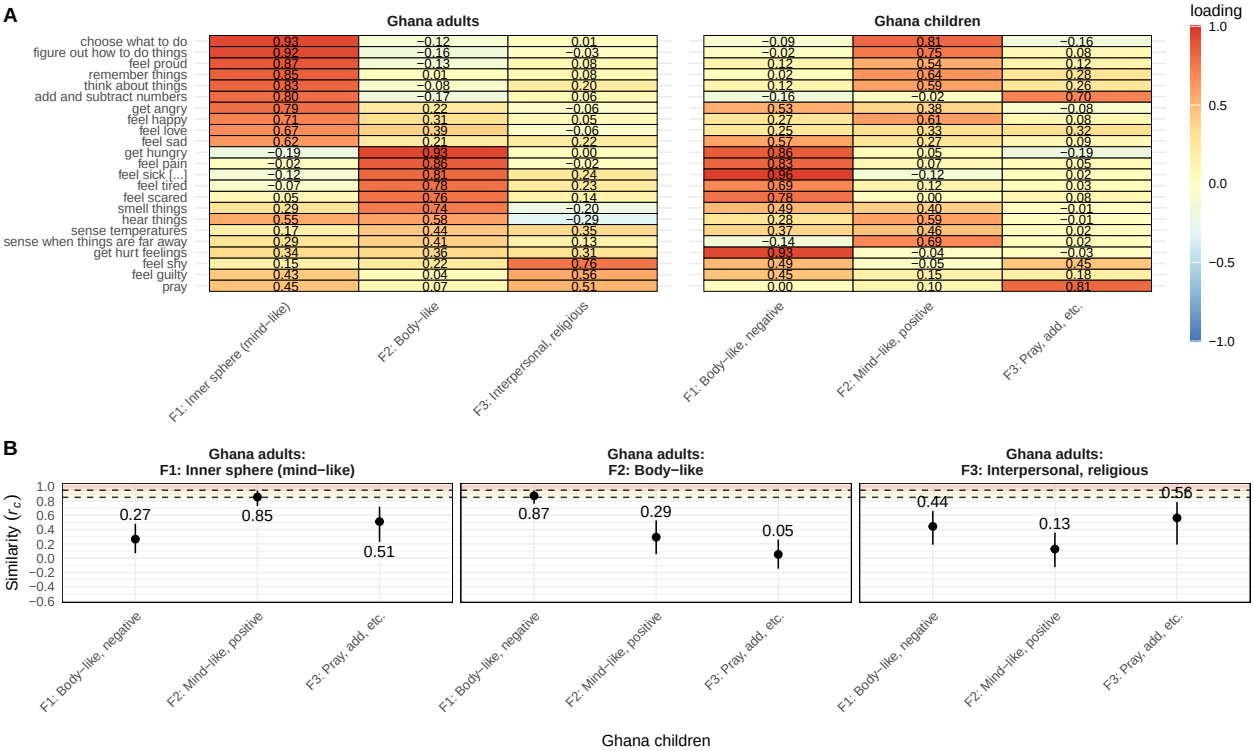
Jaccard Similarity: Figure S1.

