

# Posterior EEG Alpha and Personal Importance of Religion/Spirituality as Predictors of Depression Severity in Families at Risk for Depression

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## Introduction

- **Greater posterior EEG alpha**, a putative biomarker of clinical outcomes in major depression (MDD)<sup>1</sup>, may predict responsiveness to antidepressants<sup>2</sup>
- EEG alpha has been linked to **risk for** and **lifetime history of MDD**<sup>1,3</sup>
- **Personal importance of religion/spirituality (R/S)** has separately demonstrated protective effects against MDD<sup>4</sup>
- In a longitudinal study of families at high-risk for MDD<sup>5,6</sup>, we found greater EEG alpha in individuals with high R/S importance, particularly those with a lifetime history of MDD<sup>7,8</sup>

### Current Study:

- ❖ New measure of current depression symptoms
- ❖ New conceptualization and estimation of R/S importance

### Objectives:

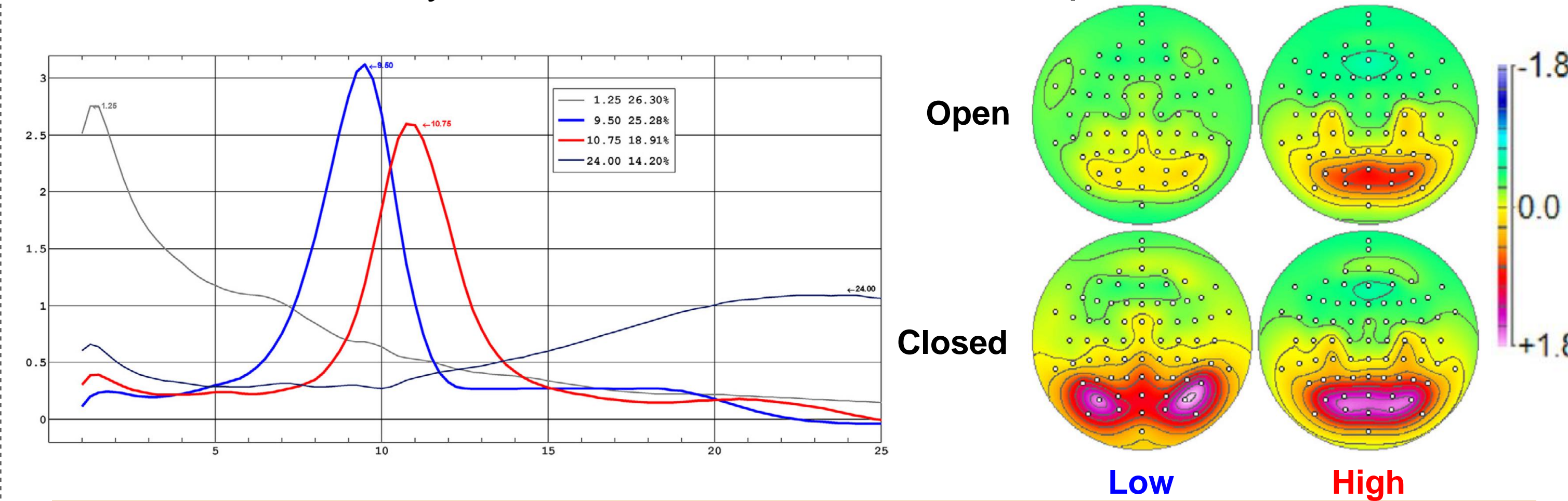
1. Compute virtual estimates at age 21 of R/S importance from all lifetime ratings
2. Explore the relationship between these variables and current depression symptoms

## Method: Predicting Depression Severity

- Obtained the **Personal Health Questionnaire (PHQ-9)**<sup>11</sup> at most recently completed wave (Y35); score range: 0 – 27, higher scores represent greater depression symptom severity
- Other **variables** in previous dataset and the same sample ( $N = 73$ ) used

### Data from Tenke et al (2017)

**Posterior EEG alpha:** 72-channel resting EEG collected. 2-s epochs transformed to scalp current source density (CSD) with spherical splines<sup>12,13</sup>. Average CSD amplitude spectra submitted to frequency PCA with Varimax rotation<sup>14</sup>. Two alpha factors (loadings within 8-13 Hz) pooled across posterior sites; mean across eyes condition used as overall amplitude.



**Fig 2.** CSD-fPCA factor loadings for **low** and **high** frequency alpha (left). Factor score topographies (right) show greater alpha for eyes-closed.

