Unity in diversity: Children from 17 communities process gaze in similar ways

Supplementary material

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Contents


```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.3     v readr     2.1.4
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.4.4     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.0
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
##
## Attaching package: 'maps'
##
##
## The following object is masked from 'package:purrr':
##
##     map
##
##
## Loading required package: Rcpp
```

```
##
## Loading 'brms' package (version 2.20.4). Useful instructions
## can be found by typing help('brms'). A more detailed introduction
## to the package is available through vignette('brms_overview').
##
##
## Attaching package: 'brms'
##
##
## The following object is masked from 'package:stats':
##
##     ar
##
##
##
## Attaching package: 'cowplot'
##
##
## The following object is masked from 'package:ggthemes':
##
##     theme_map
##
##
## The following object is masked from 'package:ggpubr':
##
##     get_legend
##
##
## The following object is masked from 'package:lubridate':
##
##     stamp
```

Overview

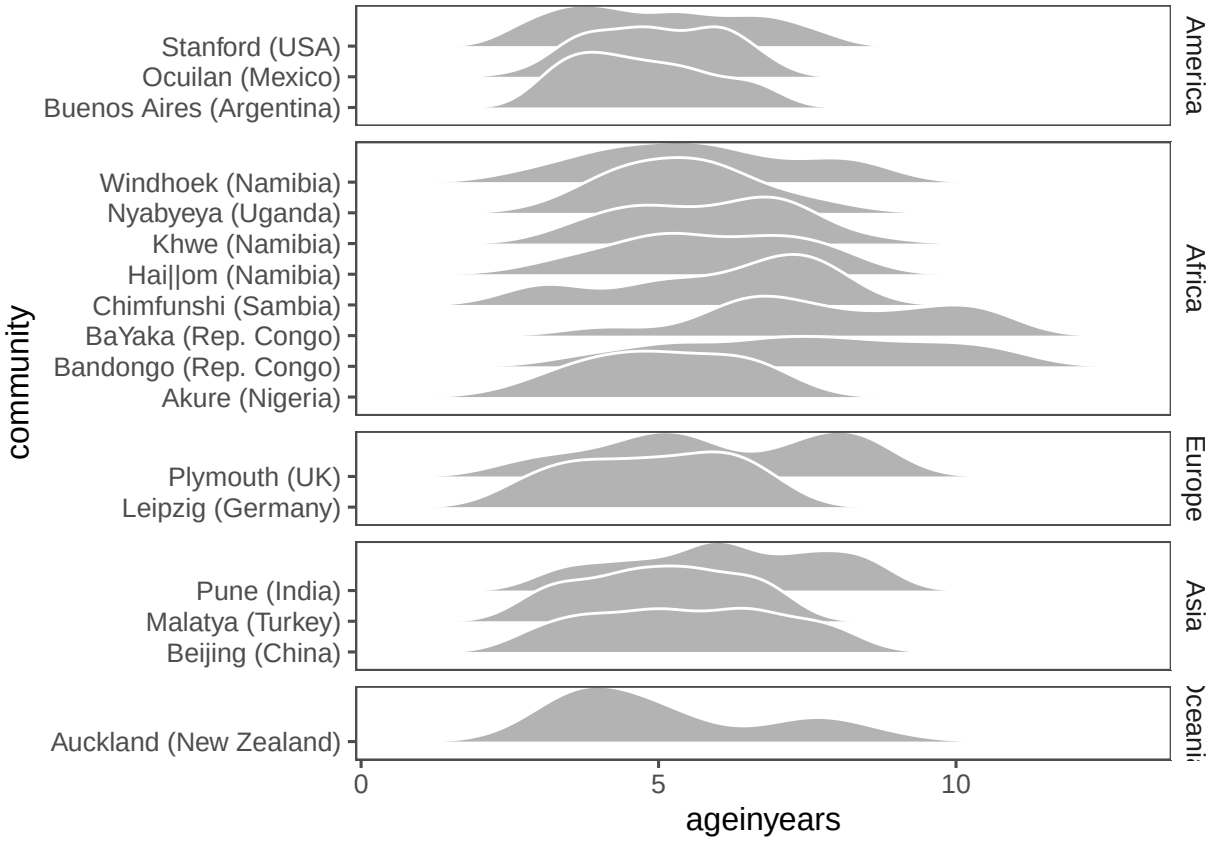
in the section site descriptions

Participants

A total of 1311 children between 2.38 and 10.95 provided data for the study. Children lived in 17 different communities, located in 0 different countries. Table 1 gives the sample size per community together with some basic demographic information. Additional children were recruited but did not contribute data to the study. The recruitment strategy varied from community to community and we therefore cannot provide detailed information about the number of children that were excluded. All children who contributed at least five valid data points were included in the final sample. We did not exclude any participants for performance reasons. A detailed description of each site and the way children were recruited can be found below.

Supplementary Table 1: Participant demographics.