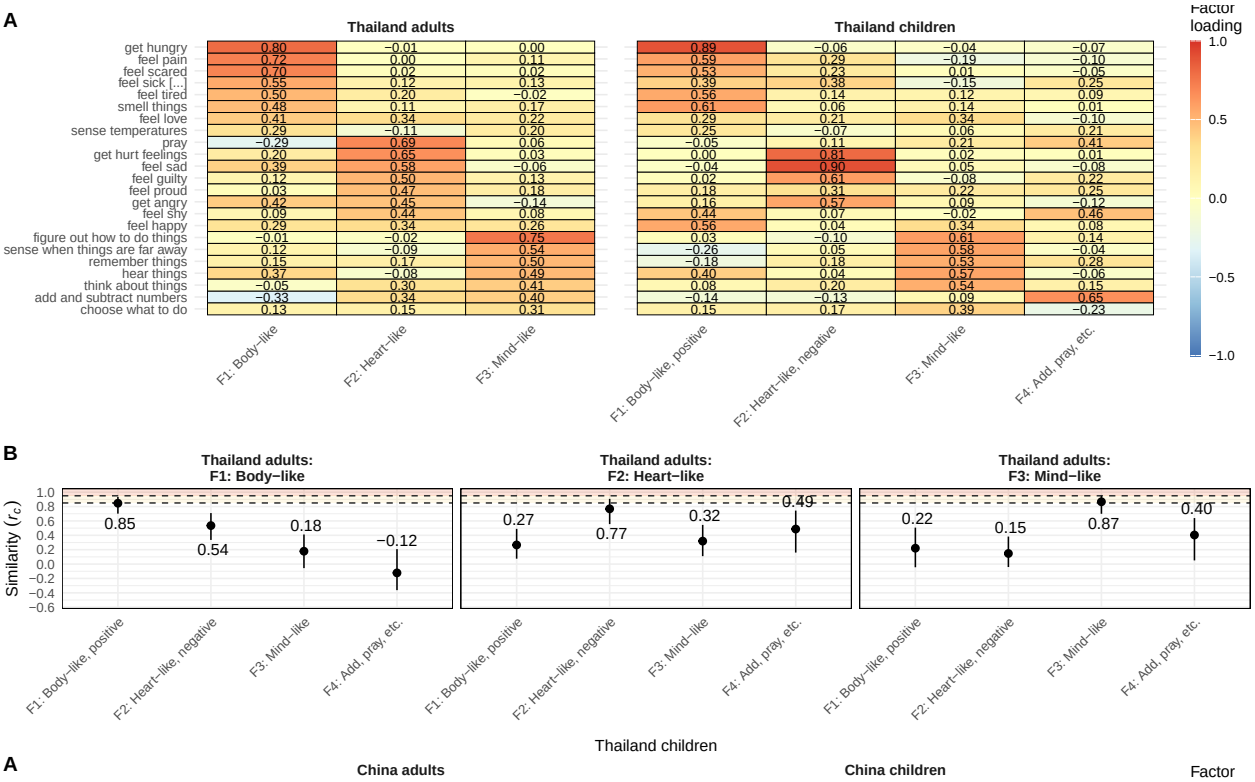




US children

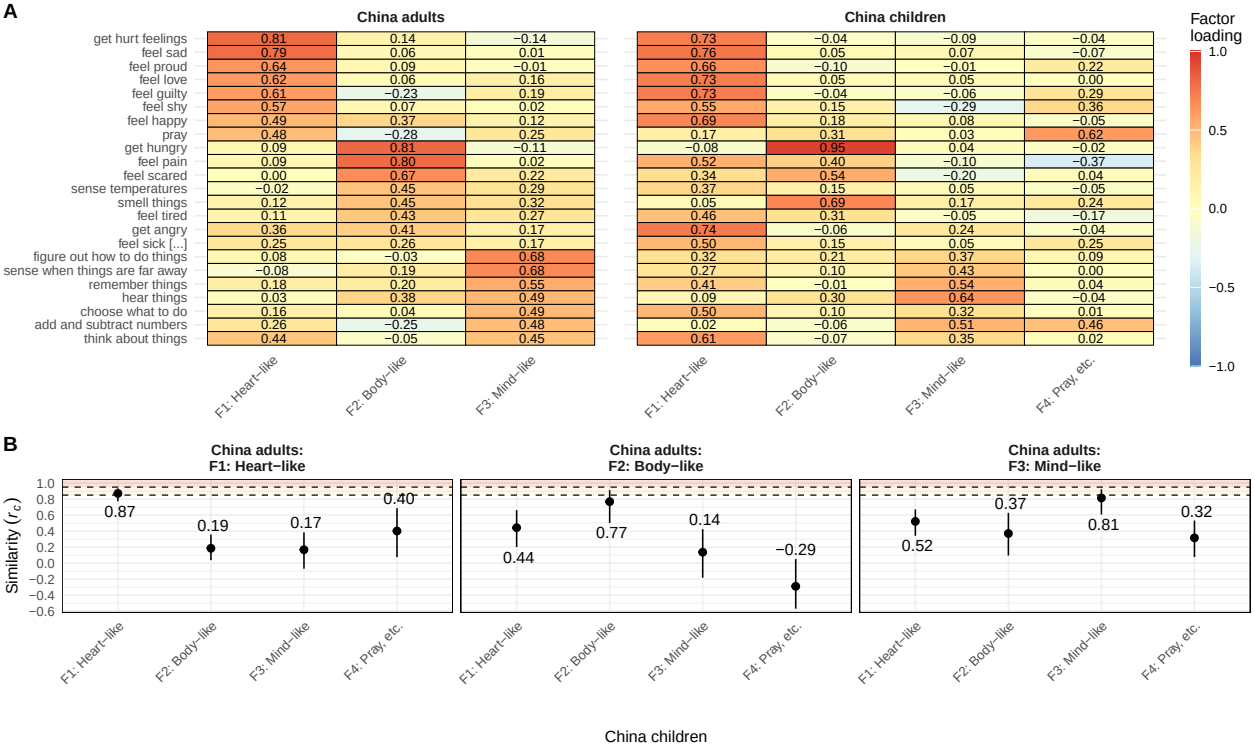


Ghana children



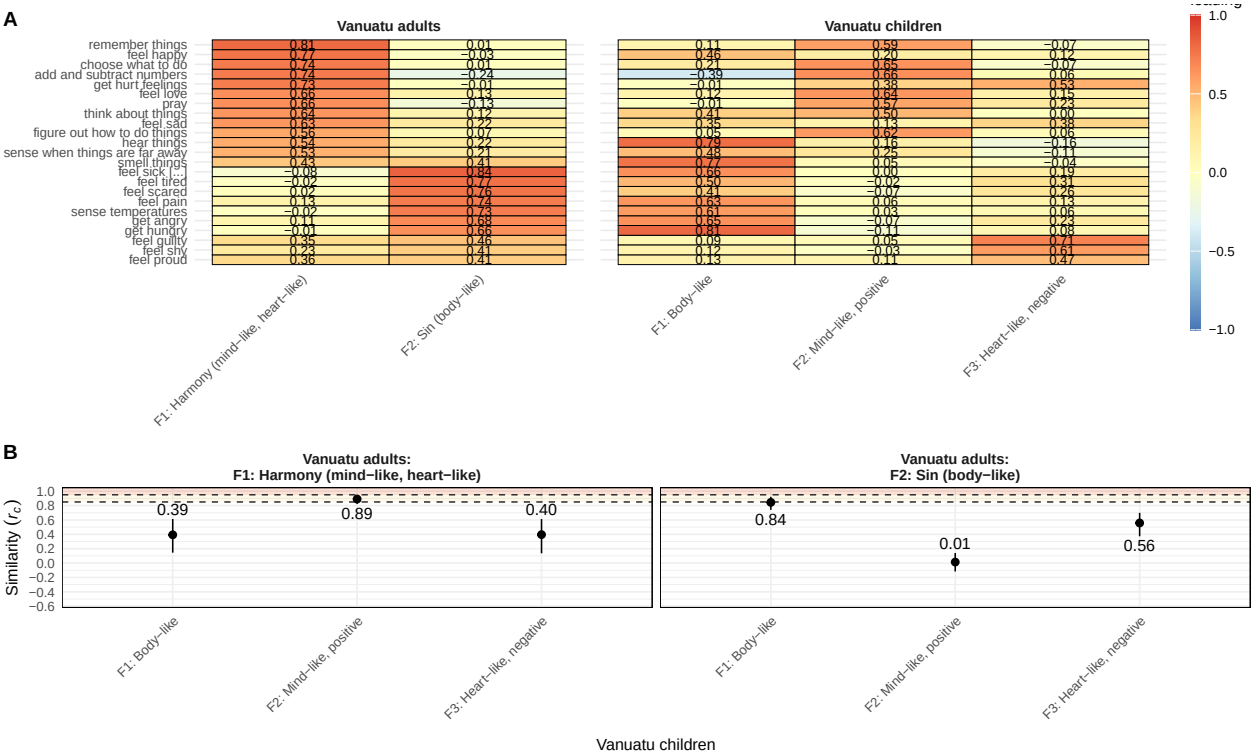
Thailand children

263

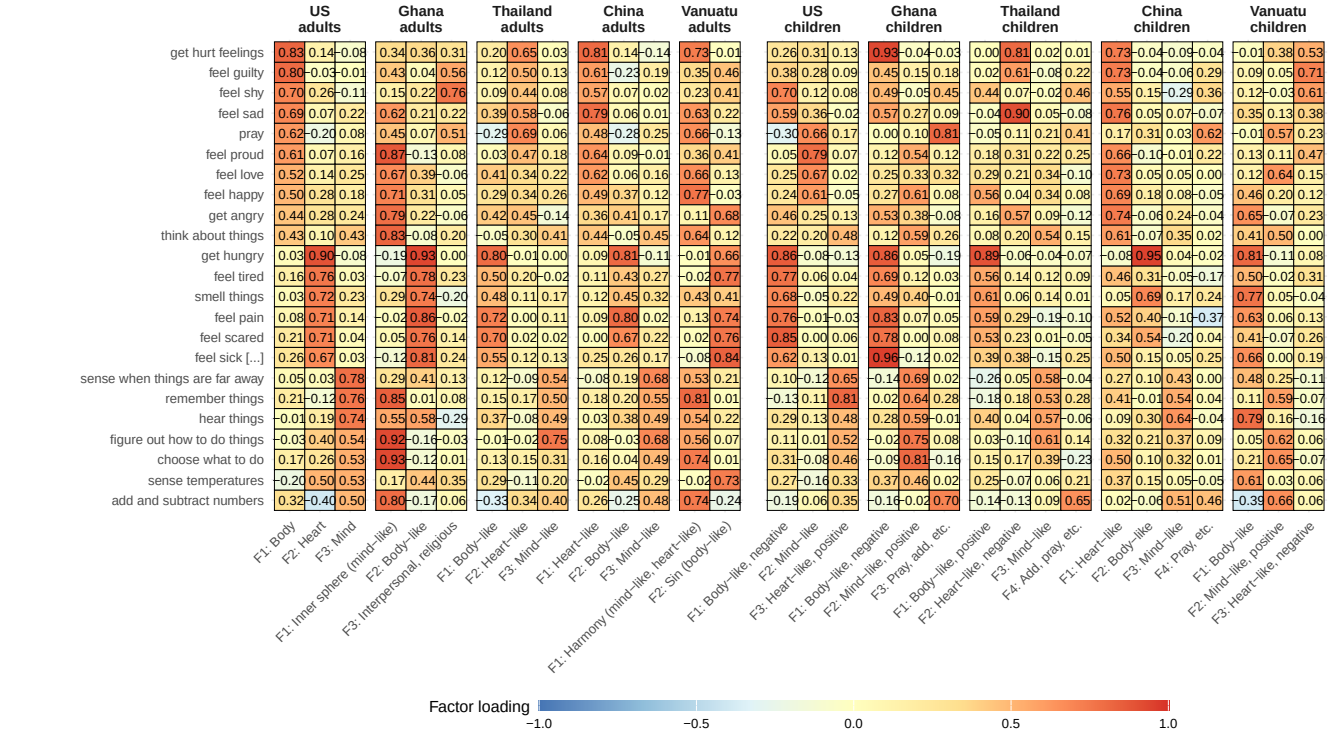


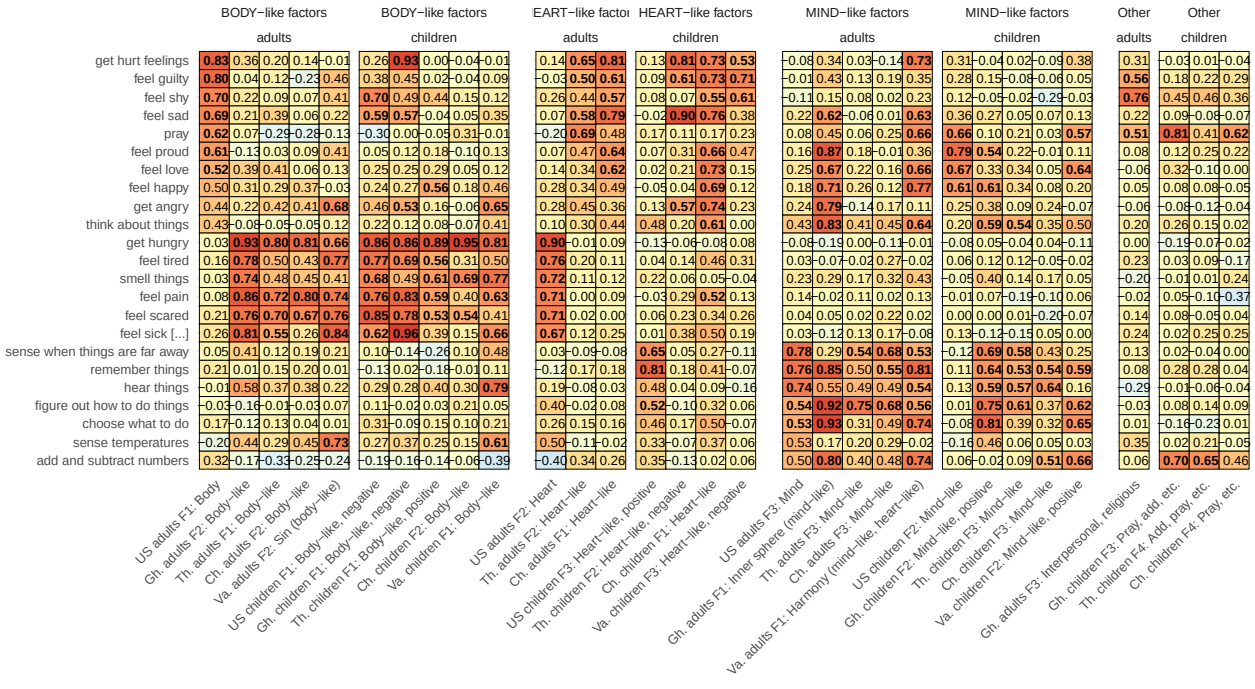
China children

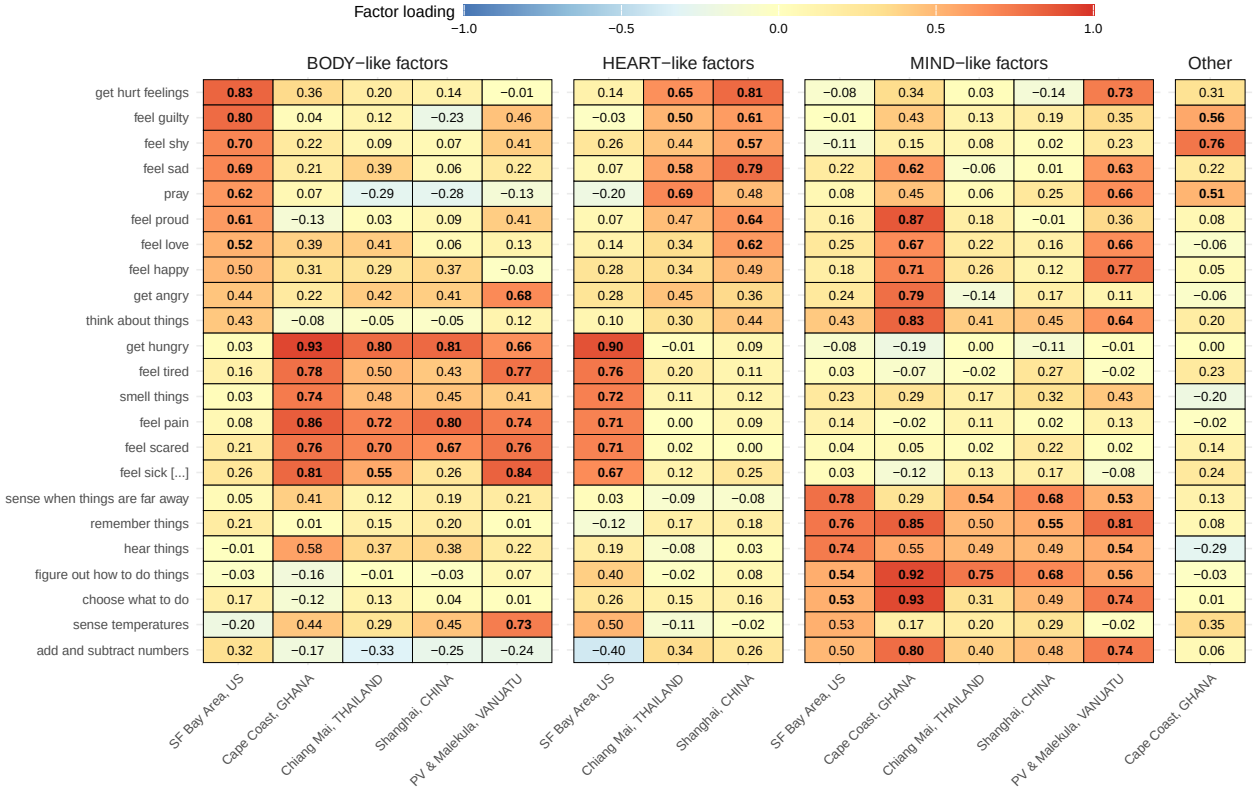
264



Vanuatu children








```
##                 metric age_group factor   US Ghana Thailand China Vanuatu
## 1  Proportion Explained    adults     F1 0.36  0.50     0.41  0.39    0.55
## 2        Proportion Var    adults     F1 0.23  0.35     0.18  0.20    0.29
```

```
## 3  Proportion Explained    adults     F2 0.35  0.36     0.33  0.31    0.45
## 4         Proportion Var    adults     F2 0.23  0.25     0.14  0.16    0.24
## 5  Proportion Explained    adults     F3 0.29  0.14     0.26  0.30      NA
## 6         Proportion Var    adults     F3 0.19  0.10     0.11  0.15      NA
## 7  Proportion Explained    adults     F4   NA    NA       NA    NA      NA
## 8         Proportion Var    adults     F4   NA    NA       NA    NA      NA
## 9  Proportion Explained  children     F1 0.51  0.49     0.34  0.52    0.49
## 10        Proportion Var  children     F1 0.26  0.29     0.16  0.29    0.24
## 11 Proportion Explained  children     F2 0.25  0.37     0.30  0.22    0.28
## 12        Proportion Var  children     F2 0.13  0.22     0.14  0.12    0.14
## 13 Proportion Explained  children     F3 0.24  0.15     0.23  0.16    0.23
## 14        Proportion Var  children     F3 0.12  0.09     0.11  0.09    0.11
## 15 Proportion Explained  children     F4   NA    NA     0.13  0.10      NA
## 16        Proportion Var  children     F4   NA    NA     0.06  0.06      NA
```

