
Figures and figure supplements

Toward neuroanatomical and cognitive foundations of macaque social tolerance grades

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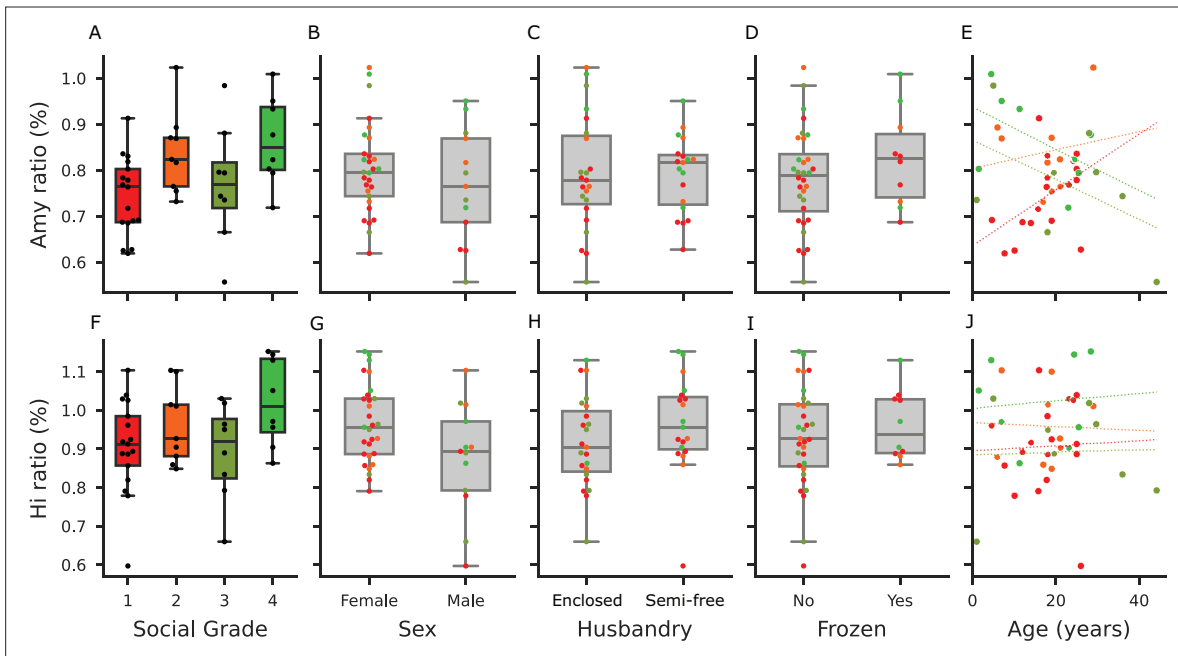


Figure 1. Model predictors of the amygdala and hippocampus, and volume predictions across social tolerance grades. First row (A–D): Model predictors and responses for amygdala volume. The volume ratio is calculated as the amygdala volume divided by the total brain volume (excluding the myelencephalon and cerebellum). (A) Distribution of amygdala volume ratios across social tolerance grades. (B) Distribution of amygdala volume ratios by sex. (C) Distribution of amygdala volume ratios by husbandry condition (enclosed vs. semi-free). (D) Distribution of amygdala volume ratios by the frozen status. (E) Distribution of amygdala volume ratios by age. Second row (F–J): Model predictors and responses for hippocampal volume. The volume ratio is calculated as the hippocampal volume divided by the total brain volume (excluding the myelencephalon and cerebellum). (F) Distribution of hippocampal volume ratios across social tolerance grades. (G) Distribution of hippocampal volume ratios by sex. (H) Distribution of hippocampal volume ratios by husbandry condition (enclosed vs. semi-free). (I) Distribution of hippocampal volume ratios by the frozen status. (J) Distribution of hippocampal volume ratios by age. Panels A–E and F–J share the same y-axis.