Community	Country	Continent	N	Sex (male)	Age (range)
Buenos Aires	Argentina	America	105	53	4.72 (3.00 - 6.96)
Ocuilan	Mexico	America	125	61	4.97 (2.57 - 6.95)
Stanford	USA	America	100	0	5.00 (2.52 - 7.90)
Akure	Nigeria	Africa	114	53	5.07 (2.57 - 7.33)
BaYaka	Rep. Congo	Africa	28	12	7.86 (3.94 - 10.56)
Bandongo	Rep. Congo	Africa	30	11	7.45 (3.50 - 10.95)
Chimfunshi	Sambia	Africa	22	5	5.98 (2.88 - 8.00)
Hai||om	Namibia	Africa	60	38	5.85 (2.74 - 8.34)
Khwe	Namibia	Africa	59	24	5.84 (3.38 - 8.63)
Nyabyeya	Uganda	Africa	51	27	5.41 (3.27 - 8.21)
Windhoek	Namibia	Africa	41	18	5.68 (2.66 - 8.66)
Leipzig	Germany	Europe	100	48	4.88 (2.53 - 6.95)
Plymouth	UK	Europe	70	30	6.02 (2.38 - 8.94)
Beijing	China	Asia	123	62	5.47 (2.69 - 8.48)
Malatya	Turkey	Asia	85	40	5.02 (2.75 - 7.12)
Pune	India	Asia	155	75	6.14 (3.06 - 8.83)
Auckland	New Zealand	Oceania	43	19	5.14 (2.81 - 8.75)



Site descriptions

Chimfunshi (Sambia) - Location

Hai||om (Namibia) - Ethnic group

Khwe (Namibia) - Ethnic group

Windhoek (Namibia) - Location

Leipzig (Germany) - Location

Akure (Nigeria) - Location

Plymouth (UK) - Location

Stanford (USA) - Location

Ocuilan (Mexico) - Location

Beijing (China) - Location

Buenos Aires (Argentina) - Location

Pune (India) - Location

Auckland (New Zealand) - Location

Malatya (Turkey) - Location

Bandongo (Rep. Congo) - Ethnic group

Bayaka (Rep. Congo) - Ethnic group

Nyabyeya (Uganda) - Location

Method

We adapted the task developed by Prein and colleagues (Prein et al. 2023). We refer to the original publication for a detailed description of its development, implementation and psychometric evaluation (in Germany). Below give an overview and focus on the cross-cultural adaptation of the task.

Design

Setup and Procedure

The task was implemented as a browser-based interactive picture book. Participants saw animated agents on a touch screen device, listened to pre-recorded audio instructions and responded by touching the screen. In all communities, a research assistant, fluent in the local language(s), guided the child through the task.

Figure X shows a screenshot from the task. The task was introduced verbally by the assistant as the balloon game in which the participant would play with other children to find a balloon. On each trial, participants

saw an agent located in a window in the center of the screen. A balloon fell down from its starting position just below the agent. The agent's gaze followed the trajectory of the balloon. That is, the pupils and the iris were programmed to align with the center of the balloon. Once the balloon had landed on the ground, the agent was instructed to locate it, that is, to touch the location on the screen where they thought the balloon was.

There were two types of familiarization trials. In fam1 trials, the balloon fell down and landed in plain sight. Participants simply had to touch the visible balloon. In fam2 trials, the trajectory of the balloon was visible but it landed behind a small barrier (usually a hedge - see Figure XXB). Thus, participants needed to touch the hedge where they saw the balloon land. Next came test trials. Here, the barrier moved up and covered the balloons trajectory. That is, participants only saw the agents eyes move, but not the balloon. They had to infer the location of the balloon based on the agent's gaze direction. During fam1, fam2 and the first test trial, children heard voice overs commenting what happened on the screen. Critically, the agent was described as wanting to help the child and to always look at the balloon (see section script for the English wording).

Children completed one fam1 trial, two fam2 trials and 16 test trials. We excluded the first test trial from the analysis because of the voice-over. Thus, 15 test trials were used in the analysis below.

Each child saw eight different agents, four male, four female. The agent changed from trial to trail, with alternating genders. A coin toss before the first trial decided whether the first agent was male or female. The order in which agents were shown was randomized with the constraint that all agents had to be shown once until an agent was shown again. The color of the balloon also changed from trial to trial in a random order, also with the constraint that all colors appeared once before any one was repeated.

The location (x-coordinate) where the balloon landed was determined in the following way: The screen was divided in ten equally sized bins. On each trial, one of the bins was randomly selected and the exact x-coordinate was randomly chosen within that bin. Constraints were that the balloon landed in each bin equally often and the same bin appeared no more than twice in a row.

Culture-specific adaptations

Each child saw eight different agents, four female and four male.

different devices used, all at least 11'' screen and touch screen

Analysis

Appendix: Script

Welcome (before the start of the task):

Hello! Great that you're here. We'll now play a balloon game. Can you see the children in the picture over there? We want to play together with the children using the balloon. We'll now talk you through exactly what will happen.

Fam 1:

Look, a girl/boy is standing in the window. And can you see the balloon over there? The balloon always falls down and lands on the ground. And you have to find it! The girl/boy helps you and always looks at the balloon.

[balloon falls down]

Where is the balloon? Touch the balloon!

Fam 2:

Perfect, that was great! Now, we'll continue playing. Can you see the girl/boy and the balloon again? The balloon will fall down again. This time, it will fall behind a hedge. And you have to find it! The girl/boy helps you and looks at the balloon.

[balloon falls down]

Where is the balloon? On the hedge, touch where the balloon is.

Test:

Nice, good job! Now, we'll continue playing. There is the balloon, the girl/boy and the hedge. The hedge is growing a bit now.

The balloon is behind the hedge now. You can't see it - but the girl/boy can! The balloon falls to the ground and you have to find it. Remember - the girl/boy always looks at the balloon!

Prein, Julia Christin, Steven Kalinke, Daniel BM Haun, and Manuel Bohn. 2023. "TANGO: A Reliable, Open-Source, Browser-Based Task to Assess Individual Differences in Gaze Understanding in 3 to 5-Year-Old Children and Adults." *Behavior Research Methods*, 1–17.