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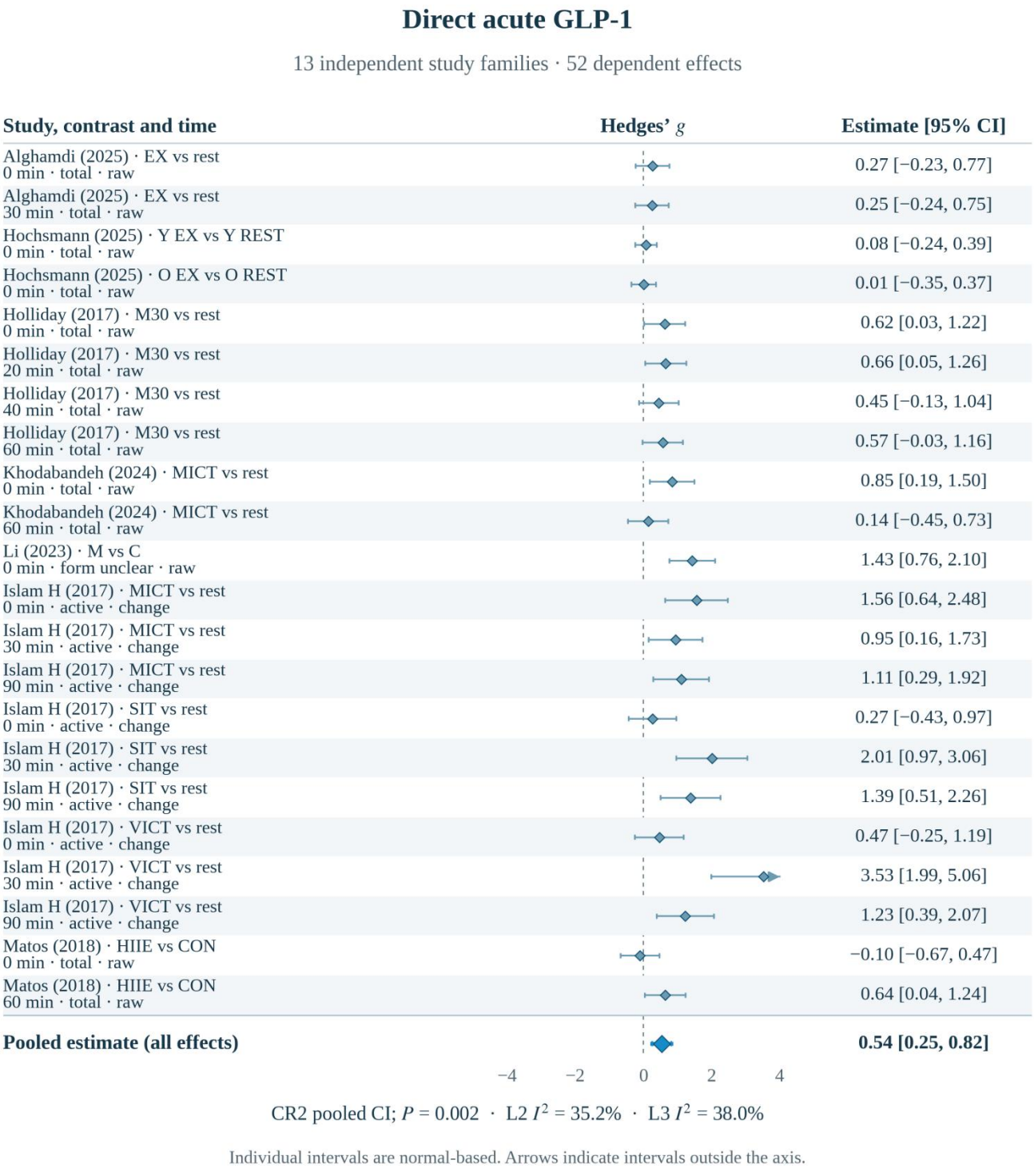
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Supplementary Figure S1. Forest plot for the overall direct acute GLP-1 response.

Positive *g* indicates higher circulating GLP-1 concentrations after exercise, not demonstrated appetite suppression or reduced food intake. Each row is a dependent effect estimate. Pooled estimates and confidence intervals use the full set of study-family-clustered data, including on continuation panels.

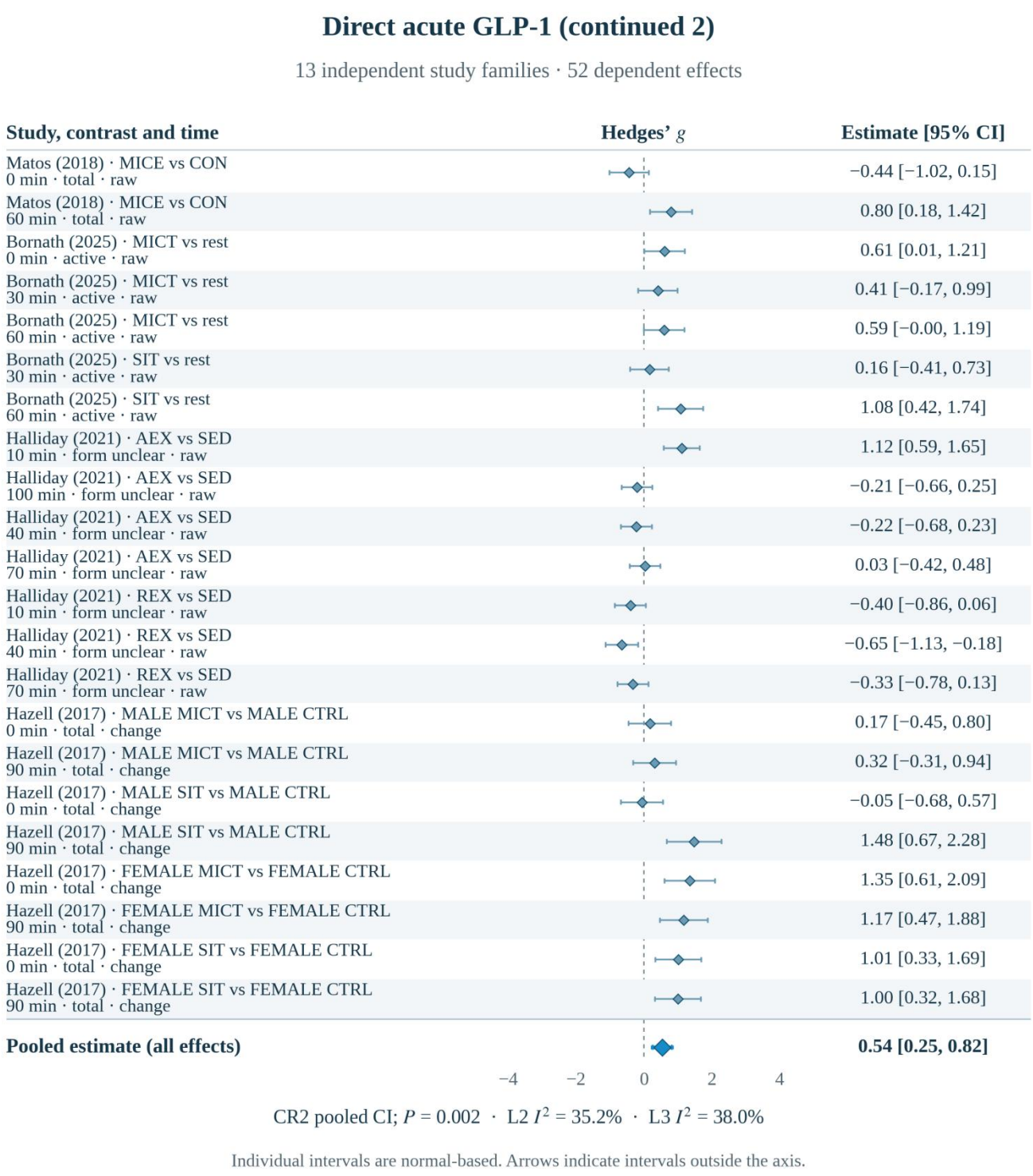
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Supplementary Figure S1. Forest plot for the overall direct acute GLP-1 response (continued).

Panel A2. The corresponding methods and interpretation are given in the caption on the first page of this figure.