**Lifetime history for MDD:** diagnostic assessments (yes / no) made by trained clinicians using best-estimate procedure

**Family Risk for MDD:** **High Risk** = offspring (children, grandchildren) of probands with MDD; **Low Risk** = offspring of healthy controls recruited from same community and time

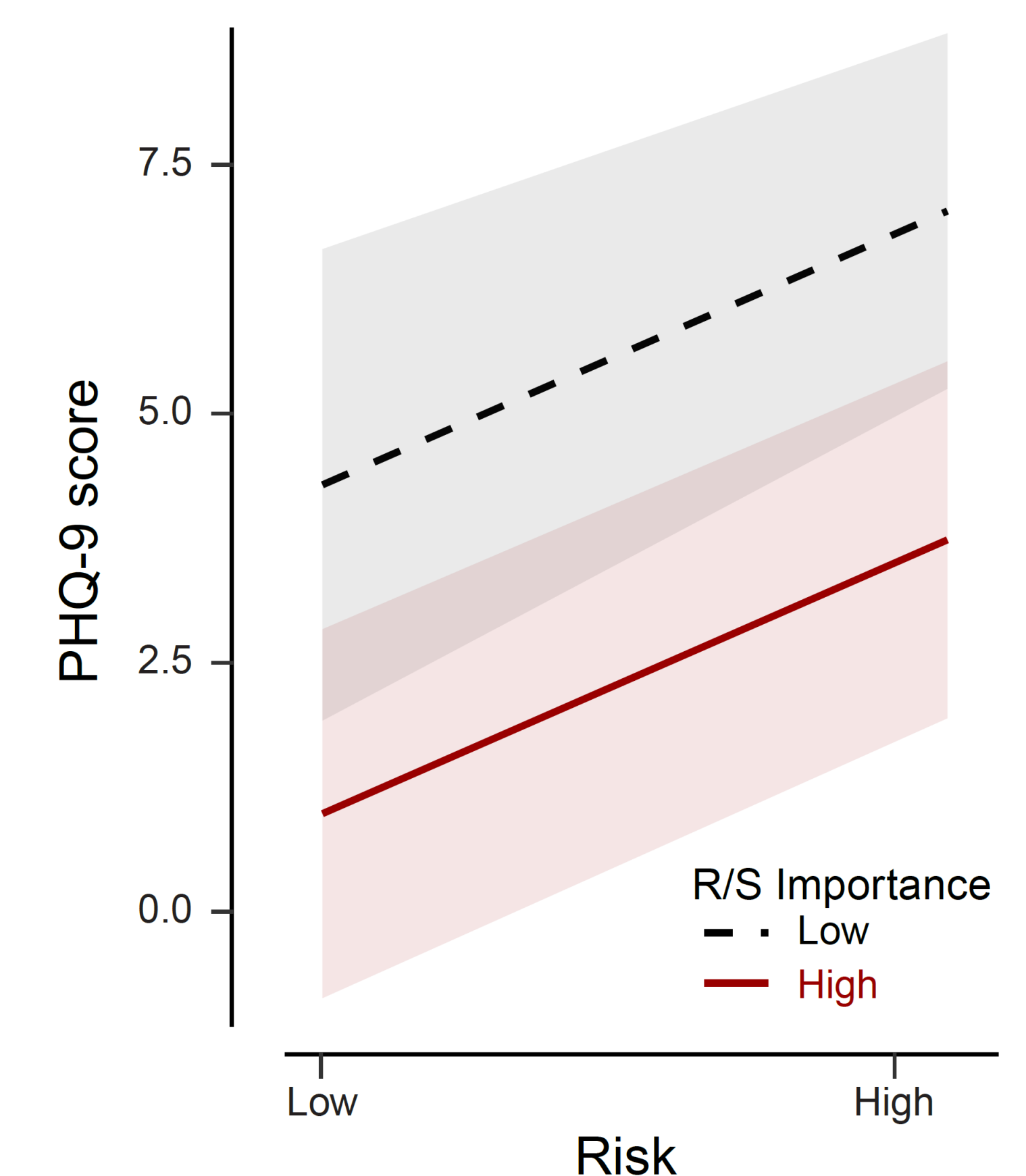
**Sex and Age:** variables collected at the time of EEG testing (Y30)

PHQ-9 scores were regressed in a model with **EEG alpha**, **R/S importance**, and **lifetime MDD** in an interaction term; risk for MDD, age and sex as constant covariates.

## Results: Main Effects

Lower PHQ-9 scores also associated with:

- Higher R/S importance
- Low familial risk of MDD
- Being older



**Fig 4.** Main effects of R/S importance ( $p = .020$ ,  $\eta^2_p = .084$ ) and Risk ( $p = .016$ ,  $\eta^2_p = .090$ ) on depression symptom severity.