```
## # A tibble: 2 x 7
##   metric          age_group    US Ghana Thailand China Vanuatu
##   <chr>           <fct>     <dbl> <dbl>    <dbl> <dbl>   <dbl>
## 1 Cumulative Var adults     0.65   0.7     0.43  0.52    0.53
## 2 Cumulative Var children   0.5    0.6     0.47  0.57    0.49
```

```
## US ADULTS
```

```
##           F1        F2        F3
## F1 1.0000000 0.5114648 0.5376676
## F2 0.5114648 1.0000000 0.4805622
## F3 0.5376676 0.4805622 1.0000000
```

```
##
```

```
## US CHILDREN

##           F1        F2        F3
## F1 1.0000000 0.4334098 0.3031865
## F2 0.4334098 1.0000000 0.4856172
## F3 0.3031865 0.4856172 1.0000000

## GHANA ADULTS

##           F1        F2        F3
## F1 1.0000000 0.2725881 0.3444798
## F2 0.2725881 1.0000000 0.2558207
## F3 0.3444798 0.2558207 1.0000000

##
## GHANA CHILDREN

##           F1        F2        F3
## F1 1.0000000 0.5790820 0.1747165
## F2 0.5790820 1.0000000 0.3854114
## F3 0.1747165 0.3854114 1.0000000

## THAILAND ADULTS

##           F1        F2        F3
## F1 1.0000000 0.4142881 0.3218404
## F2 0.4142881 1.0000000 0.4161488
## F3 0.3218404 0.4161488 1.0000000
```

```
##
## THAILAND CHILDREN

##              F1         F2        F3           F4
## F1  1.000000000 0.54189979 0.1468730 -0.008909088
## F2  0.541899792 1.00000000 0.3169020  0.092978779
## F3  0.146873030 0.31690205 1.0000000  0.269117295
## F4 -0.008909088 