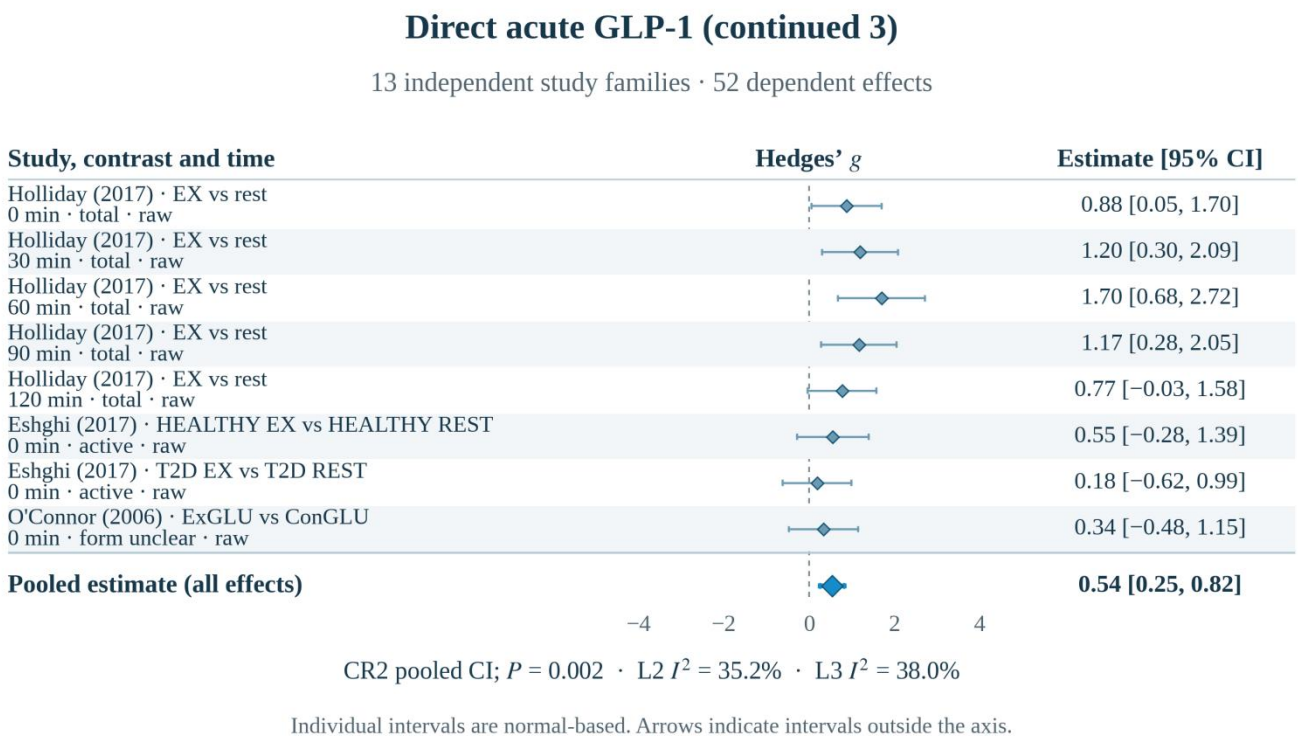
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Supplementary Figure S1. Forest plot for the overall direct acute GLP-1 response (continued).

Panel A3. The corresponding methods and interpretation are given in the caption on the first page of this figure.

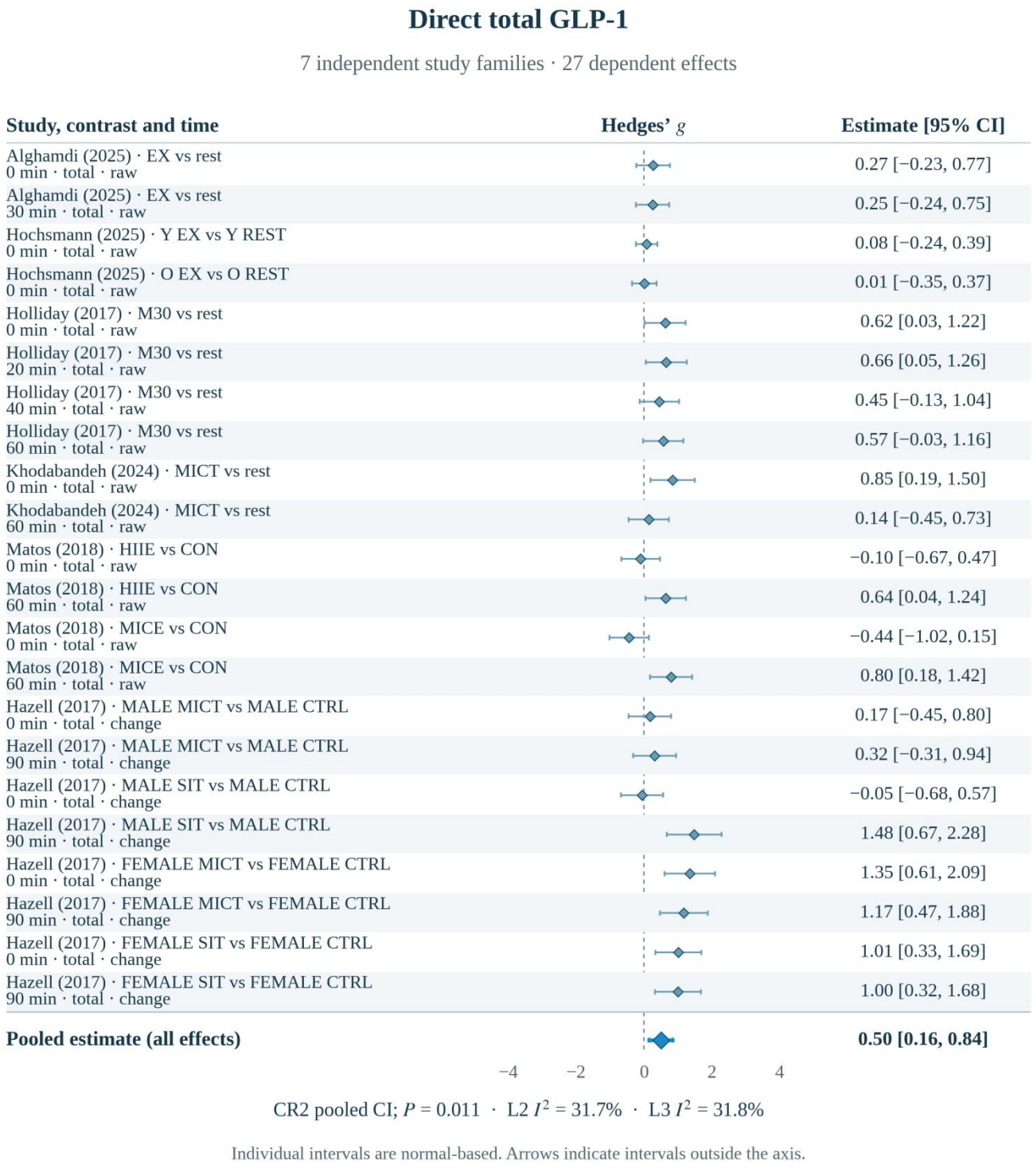
A3



Supplementary Figure S2. Forest plots for direct acute GLP-1 by molecular form.

A, total GLP-1; B, active or intact GLP-1. These molecular forms measure related but distinct aspects of the circulating hormonal response.

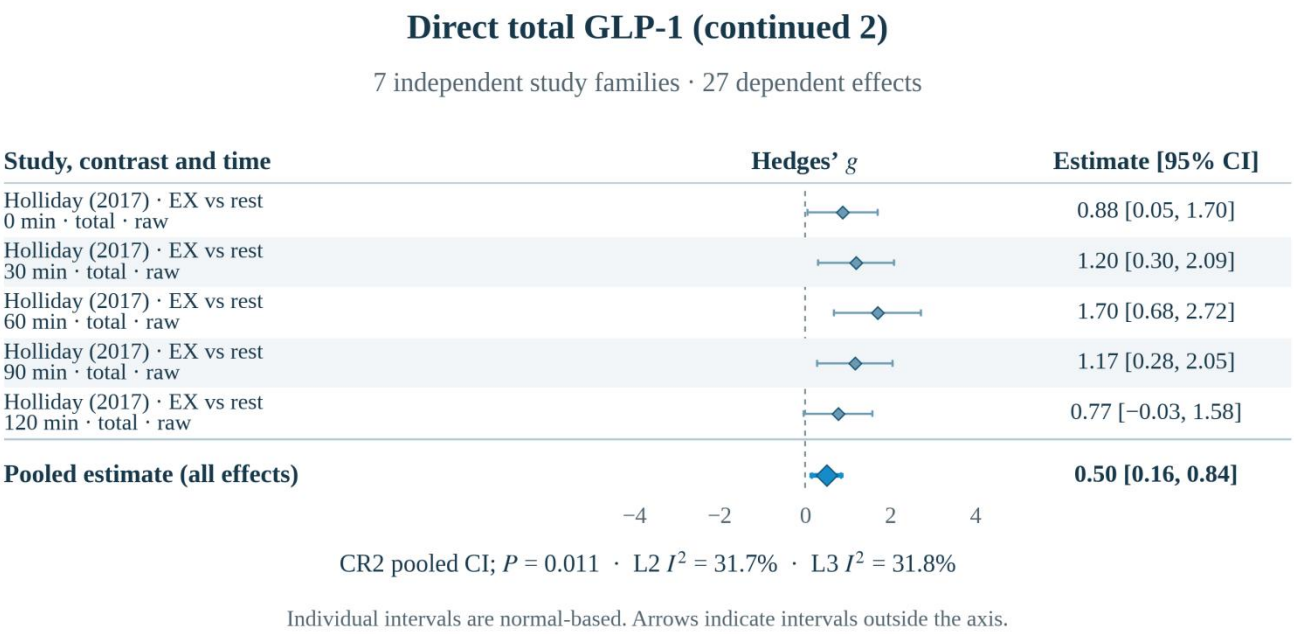
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Supplementary Figure S2. Forest plots for direct acute GLP-1 by molecular form (continued).