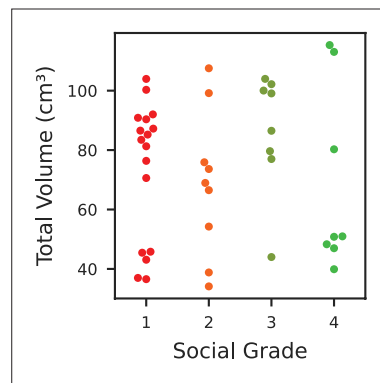


Figure 1—figure supplement 1. Total brain volume across macaque species categorized by social grade. Distribution of total brain volumes (in cm³) across the four social tolerance grades of the *Macaca* genus. Each dot represents an individual (n=42), and colors indicate social grade: red (grade 1, intolerant), orange (grade 2), olive (grade 3), and green (grade 4, tolerant). Total brain volume was computed from *post-mortem* MRI scans, excluding the cerebellum and myelencephalon to control for inter-individual variation in preservation quality. While total volume was included as a covariate in the statistical model, this figure provides a complementary descriptive overview of its distribution across social grades.

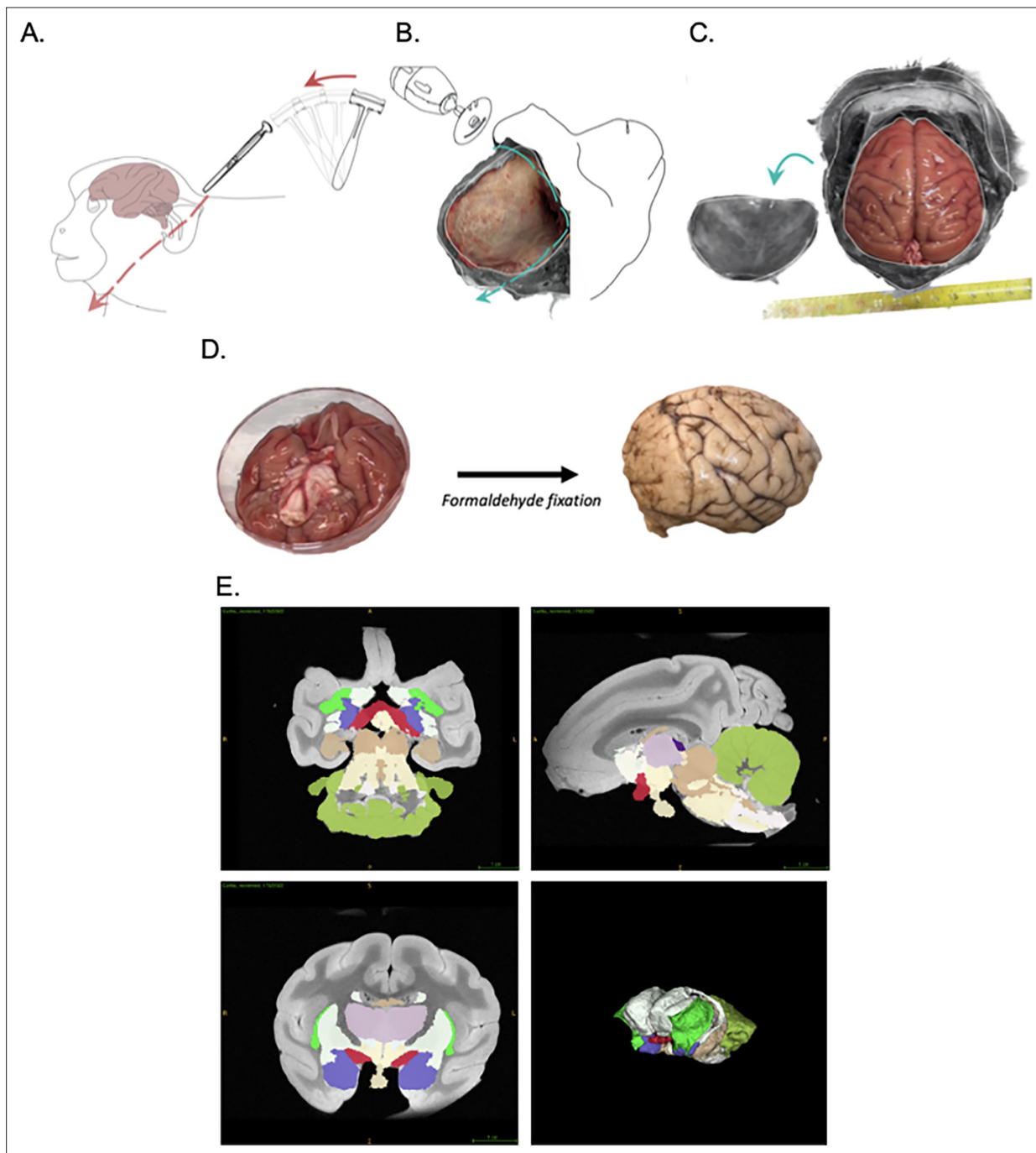


Figure 1—figure supplement 2. Sequence of dissection steps and MRI acquisition. (A) Craniotomy step: Position of the cadaver and cut site. (B) Steps of scalp and skull removal using a Dremel tool associated with a flex shaft rotary