0.09297878 0.2691173  1.000000000

## CHINA ADULTS

##           F1        F2        F3
## F1 1.0000000 0.4590388 0.6187141
## F2 0.4590388 1.0000000 0.3703614
## F3 0.6187141 0.3703614 1.0000000

##
## CHINA CHILDREN

##           F1         F2        F3         F4
## F1 1.0000000 0.51249526 0.3245885 0.25786749
## F2 0.5124953 1.00000000 0.1524842 0.07635739
## F3 0.3245885 0.15248416 1.0000000 0.13450834
## F4 0.2578675 0.07635739 0.1345083 1.00000000

## VANUATU ADULTS

##          F1       F2
## F1 1.000000 0.687325
## F2 0.687325 1.000000
```

```
##
## VANUATU CHILDREN

##           F1        F2        F3
## F1 1.0000000 0.3116574 0.5189923
## F2 0.3116574 1.0000000 0.3362370
## F3 0.5189923 0.3362370 1.0000000
```

3.5 Repeatability test results

4 Discussion

4.1 Analysis of the results of the computational reproducibility test

We successfully replicated the factor structure of adult and child conceptualizations of psychological abilities across five cultures as reported by Weisman et al. (2021), and observed similar cross-cultural and cross-age-group patterns. Specifically, we arrived at the following conclusions:

- **Cross-Cultural Consistency:** Both adults and children clearly differentiated between somatic sensations and cognitive abilities in all five cultures, aligning with the original study's conclusions.
- **Cross-Age-Group Differences:** We noted significant differences in social affective capabilities between children and adults across the five cultures, supporting the original study's findings.