Panel A2. The corresponding methods and interpretation are given in the caption on the first page of this figure.

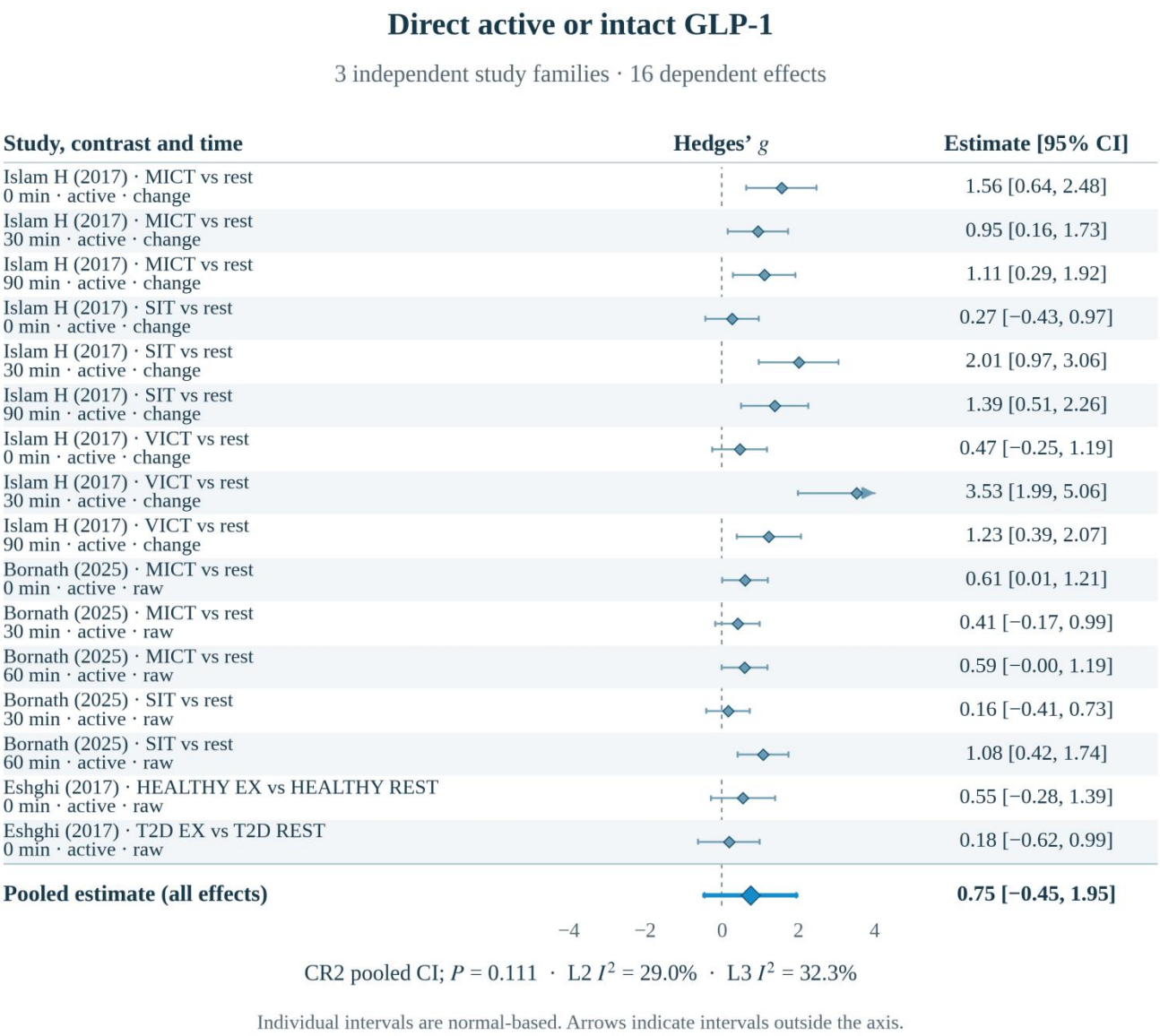
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Supplementary Figure S2. Forest plots for direct acute GLP-1 by molecular form (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

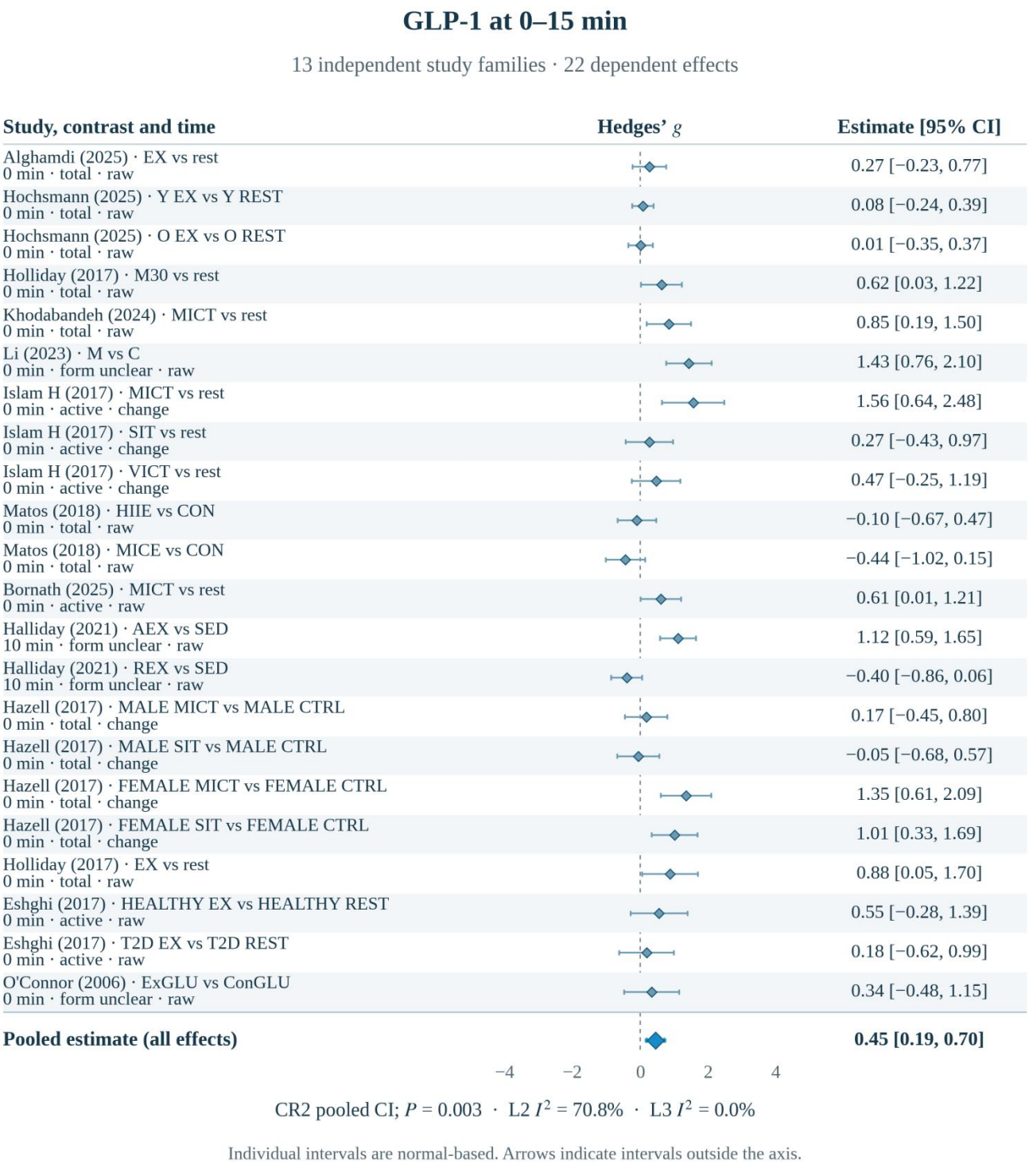
B



Supplementary Figure S3. Forest plots for the temporal profile of direct acute GLP-1.

A, 0–15 min; B, >15–60 min; C, >60–120 min after exercise. Differences in statistical significance across windows do not establish a declining temporal response. The windows include different numbers of independent study families.