tool. (C) View of the skull after skull and dura removal. (D) Extraction and formaldehyde fixation of the brain. Right lateral view of the brain after a 7-day formaldehyde fixation. (E) SARM Regions (SARM2) and 3D MRI acquisition with atlas (bottom right). Amygdala (purple; Hartig et al., 2021).

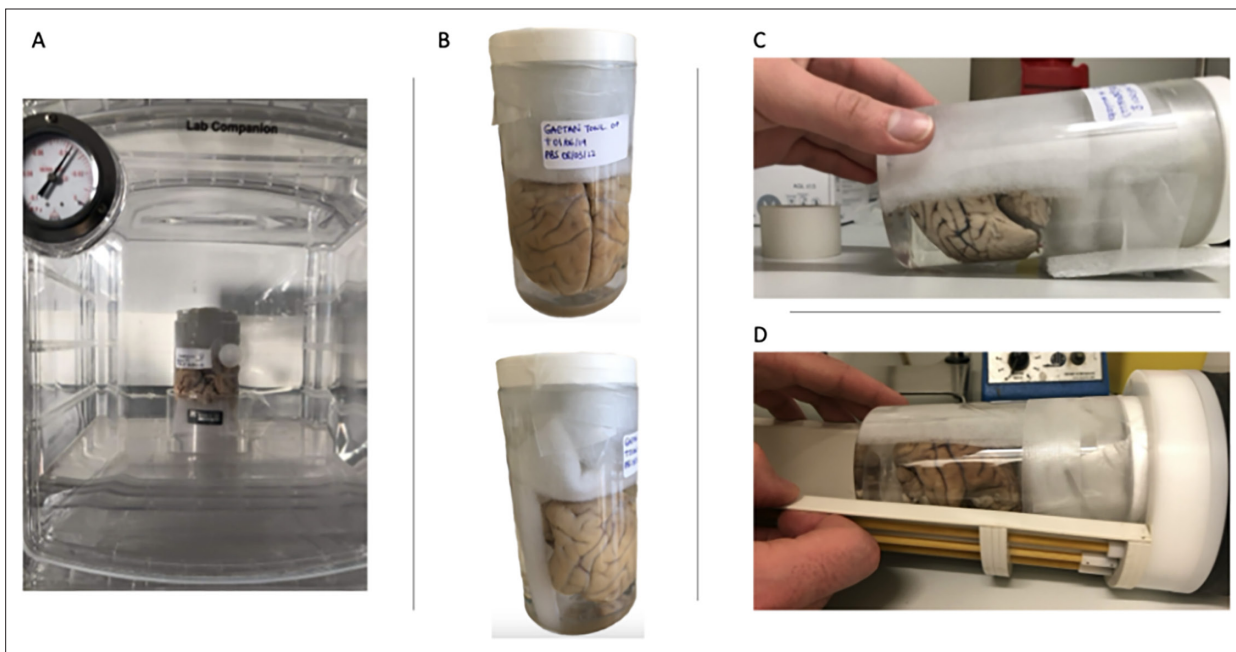


Figure 1—figure supplement 3. Set of photographs of the preparation of the fixed brain for MRI acquisitions. **(A)** Air bubble removal stages in a vacuum chamber. The brain is immersed in Fluorinert FC-770 and held in position by the aquarium foam squares. The container is placed in a receptacle to catch any Fluorinert FC-770 that may spill out of the container during the procedure; **(B)** Placement of the aquarium foam squares inside the container of brain immersed in Fluorinert FC-770 and sealed with parafilm; **(C)** Placement of the container with a lift foam square to contain the residual air bubble in the top third of the container; **(D)** Placement of the container in the MRI antenna.