Upon comparing our replication results with the original study, we identified minor discrepancies that may stem primarily from the R environment and package versions. We further explored the similarity between adult factors in different countries and those in the U.S., as well as the similarity between child factors in different countries and those of local

adults, to investigate structural differences in psychological life across cultures and age groups.

Our analysis indicates that descriptive statistics, cross-cultural comparisons, and developmental comparisons align with the original study. However, we observed slight deviations in individual values in the variance explained by factors and the correlation between adult and child factors.

We conducted our data analysis using R version 4.3.1, while the original study was based on R version 4.0.0. Additionally, updates to software packages may lead to deprecated functions, contributing to minor differences in results due to variations in programming environments and software package versions. To enhance result consistency, we will ensure stable package versions in future research, regularly updating and testing the R packages used to prevent similar issues.

In conclusion, our research findings support the conclusions of Weisman et al. (2021), demonstrating the existence of universal patterns in the conceptualization of psychological abilities across cultures and age groups, providing essential insights for understanding the cultural and developmental foundations of human psychology.

P.S.: Due to the substantial amount of numerical values involved in the EFA factor loading heatmaps in the main text of the paper, we did not calculate reproducibility results for them. Tables 1 to 17 do not encompass comparisons for all replicated results. However, through our replication of the figures in the paper, it is evident that our results align with the heatmaps created by the authors.

表 1. 复现结果中各国家的样本量 (Adults)

Country	n		δ	评级
	原研究报告结果	本研究报告结果		
US	127	127	0%	完全一致
Ghana	150	150	0%	完全一致
Thailand	150	150	0%	完全一致
China	136	136	0%	完全一致
Vanuatu	148	148	0%	完全一致

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表 2. 复现结果中各国家的样本量 (Children)

Country	n		δ	评级
	原研究报告结果	本研究报告结果		
US	117	117	0%	完全一致
Ghana	150	150	0%	完全一致
Thailand	152	152	0%	完全一致
China	131	131	0%	完全一致
Vanuatu	143	143	0%	完全一致

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表 3. 复现结果中各国家不同回答类别的百分比 (Adults)

Country	报告结果	No	Kind of	Yes	missing data	δ	评级
US	原研究报告结果	41.73%	4.90%	53.30%	0.07%	0%	完全一致
	本研究报告结果	41.73%	4.90%	53.30%	0.07%		
Ghana	原研究报告结果	73.86%	0.99%	24.99%	0.17%	0%	完全一致
	本研究报告结果	73.86%	0.99%	24.99%	0.17%		
Thailand	原研究报告结果	34.32%	18.55%	47.07%	0.06%	0%	完全一致
	本研究报告结果	34.32%	18.55%	47.07%	0.06%		
China	原研究报告结果	41.08%	9.21%	49.42%	0.29%	0%	完全一致
	本研究报告结果	41.08%	9.21%	49.42%	0.29%		
Vanuatu	原研究报告结果	35.46%	4.99%	59.17%	0.38%	0%	完全一致
	本研究报告结果	35.46%	4.99%	59.17%	0.38%		

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表 4. 复现结果中各国家不同回答类别的百分比 (Children)

Country	报告结果	No	Kind of	Yes	missing data	δ	评级
US	原研究报告结果	42.14%	16.09%	40.88%	0.89%	0%	完全一致
	本研究报告结果	42.14%	16.09%	40.88%	0.89%		
Ghana	原研究报告结果	54.12%	1.48%	44.09%	0.32%	0%	完全一致
	本研究报告结果	54.12%	1.48%	44.09%	0.32%		
Thailand	原研究报告结果	37.99%	25.86%	35.90%	0.26%	0%	完全一致
	本研究报告结果	37.99%	25.86%	35.90%	0.26%		
China	原研究报告结果	35.01%	17.03%	47.00%	0.96%	0%	完全一致
	本研究报告结果	35.01%	17.03%	47.00%	0.96%		
Vanuatu	原研究报告结果	50.02%	3.89%	46.03%	0.06%	0%	完全一致
	本研究报告结果	50.02%	3.89%	46.03%	0.06%		

表 5. 其他国家中与美国成人“Body”因子相似的因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chADULTS_F2	usADULTS_F1	0.881	0.760	0.950	adults	China	Ch. adults Factor 2	0%	完全一致
复现	chADULTS_F2	usADULTS_F1	0.871	0.700	0.959	adults	China	Ch. adults Factor 2		
原文	ghADULTS_F2	usADULTS_F1	0.871	0.700	0.959	adults	Ghana	Gh. adults Factor 2	0%	完全一致
复现	ghADULTS_F2	usADULTS_F1	0.871	0.700	0.959	adults	Ghana	Gh. adults Factor 2		
原文	thADULTS_F1	usADULTS_F1	0.900	0.785	0.959	adults	Thailand	Th. adults Factor 1	0%	完全一致
复现	thADULTS_F1	usADULTS_F1	0.900	0.785	0.959	adults	Thailand	Th. adults Factor 1		
原文	vtADULTS_F2	usADULTS_F1	0.870	0.739	0.941	adults	Vanuatu	Va. adults Factor 2	0%	完全一致
复现	vtADULTS_F2	usADULTS_F1	0.870	0.739	0.941	adults	Vanuatu	Va. adults Factor 2		