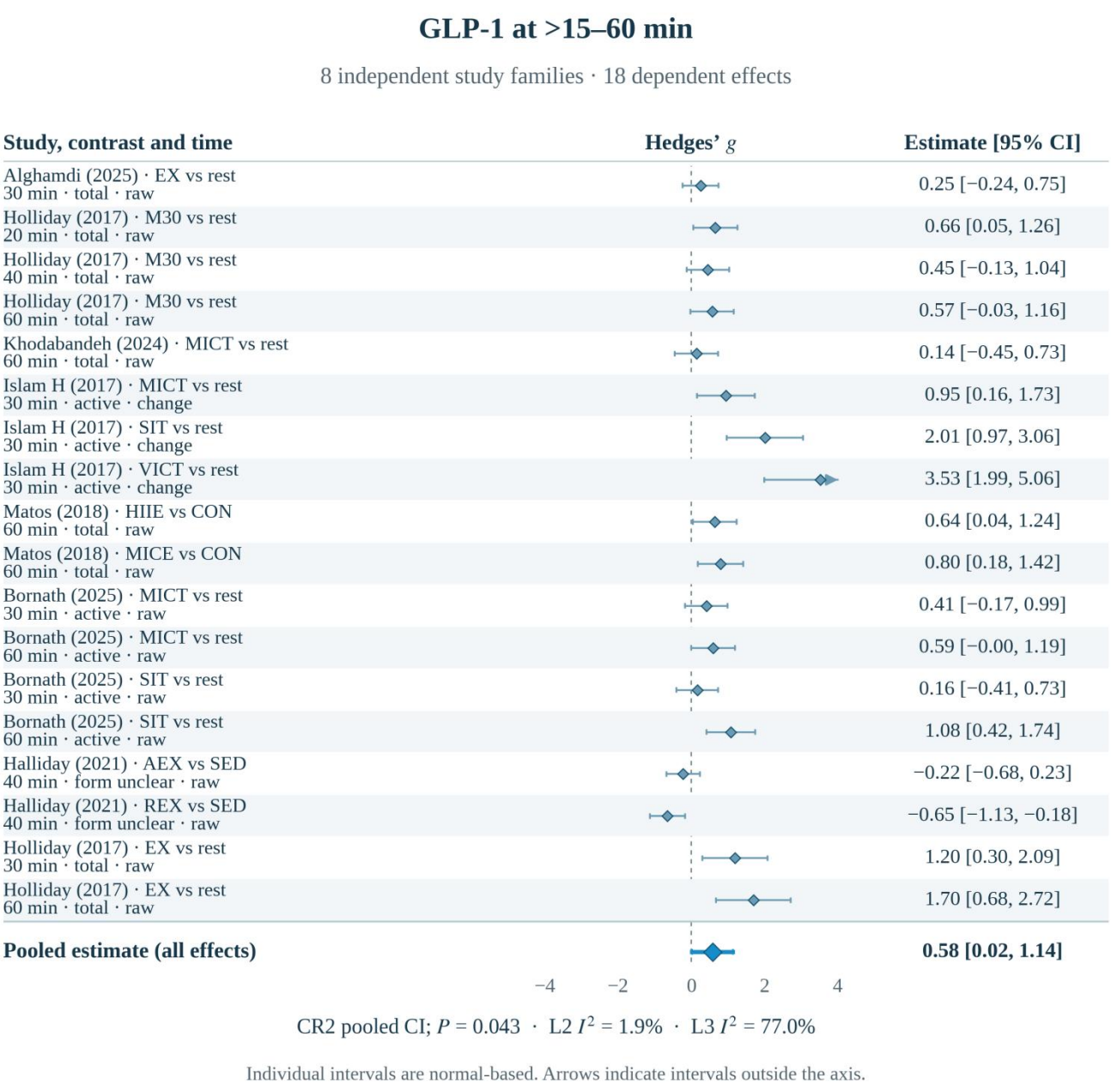
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Supplementary Figure S3. Forest plots for the temporal profile of direct acute GLP-1 (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

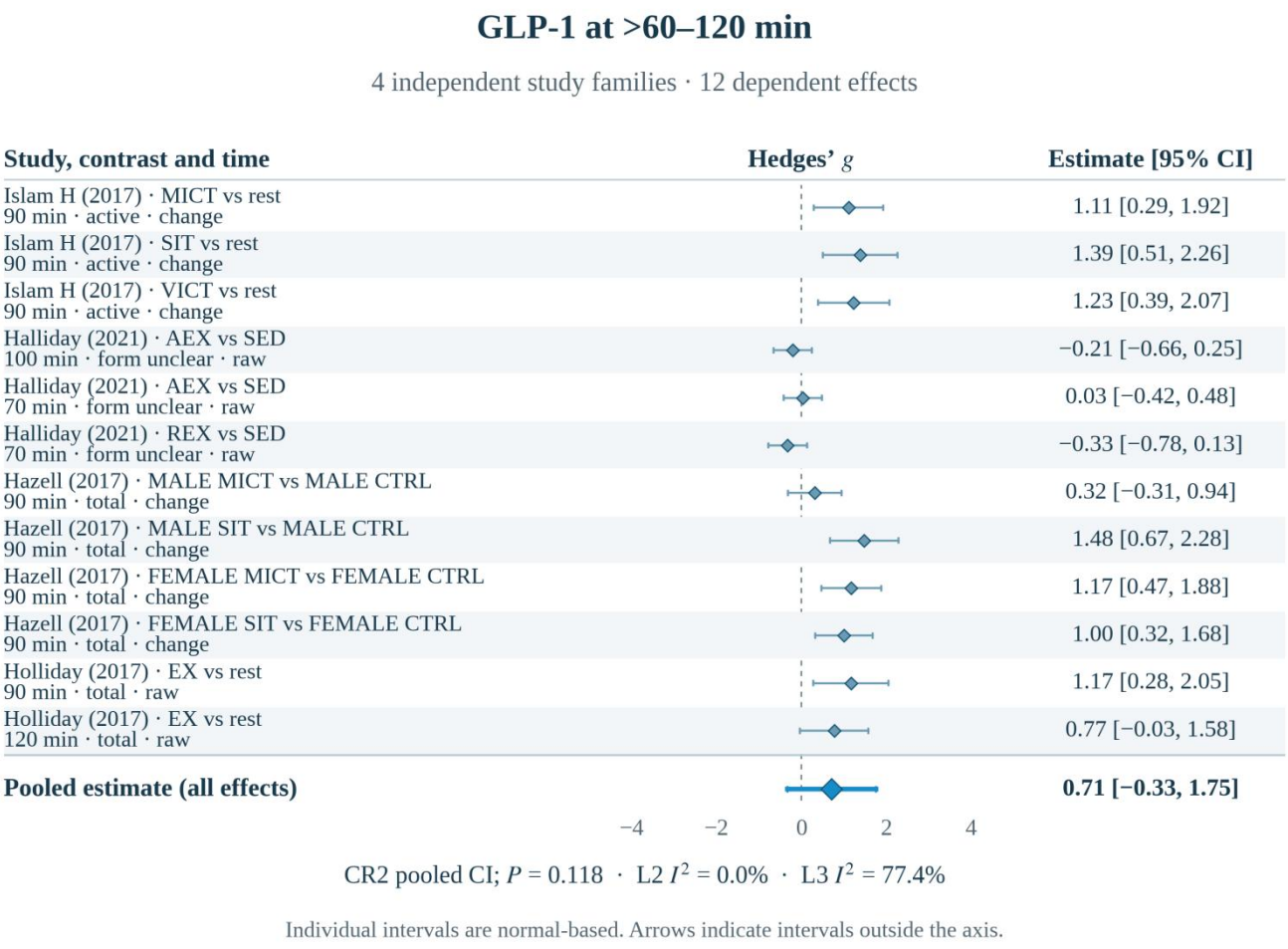
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Supplementary Figure S3. Forest plots for the temporal profile of direct acute GLP-1 (continued).

Panel C. The corresponding methods and interpretation are given in the caption on the first page of this figure.