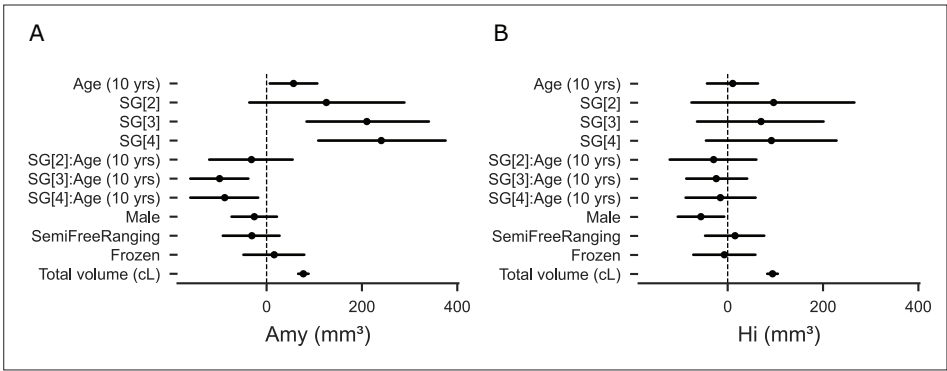


Figure 2. Parameters of the model. **(A)** Parameters of the model for the amygdala volume. **(B)** Parameters of the model for the hippocampal volume. SG [x]: Social Grade [x] vs Social Grade [1]; SG[x]: Age (10 years): Social Grade-Age interaction.