表 6. 其他国家中与美国成人“Body”因子不相似但与“Mind”因子相似的因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chADULTS_F2	usADULTS_F3	0.327	0.074	0.562	adults	China	Ch. adults Factor 2	0%	完全一致
复现	chADULTS_F2	usADULTS_F3	0.327	0.074	0.562	adults	China	Ch. adults Factor 2		
原文	ghADULTS_F2	usADULTS_F3	0.287	0.015	0.520	adults	Ghana	Gh. adults Factor 2	0%	完全一致
复现	ghADULTS_F2	usADULTS_F3	0.287	0.015	0.520	adults	Ghana	Gh. adults Factor 2		
原文	thADULTS_F1	usADULTS_F3	0.302	0.069	0.527	adults	Thailand	Th. adults Factor 1	0%	完全一致
复现	thADULTS_F1	usADULTS_F3	0.302	0.069	0.527	adults	Thailand	Th. adults Factor 1		
原文	vtADULTS_F2	usADULTS_F3	0.294	0.088	0.492	adults	Vanuatu	Va. adults Factor 2	0%	完全一致
复现	vtADULTS_F2	usADULTS_F3	0.294	0.088	0.492	adults	Vanuatu	Va. adults Factor 2		

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表 7. 其他国家中与美国成人“Mind”因子相似的因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chADULTS_F3	usADULTS_F3	0.917	0.830	0.962	adults	China	Ch. adults Factor 3	0%	完全一致
复现	chADULTS_F3	usADULTS_F3	0.917	0.830	0.962	adults	China	Ch. adults Factor 3		
原文	ghADULTS_F1	usADULTS_F3	0.781	0.642	0.892	adults	Ghana	Gh. adults Factor 1	0%	完全一致
复现	ghADULTS_F1	usADULTS_F3	0.781	0.642	0.892	adults	Ghana	Gh. adults Factor 1		
原文	thADULTS_F3	usADULTS_F3	0.889	0.777	0.960	adults	Thailand	Th. adults Factor 3	0%	完全一致
复现	thADULTS_F3	usADULTS_F3	0.889	0.777	0.960	adults	Thailand	Th. adults Factor 3		
原文	vtADULTS_F1	usADULTS_F3	0.750	0.563	0.885	adults	Vanuatu	Va. adults Factor 1	0%	完全一致
复现	vtADULTS_F1	usADULTS_F3	0.750	0.563	0.885	adults	Vanuatu	Va. adults Factor 1		

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表 8. 其他国家中与美国成人“Mind”因子不相似但与“Body”因子相似的因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chADULTS_F3	usADULTS_F1	0.334	0.036	0.595	adults	China	Ch. adults Factor 3	0%	完全一致
复现	chADULTS_F3	usADULTS_F1	0.334	0.036	0.595	adults	China	Ch. adults Factor 3		
原文	ghADULTS_F1	usADULTS_F1	0.184	-0.069	0.447	adults	Ghana	Gh. adults Factor 1	0%	完全一致
复现	ghADULTS_F1	usADULTS_F1	0.184	-0.069	0.447	adults	Ghana	Gh. adults Factor 1		
原文	thADULTS_F3	usADULTS_F1	0.265	0.024	0.490	adults	Thailand	Th. adults Factor 3	0%	完全一致
复现	thADULTS_F3	usADULTS_F1	0.265	0.024	0.490	adults	Thailand	Th. adults Factor 3		
原文	vtADULTS_F1	usADULTS_F1	0.196	-0.060	0.439	adults	Vanuatu	Va. adults Factor 1	0%	完全一致
复现	vtADULTS_F1	usADULTS_F1	0.196	-0.060	0.439	adults	Vanuatu	Va. adults Factor 1		

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表 9. 其他国家中与美国成人“Heart”因子相似的因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chADULTS_F1	usADULTS_F2	0.973	0.949	0.987	adults	China	Ch. adults Factor 1	0%	完全一致
复现	chADULTS_F1	usADULTS_F2	0.973	0.949	0.987	adults	China	Ch. adults Factor 1		
原文	thADULTS_F2	usADULTS_F2	0.969	0.947	0.986	adults	Thailand	Th. adults Factor 2	0%	完全一致
复现	thADULTS_F2	usADULTS_F2	0.969	0.947	0.986	adults	Thailand	Th. adults Factor 2		

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表 10. 其他国家中与美国成人“Heart”因子不相似但与“Body”或“Mind”因子相似的因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chADULTS_F2	usADULTS_F2	0.157	-0.093	0.416	adults	China	Ch. adults Factor 2	0%	完全一致
复现	chADULTS_F2	usADULTS_F2	0.157	-0.093	0.416	adults	China	Ch. adults Factor 2		
原文	chADULTS_F3	usADULTS_F2	0.324	0.122	0.530	adults	China	Gh. adults Factor 3	0%	完全一致
复现	chADULTS_F3	usADULTS_F2	0.324	0.122	0.530	adults	China	Gh. adults Factor 3		
原文	thADULTS_F1	usADULTS_F2	0.349	0.103	0.576	adults	Thailand	Th. adults Factor 1	0%	完全一致
复现	thADULTS_F1	usADULTS_F2	0.349	0.103	0.576	adults	Thailand	Th. adults Factor 1		
原文	thADULTS_F3	usADULTS_F2	0.327	0.137	0.548	adults	Thailand	Va. adults Factor 3	0%	完全一致
复现	thADULTS_F3	usADULTS_F2	0.327	0.137	0.548	adults	Thailand	Va. adults Factor 3		

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表 11. 与当地成人“Body”因子相似的儿童因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chCHILDREN_F2	chCHILDREN_F2	0.766	0.504	0.912	children	China	Ch. children Factor 2	0%	完全一致
复现	chCHILDREN_F2	chCHILDREN_F2	0.766	0.504	0.912	children	China	Ch. children Factor 2		
原文	ghCHIDREN_F1	ghCHILDREN_F2	0.870	0.745	0.950	children	Ghana	Gh. children Factor 1	0%	完全一致
复现	ghCHIDREN_F1	ghCHILDREN_F2	0.870	0.745	0.950	children	Ghana	Gh. children Factor 1		
原文	thCHILDREN_F1	thCHILDREN_F1	0.844	0.701	0.934	children	Thailand	Th. chidren Factor 1	0%	完全一致
复现	thCHILDREN_F1	thCHILDREN_F1	0.844	0.701	0.934	children	Thailand	Th. chidren Factor 1		
原文	usCHILDREN_F1	usCHILDREN_F1	0.904	0.807	0.970	children	US	US children Factor 1	0%	完全一致
复现	usCHILDREN_F1	usCHILDREN_F1	0.904	0.807	0.970	children	US	US children Factor 1		
原文	vtCHILDREN_F1	vtCHILDREN_F2	0.843	0.715	0.922	children	Vanuatu	Va. children Factor 1	0%	完全一致
复现	vtCHILDRE_F1	vtCHILDRE_F2	0.843	0.715	0.922	children	Vanuatu	Va. children Factor 1		