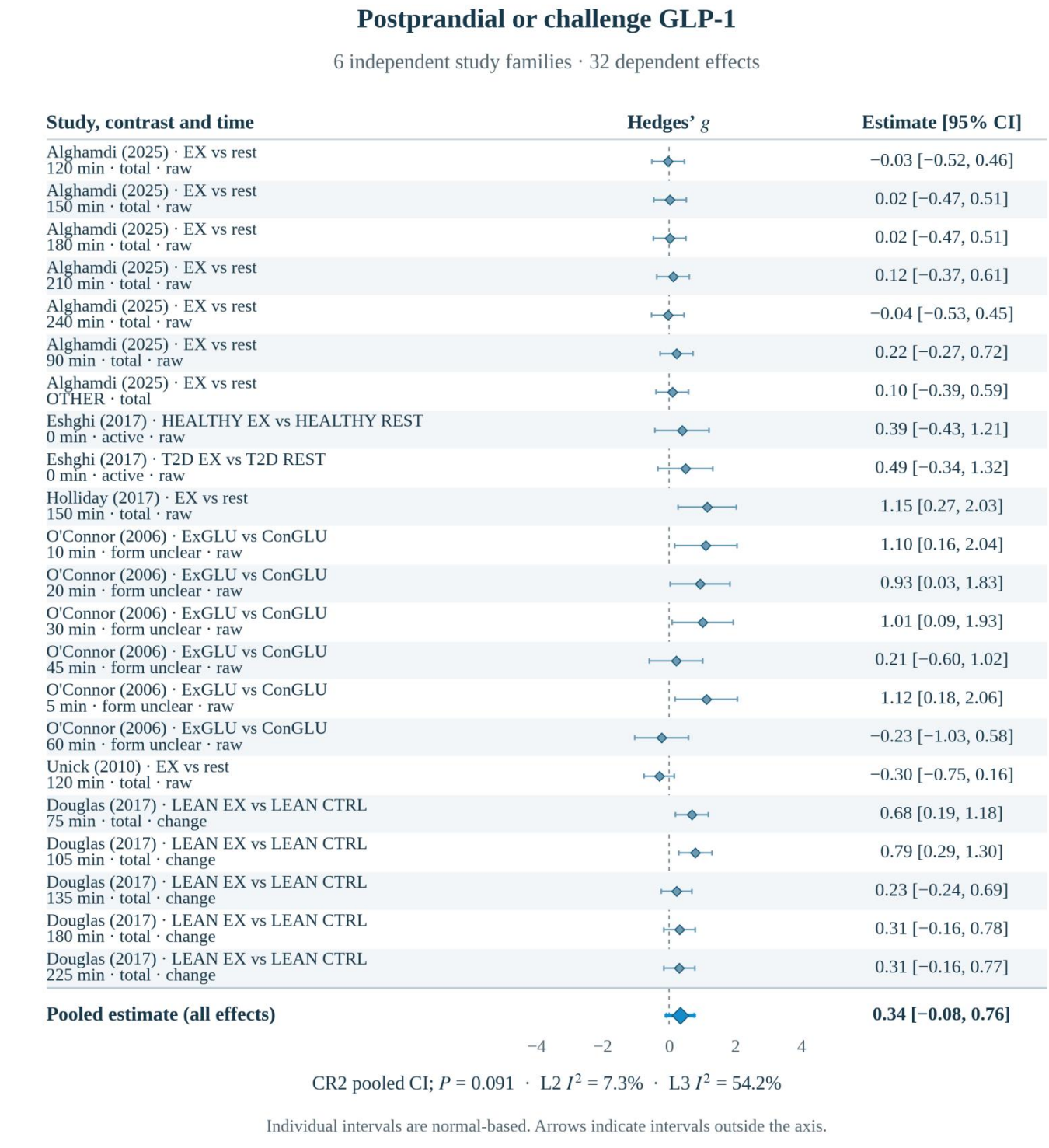
C



Supplementary Figure S4. Forest plots for exercise-modified postprandial or nutrient-challenge GLP-1.

A, overall time-point synthesis; B, total GLP-1; C, area-under-the-curve outcomes. Meal or nutrient-challenge responses are distinct from the direct pre-feeding exercise response and are not later observations on a common recovery trajectory.

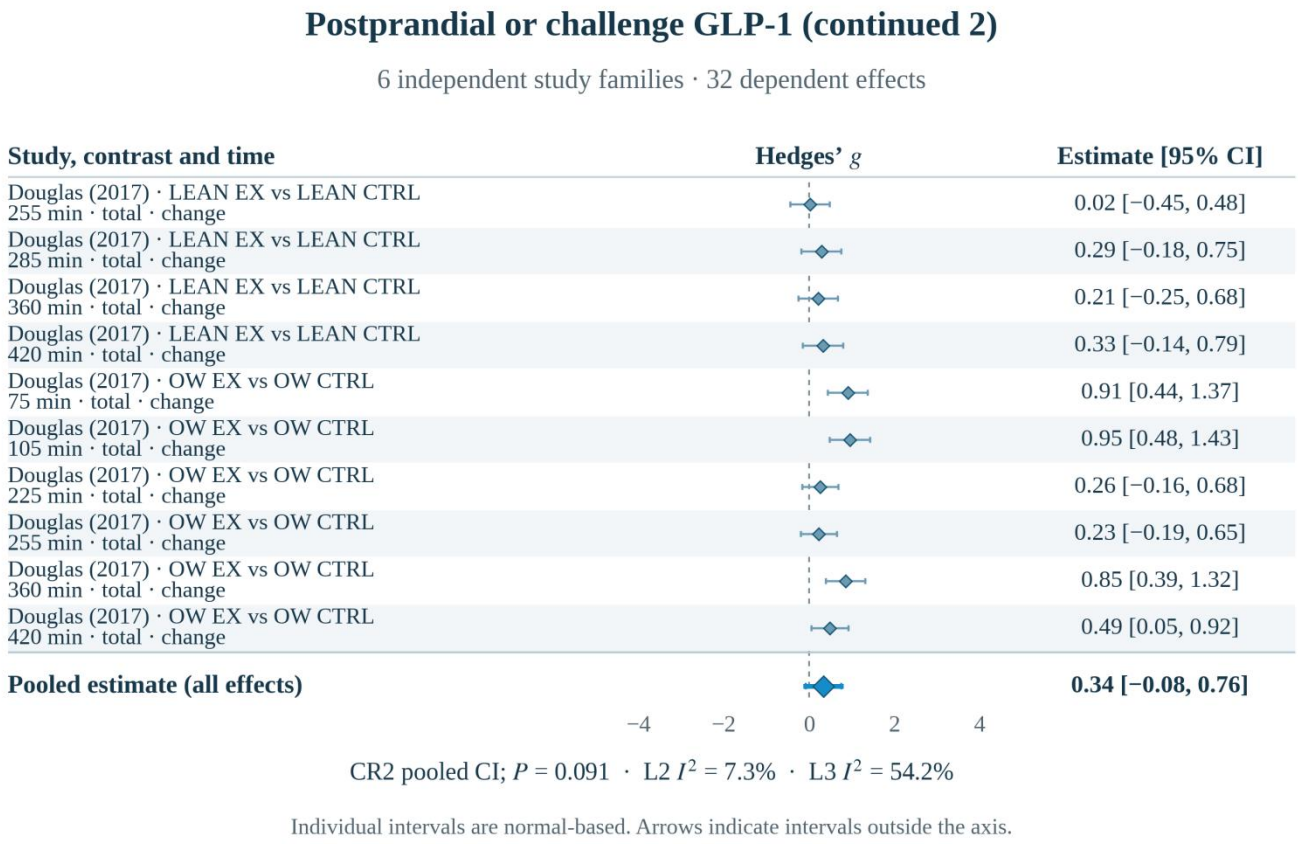
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Supplementary Figure S4. Forest plots for exercise-modified postprandial or nutrient-challenge GLP-1 (continued).

Panel A2. The corresponding methods and interpretation are given in the caption on the first page of this figure.

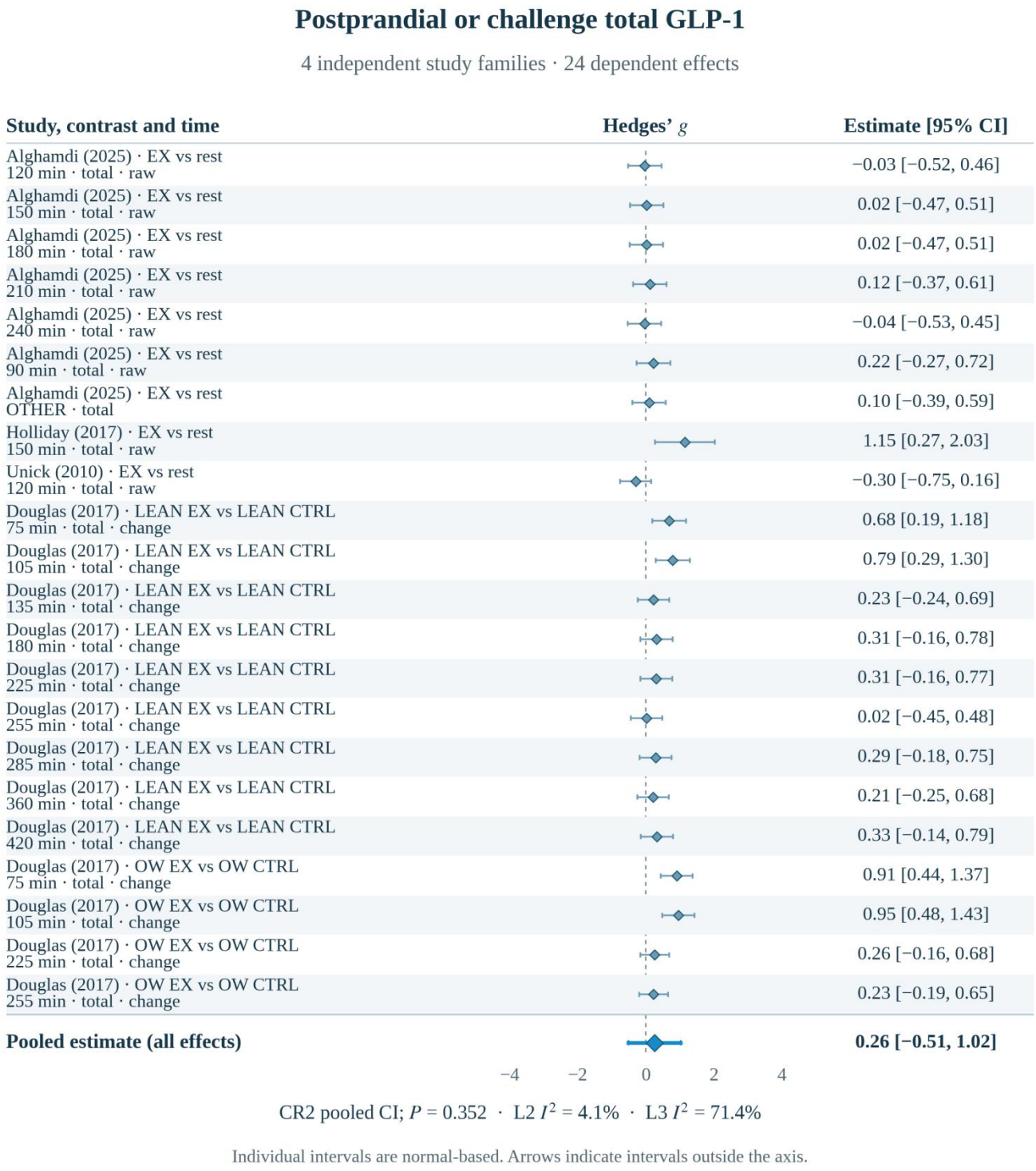
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Supplementary Figure S4. Forest plots for exercise-modified postprandial or nutrient-challenge GLP-1 (continued).