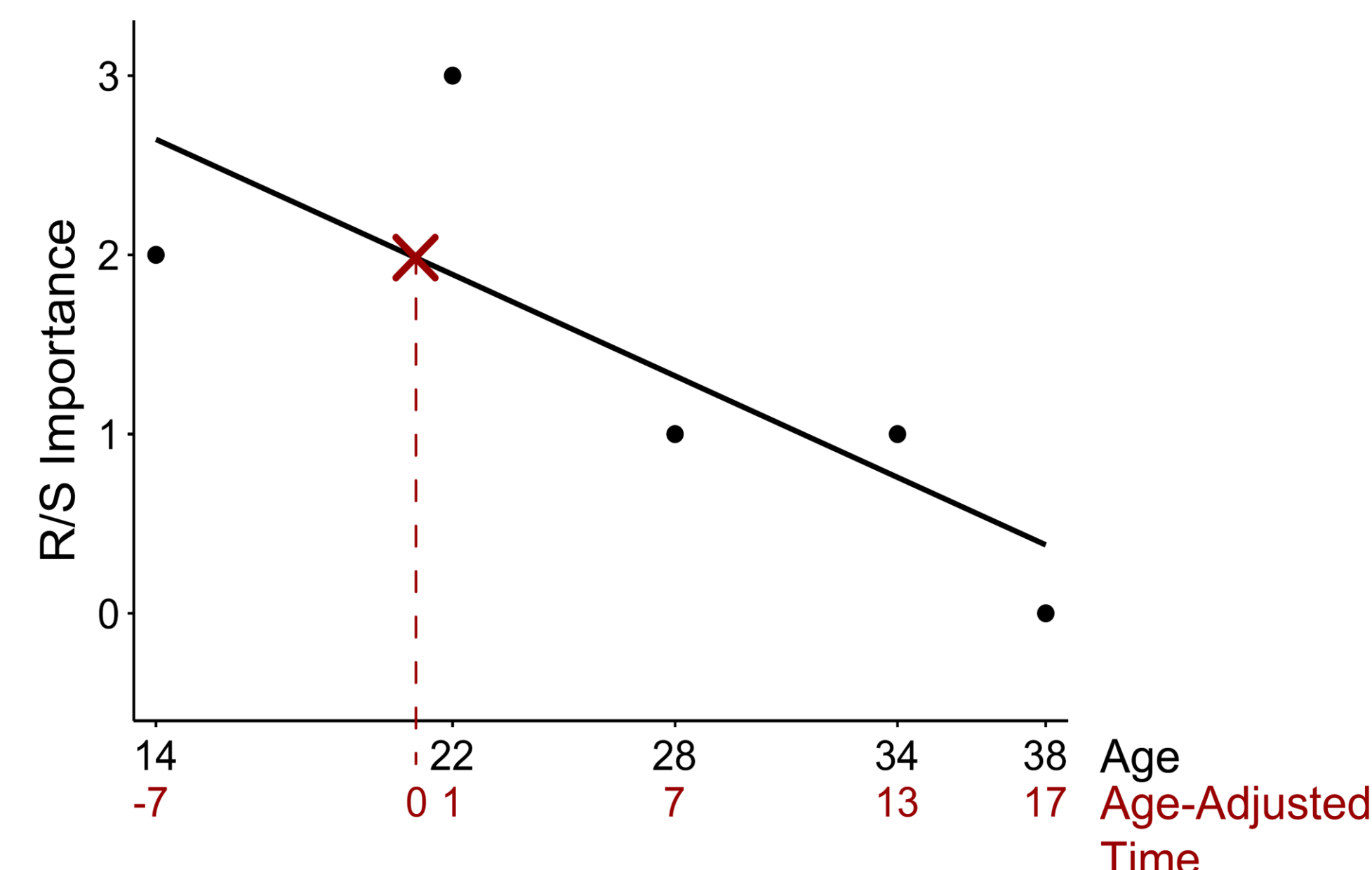
## Method: Estimating R/S importance

“How important is religion or spirituality to you?”

0	1	2	3
Not important at all	Somewhat important	Moderately important	Highly important

We asked participants **5** times over a span of 25 years, in Year 10 (1992), Y20, 25, 30, 35.

- Mixed-effects model<sup>9</sup> used to predict R/S importance based on **Age-Adjusted Time** (age of each person centered at age 21, representing early adulthood<sup>10</sup>).
- Model included a random slope, fixed effect slope, removing the random effect of participant.