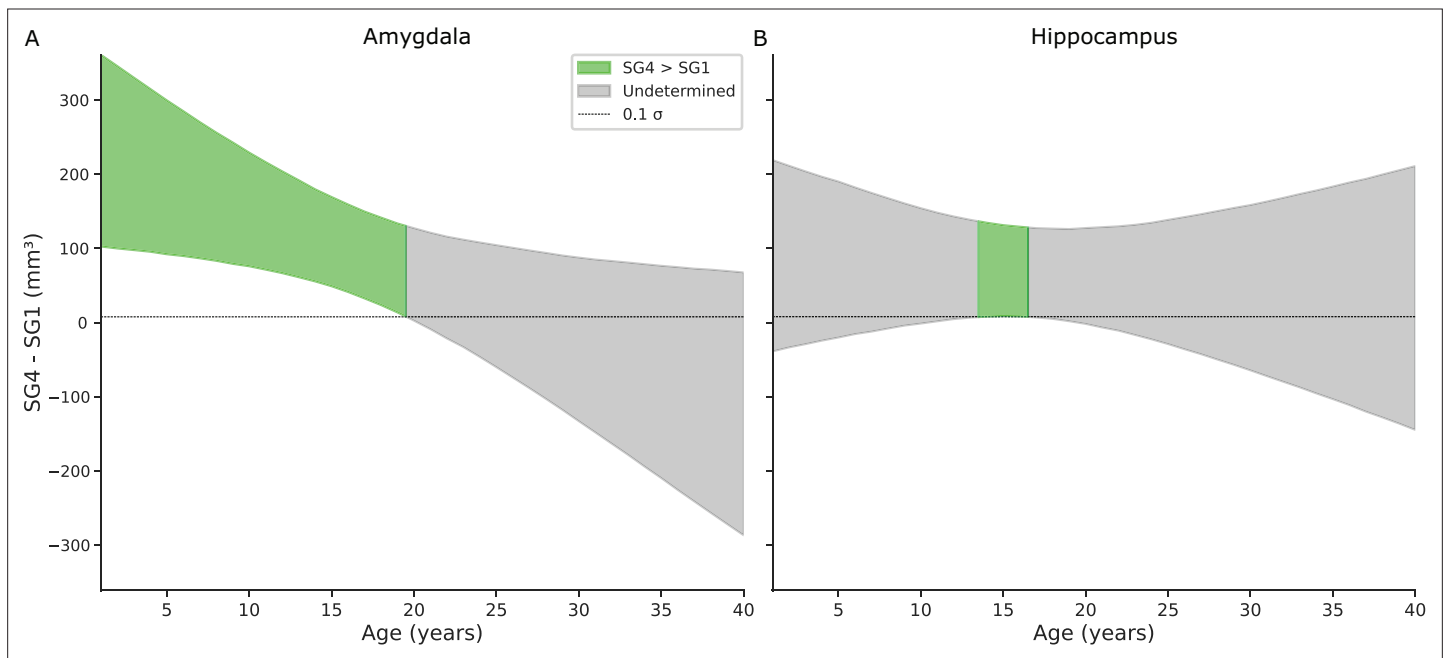


Figure 3. Bayesian hypothesis testing using a Region of Practical Equivalence (ROPE) to assess volume (in mm³) differences between Social Grade 4 (SG4; tolerant) and Social Grade 1 (SG1; intolerant) across age, for the amygdala (left) and hippocampus (right). Curves represent median posterior estimates, and shaded areas show 90% credible intervals. Gray bands indicate the ROPE ($\pm 0.1\sigma$). For the amygdala, the difference is credible until ~19 years. For the hippocampus, a credible effect is observed only between ~13 and 18 years.