Panel B1. The corresponding methods and interpretation are given in the caption on the first page of this figure.

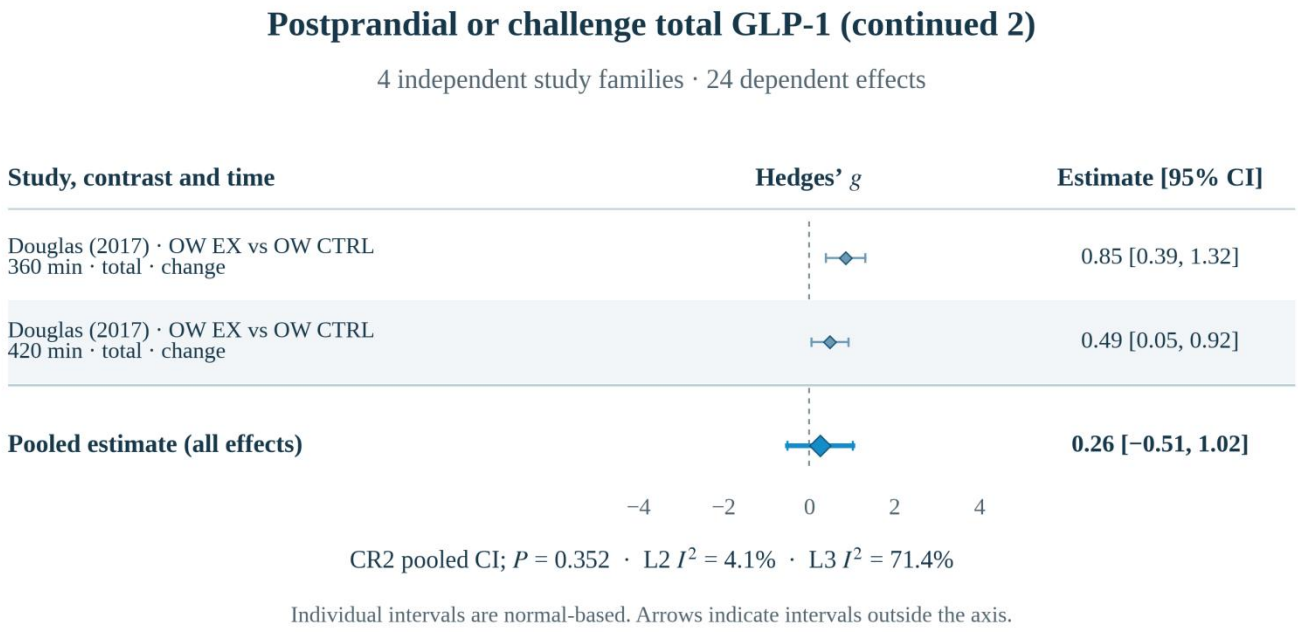
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Supplementary Figure S4. Forest plots for exercise-modified postprandial or nutrient-challenge GLP-1 (continued).

Panel B2. The corresponding methods and interpretation are given in the caption on the first page of this figure.

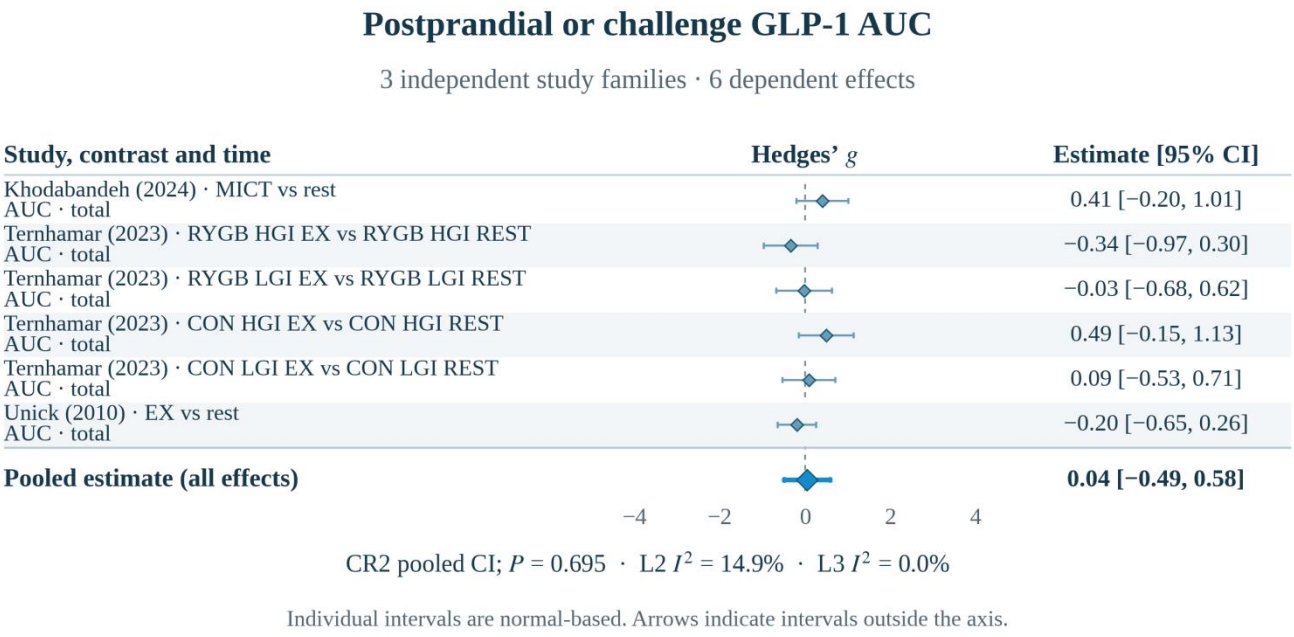
B2



Supplementary Figure S4. Forest plots for exercise-modified postprandial or nutrient-challenge GLP-1 (continued).

Panel C. The corresponding methods and interpretation are given in the caption on the first page of this figure.