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表 12. 与当地成人“Body”因子不相似但与“Mind”因子相似的儿童因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chCHILDREN_F2	chCHILDREN_F3	0.374	0.085	0.650	children	China	Ch. children Factor 2	0%	完全一致
复现	chCHILDREN_F2	chCHILDREN_F3	0.374	0.085	0.650	children	China	Ch. children Factor 2		
原文	ghCHILDREN_F1	ghCHILDREN_F1	0.265	0.057	0.496	children	Ghana	Gh. children Factor 1	0%	完全一致
复现	ghCHILDREN_F1	ghCHILDREN_F1	0.265	0.057	0.496	children	Ghana	Gh. children Factor 1		
原文	thCHILDREN_F1	thCHILDREN_F3	0.215	-0.048	0.500	children	Thailand	Th. chidren Factor 1	0%	完全一致
复现	thCHLDREN_F1	thCHILDREN_F3	0.215	-0.048	0.500	children	Thailand	Th. chidren Factor 1		
原文	usCHILDREN_F1	usCHILDREN_F3	0.253	0.056	0.447	children	US	US children Factor 1	0%	完全一致
复现	usCHILDREN_F1	usADULTS_F3	0.253	0.056	0.447	children	US	US children Factor 1		
原文	vtCHILDREN_F1	vtCHILDREN_F1	0.388	0.133	0.615	children	Vanuatu	Va. children Factor 1	0%	完全一致
复现	vtCHILDREN_F1	vtCHILDREN_F1	0.388	0.133	0.615	children	Vanuatu	Va. children Factor 1		

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表 13. 与当地成人“Mind”因子相似的儿童因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chCHILDREN_F3	chCHILDREN_F3	0.811	0.599	0.922	children	China	Ch. children Factor 3	0%	完全一致
复现	chCHILDREN_F3	chCHILDRENS_F3	0.811	0.599	0.922	children	China	Ch. children Factor 3		
原文	ghCHILDREN_F2	ghCHILDREN_F1	0.852	0.709	0.945	children	Ghana	Gh. children Factor 2	0%	完全一致
复现	ghCHILDREN_F2	ghCHILDREN_F1	0.852	0.709	0.945	children	Ghana	Gh. children Factor 2		
原文	thCHILDREN_F3	thCHILDREN_F3	0.867	0.701	0.954	children	Thailand	Th. chidren Factor 3	0%	完全一致
复现	thCHILDREN_F3	thCHILDREN_F3	0.867	0.701	0.954	children	Thailand	Th. chidren Factor 3		
原文	usCHILDREN_F2	usCHILDREN_F3	0.926	0.840	0.967	children	US	US children Factor 2	0%	完全一致
复现	usCHILDREN_F2	usCHILDREN_F3	0.926	0.840	0.967	children	US	US children Factor 2		
原文	vtCHILDREN_F2	vtCHILDREN_F1	0.891	0.822	0.948	children	Vanuatu	Va. children Factor 2	0%	完全一致
复现	vtCHILDREN_F2	vtCHILDREN_F1	0.891	0.822	0.948	children	Vanuatu	Va. children Factor 2		

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表 14. 与当地成人“Mind”因子不相似但与“Body”因子相似的儿童因子载荷

结果报告	factor_A	factor_B	mean	ci_lower	ci_upper	age_group_A	country_A	factor_name_A	δ	评级
原文	chCHILDREN_F3	chADULTS_F2	0.136	-0.190	0.439	children	China	Ch. children Factor 3	0%	完全一致
复现	chCHILDREN_F3	chADULTS_F2	0.136	-0.190	0.439	children	China	Ch. children Factor 3		
原文	ghCHILDREN_F2	ghADULTS_F2	0.292	0.042	0.536	children	Ghana	Gh. children Factor 2	0%	完全一致
复现	ghCHILDREN_F2	ghADULTS_F2	0.292	0.042	0.536	children	Ghana	Gh. children Factor 2		
原文	thCHILDREN_F3	thADULTS_F1	0.183	-0.058	0.442	children	Thailand	Th. children Factor 3	0%	完全一致
复现	thCHILDREN_F3	thADULTS_F1	0.183	-0.058	0.442	children	Thailand	Th. children Factor 3		
原文	usCHILDREN_F2	usADULTS_F1	0.180	-0.059	0.456	children	US	US. children Factor 2	0%	完全一致
复现	usCHILDREN_F2	usADULTS_F1	0.180	-0.059	0.456	children	US	US. children Factor 2		
原文	vtCHILDREN_F2	vtADULTS_F2	0.010	-0.128	0.153	children	Vanuatu	Va. adults Factor 2	0%	完全一致
复现	vtCHILDREN_F2	vtADULTS_F2	0.010	-0.128	0.153	children	Vanuatu	Va. adults Factor 2		

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表 15. 成年人和儿童的各因素解释方差比例

Factor	结果报告	metric	age_group	US	Ghana	Thailand	China	Vanuatu	δ	评级
F1	原文	Proportion Explained	adults	0.35	0.50	0.41	0.39	0.55	2.78%	偏差较小
	复现	Proportion Explained	adults	0.36	0.50	0.41	0.39	0.55		
	原文	Proportion Var	adults	0.23	0.35	0.18	0.20	0.29	0%	完全一致
	复现	Proportion Var	adults	0.23	0.35	0.18	0.20	0.29		
F2	原文	Proportion Explained	adults	0.36	0.36	0.33	0.31	0.45	0%	完全一致
	复现	Proportion Explained	adults	0.35	0.36	0.33	0.31	0.45		
	原文	Proportion Var	adults	0.23	0.25	0.14	0.16	0.23	2.78%	偏差较小
	复现	Proportion Var	adults	0.23	0.25	0.14	0.16	0.24		
F3	原文	Proportion Explained	adults	0.29	0.14	0.26	0.30	NA	0%	完全一致
	复现	Proportion Explained	adults	0.29	0.14	0.26	0.30	NA		
	原文	Proportion Var	adults	0.19	0.10	0.11	0.15	NA	0%	完全一致
	复现	Proportion Var	adults	0.19	0.10	0.11	0.15	NA	0%	完全一致
F4	原文	Proportion Explained	adults	NA	NA	NA	NA	NA	0%	完全一致
	复现	Proportion Explained	adults	NA	NA	NA	NA	NA		
	原文	Proportion Var	adults	NA	NA	NA	NA	NA	0%	完全一致
	复现	Proportion Var	adults	NA	NA	NA	NA	NA		
F1	原文	Proportion Explained	children	0.51	0.49	0.34	0.52	0.49	0%	完全一致
	复现	Proportion Explained	children	0.51	0.49	0.34	0.52	0.49		
	原文	Proportion Var	children	0.26	0.29	0.16	0.29	0.24	0%	完全一致
	复现	Proportion Var	children	0.26	0.29	0.16	0.29	0.24		
	原文	Cumulative Var	adults	0.65	0.7	0.43	0.52	0.53	0%	完全一致
	复现	Cumulative Var	adults	0.65	0.7	0.43	0.52	0.53		
	原文	Cumulative Var	children	0.50	0.6	0.47	0.57	0.49	0%	完全一致
	复现	Cumulative Var	chidlren	0.50	0.6	0.47	0.57	0.49		