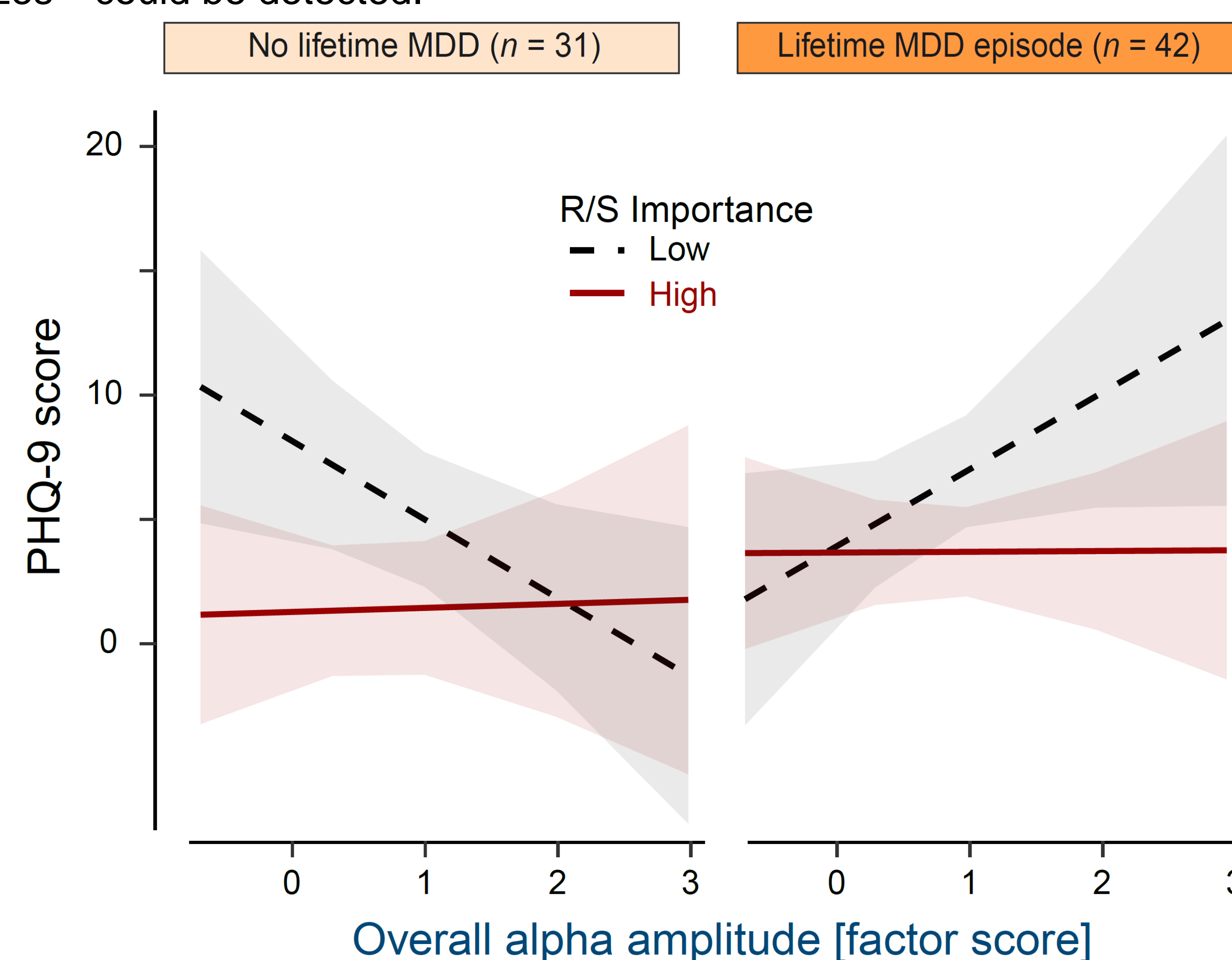


**Fig 1.** Graphical representation of the mixed-effects model on a single participant. R/S importance ratings plotted by age (black points, black best fit line).

By using **Age-Adjusted Time**, the regression intercept (red cross) output was used as the R/S importance estimate when Age-Adjusted Time = 0, or when participant is aged 21.

## Results: Interacting Predictors

The overall regression was highly significant,  $F(10, 62) = 3.10$ ,  $p = .003$ ,  $R^2_{adjusted} = 0.226$ . Sensitivity analysis<sup>15</sup> determined that medium effect sizes<sup>16</sup> could be detected.



**Fig 3.** Significant **three-way** interaction,  $p = .048$ ,  $\eta^2_p = .062$  (small-to-medium effect) Graphs separately plotted for participants with/without lifetime MDD. R/S Importance reflects means of lower quartile (0.95) and upper quartile (2.41) of the entire sample. PHQ-9 scores did not differ at high R/S importance levels (solid lines), but overall alpha interacted with lifetime MDD at low R/S importance levels (dotted lines).

This also qualified a **two-way** interaction between EEG alpha and lifetime MDD,  $p = .012$ ,  $\eta^2_p = .097$ . Greater alpha was associated with lower PHQ-9 scores for participants with no lifetime MDD, but lower alpha with participants with a history of MDD.

## CONCLUSIONS

Findings show evidence of a **complex interrelationship** between variables that are protective against MDD:

- ❖ High R/S importance
- ❖ Low family risk for MDD
- ❖ Low R/S importance combined with high EEG alpha + no lifetime MDD
- ❖ Low R/S importance combined with low EEG alpha + lifetime MDD

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