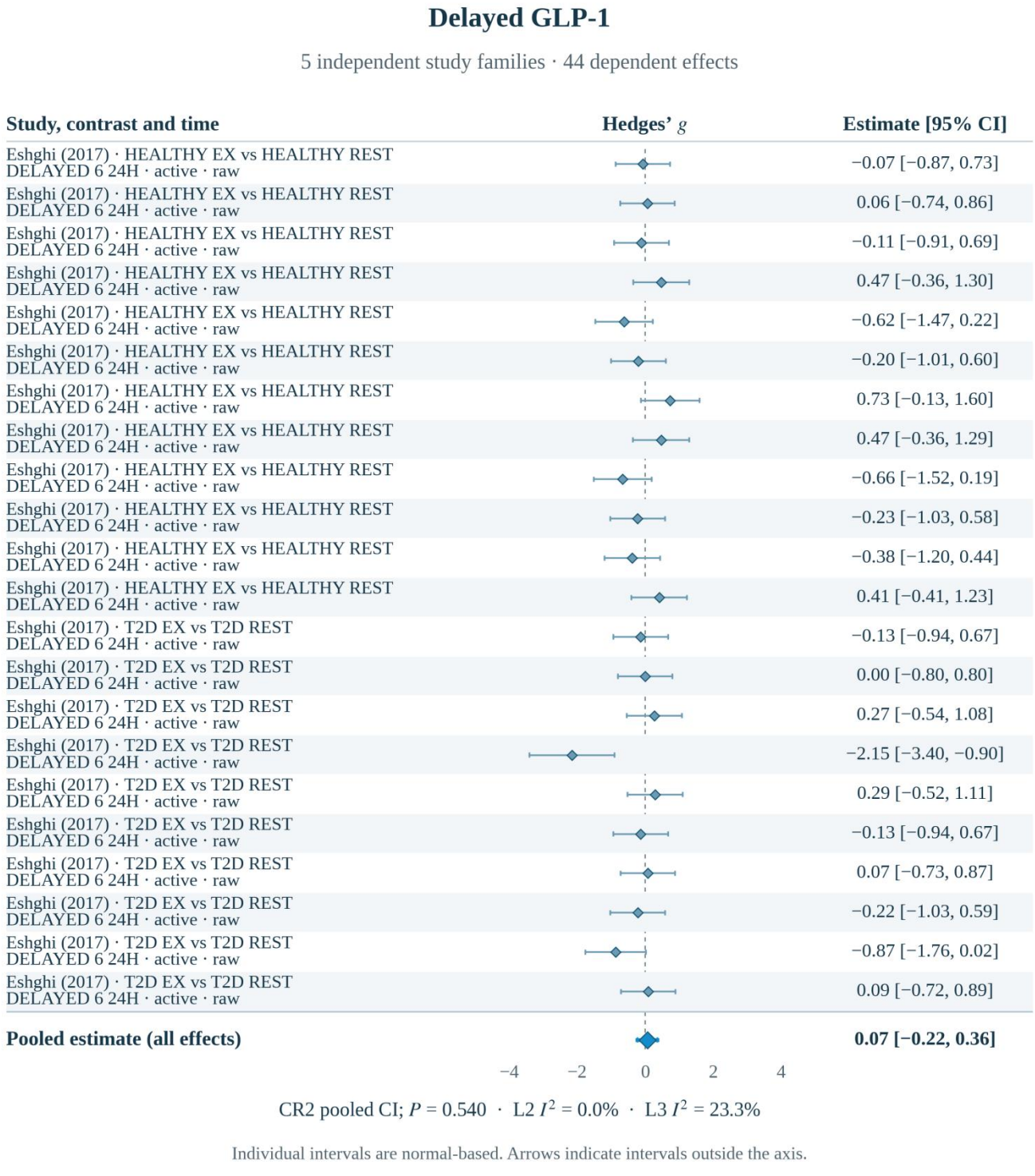
C



Supplementary Figure S5. Forest plots for delayed GLP-1 responses.

Delayed GLP-1 observations (>6 h are shown on continuation panels. The pooled estimate is identical on every panel and was fitted once using all contributing effects.

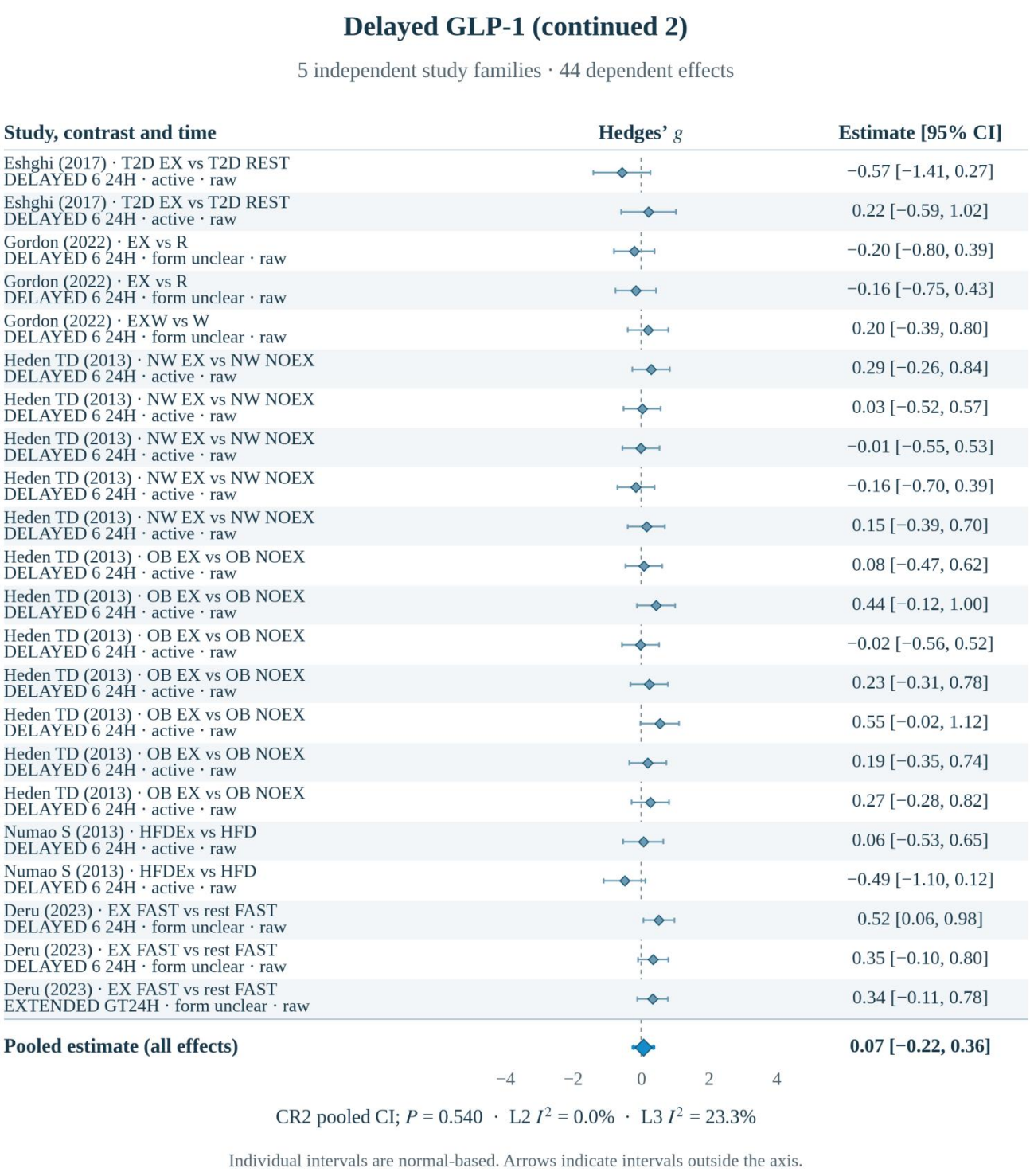
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Supplementary Figure S5. Forest plots for delayed GLP-1 responses (continued).

Panel A2. The corresponding methods and interpretation are given in the caption on the first page of this figure.