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表 16. 复现结果中各国家成人的因素间相关性

Factor	结果报告	US			Ghana			Thailand			China			Vanuatu	
		F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2
F1	原文	1.000	0.511	0.481	1.000	0.273	0.344	1.000	0.414	0.322	1.000	0.459	0.619	1.000	0.687
	复现	1.000	0.511	0.537	1.000	0.273	0.344	1.000	0.414	0.322	1.000	0.459	0.619	1.000	0.687
F2	原文	0.511	1.000	0.538	0.273	1.000	0.259	0.414	1.000	0.416	0.459	1.000	0.370	0.687	1.000
	复现	0.511	1.000	0.480	0.273	1.000	0.259	0.414	1.000	0.416	0.459	1.000	0.370	0.687	1.000
F3	原文	0.481	0.537	1.000	0.344	0.256	1.000	0.322	0.416	1.000	0.618	0.370	1.000		
	复现	0.537	0.480	1.000	0.344	0.256	1.000	0.322	0.416	1.000	0.618	0.370	1.000		
δ		10.42%	0%	12.08%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
评级		偏差较大	完全一致	偏差较大	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致

表 17. 复现结果中各国家儿童的因素间相关性

Factor	结果报告	US			Ghana			Thailand				China				Vanuatu		
		F1	F2	F3	F1	F2	F3	F1	F2	F3	F4	F1	F2	F3	F4	F1	F2	F3
F1	原文	1.000	0.303	0.433	1.000	0.579	0.175	1.000	0.542	0.147	-0.009	1.000	0.512	0.325	0.258	1.000	0.312	0.519
	复现	1.000	0.433	0.303	1.000	0.579	0.175	1.000	0.542	0.147	-0.009	1.000	0.512	0.325	0.257	1.000	0.312	0.519
F2	原文	0.303	1.000	0.486	0.579	1.000	0.385	0.542	1.000	0.317	0.093	0.512	1.000	0.152	0.076	0.312	1.000	0.336
	复现	0.433	1.000	0.486	0.579	1.000	0.385	0.542	1.000	0.317	0.093	0.512	1.000	0.152	0.076	0.312	1.000	0.336
F3	原文	0.433	0.486	1.000	0.174	0.385	1.000	0.147	0.317	1.000	0.269	0.325	0.152	1.000	0.135	0.519	0.336	1.000
	复现	0.303	0.486	1.000	0.174	0.385	1.000	0.147	0.317	1.000	0.269	0.325	0.152	1.000	0.135	0.519	0.336	1.000
F4	原文							-0.009	0.093	0.269	1.000	0.258	0.076	0.135	1.000			
	复现							-0.009	0.093	0.269	1.000	0.258	0.076	0.135	1.000			
δ		0%	30.02%	30.02%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
评级		完全一致	偏差较大	偏差较大	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致	完全一致

表 18. 计算可重复性的评估表

可重复性情况	数量及占比	
	N	%
完全一致($\delta = 0\%$)	248	97.63%
偏差较小($0\% < \delta < 10\%$)	2	0.78%
偏差较大($\delta > 10\%$)	4	1.57%
因舍入导致的偏差	0	0%

4.2 Summary of replication experience

The members of this group have also learned a lot through the reproduction of the data code in Weisman et al.'s paper, and based on their sharing, this section will summarize the key points of everyone's experience and experience

1. **Understanding Code Overview**:
    - Avoid using the `source()` function in R Markdown to prevent automatic execution of loaded R scripts. Manual review of R scripts helps in comprehensively understanding the authors' data analysis approach.
2. **Distinguishing `require` and `library` Functions**:
    - Use `require(package)` to return FALSE if the package is missing or fails to load, while `library(package)` halts execution if loading fails. Understanding this distinction is crucial for script continuity.
3. **Custom Functions and Scripts**:
    - Authors often create custom functions in separate scripts for data processing, exploratory factor analysis, regression analysis, reliability analysis, scoring, and visualization. Enhancing code modularity and readability.
4. **Data Preprocessing**:
    - Excluding specific data files or directories containing "raw" in their names, as indicated in the .gitignore file, is common practice. Understanding the authors' data preprocessing steps is essential for successful replication.
5. **Coding Style and `%>%` Pipe Operator**:
    - Familiarize with authors' coding style, including using the `%>%` pipe operator from the dplyr package for smoother and more readable data processing. The pipe operator facilitates chaining operations and streamlines code.

6. **Visualization in R Markdown**:

    - When plotting with ggplot2 in R Markdown, pay attention to saving graphs using `ggsave()` due to differences in display panes between R Markdown and R scripts.

7. **Interdisciplinary Insights**:

    - Compare psychological research in the paper with the philosophical "Three Worlds" theory to derive insights from other disciplines. Avoid relying solely on internal disciplinary assumptions in psychological research and consider adopting bottom-up research methods, especially in fields susceptible to researcher bias.

8. **R Language Learning Experience**:

    - Utilize forums, university websites, and other resources to deepen understanding of unfamiliar terms, theoretical concepts, and analytical tools' usage, while staying updated on subject-specific research group discussions.

9. **PPT Design and Presentation Skills**:

    - Emphasize concise and information-rich PPT design with logical coherence and clear structure. Avoid excessive text and prioritize the use of images for effective information presentation.

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