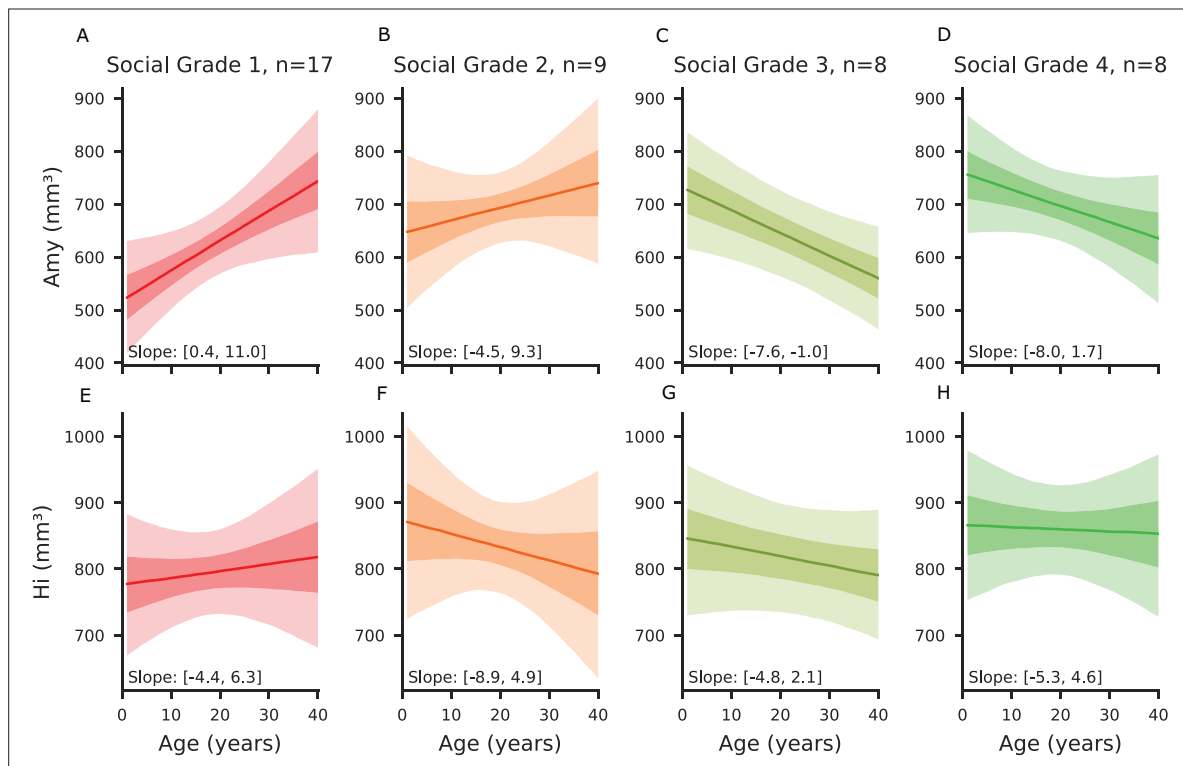


Figure 4. Volume predictions across social tolerance grades of the amygdala and hippocampus. All panels represent the predictions of the multivariate Bayesian linear model, where all the variables are kept constant (including total brain volumes) in order to represent the effect of age only on the volume of amygdala and hippocampus in mm^3 . First row (A–D): Predicted amygdala volume across social tolerance grades over the lifespan. (A) Predicted amygdala volume as a function of age for grade 1 (intolerant) individuals. (B) Predicted amygdala volume as a function of age for grade 2 individuals. (C) Predicted amygdala volume as a function of age for grade 3 individuals. (D) Predicted amygdala volume as a function of age for grade 4 (tolerant) individuals. Second row (E–H): Predicted hippocampal volume across social tolerance grades over the lifespan. (E) Predicted hippocampal volume as a function of age for grade 1 individuals. (F) Predicted hippocampal volume as a function of age for grade 2 individuals. (G) Predicted hippocampal volume as a function of age for grade 3 individuals. (H) Predicted hippocampal volume as a function of age for grade 4 individuals. In the plots, the solid lines represent the mean predicted values, and the shaded areas indicate the 90% credible intervals, with each social grade shown in a distinct color.

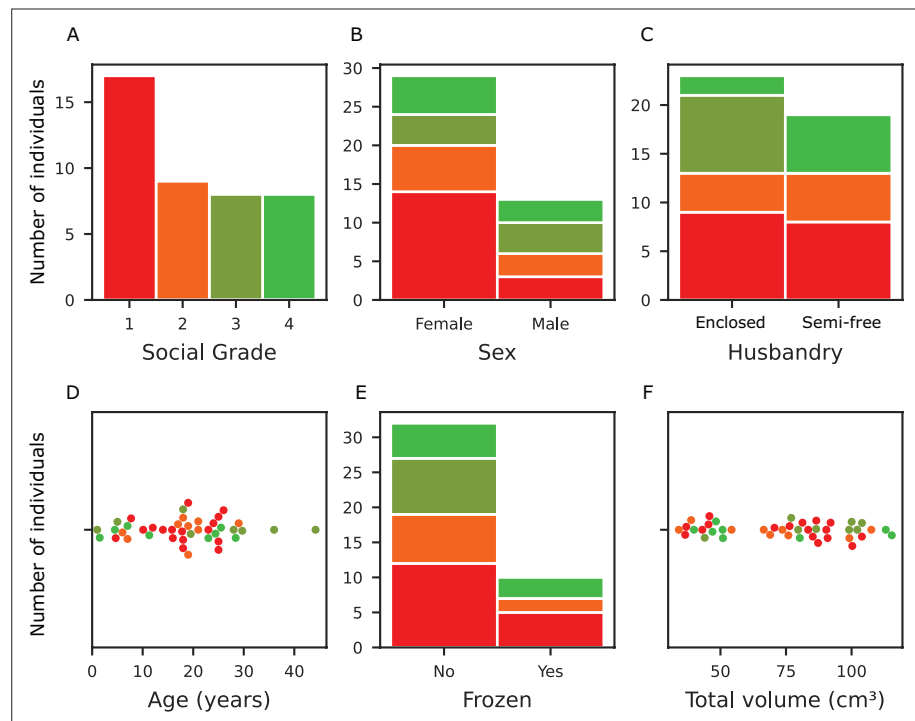


Figure 5. Dataset characteristics relative to the social grade. In red: social tolerance grade 1, orange: grade 2, olive: grade 3, and green: grade 4. **(A)** Social tolerance grade distribution, where grade 1 is overrepresented due to the prevalence of *Macaca mulatta* in laboratories. **(B)** Sex distribution: There was a significant imbalance in the sample, with females outnumbering males (2:1 ratio). **(C)** Husbandry distribution of the individuals (enclosed and semi-free ranging conditions) **(D)** Age distribution: The cohort had a relatively even age distribution with a notable peak in the 20 s. **(E)** The frozen status distribution. **(F)** Total brain volume distribution, excluding the myelencephalon and cerebellum due to variation in their preservation.