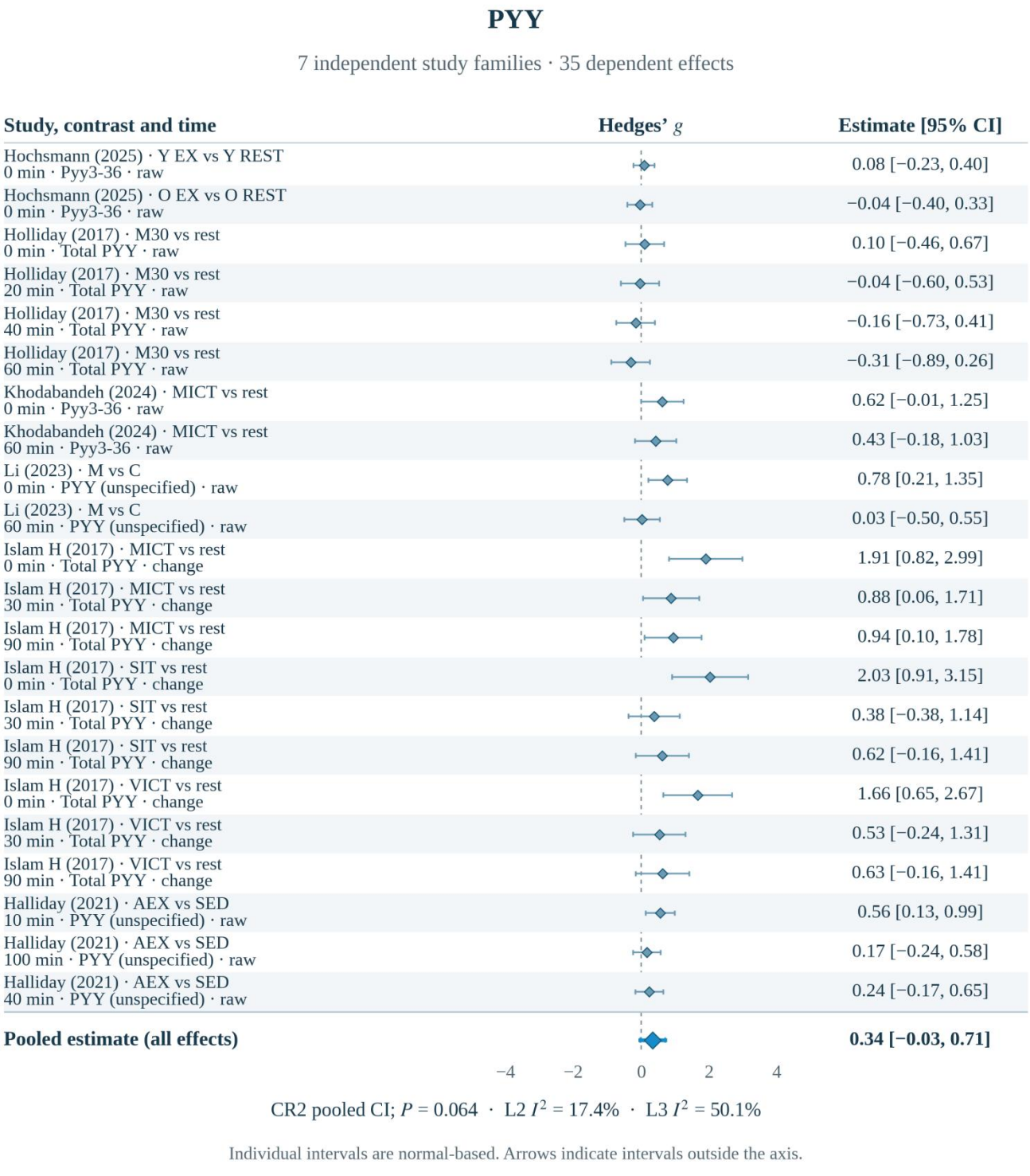
A2



Supplementary Figure S6. Forest plots for peptide YY responses.

A, overall PYY; B, PYY3–36; C, total PYY. Positive *g* indicates higher concentrations, not an established effect on subsequent eating behaviour.

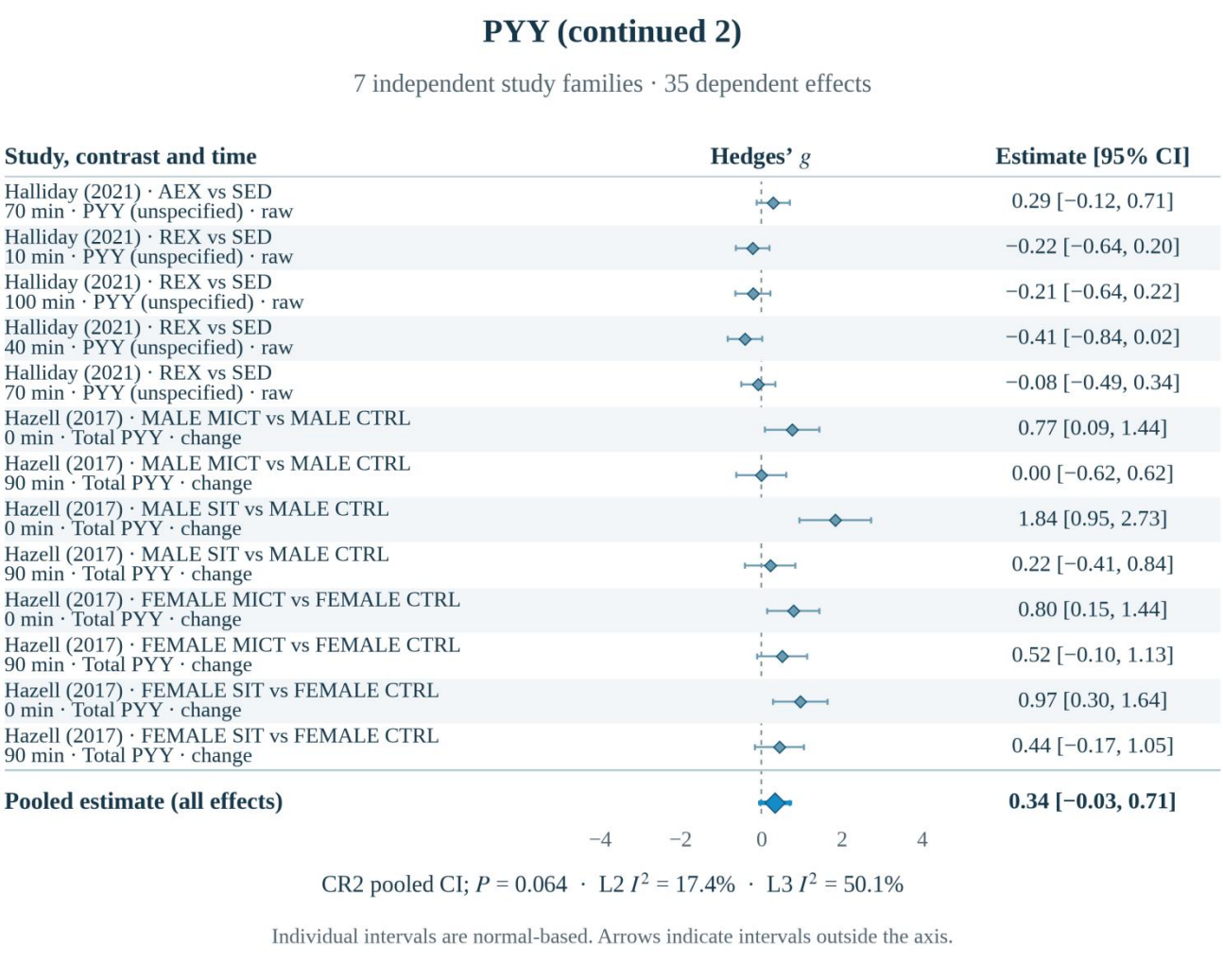
A1



Supplementary Figure S6. Forest plots for peptide YY responses (continued).

Panel A2. The corresponding methods and interpretation are given in the caption on the first page of this figure.

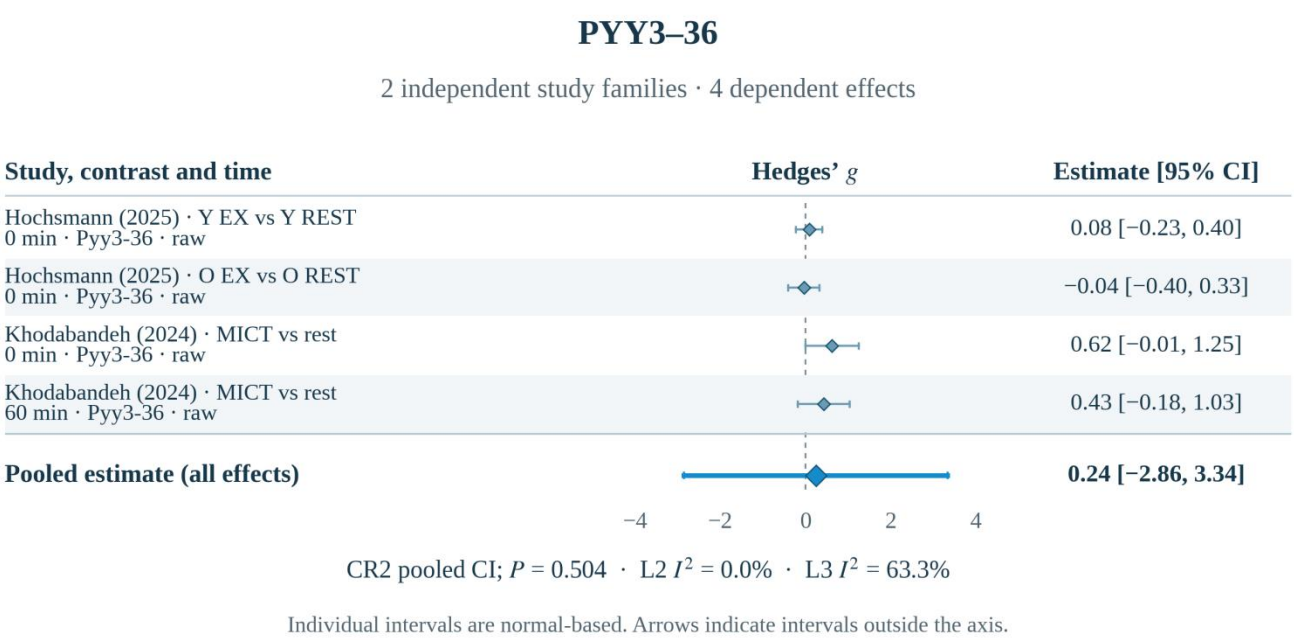
A2



Supplementary Figure S6. Forest plots for peptide YY responses (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

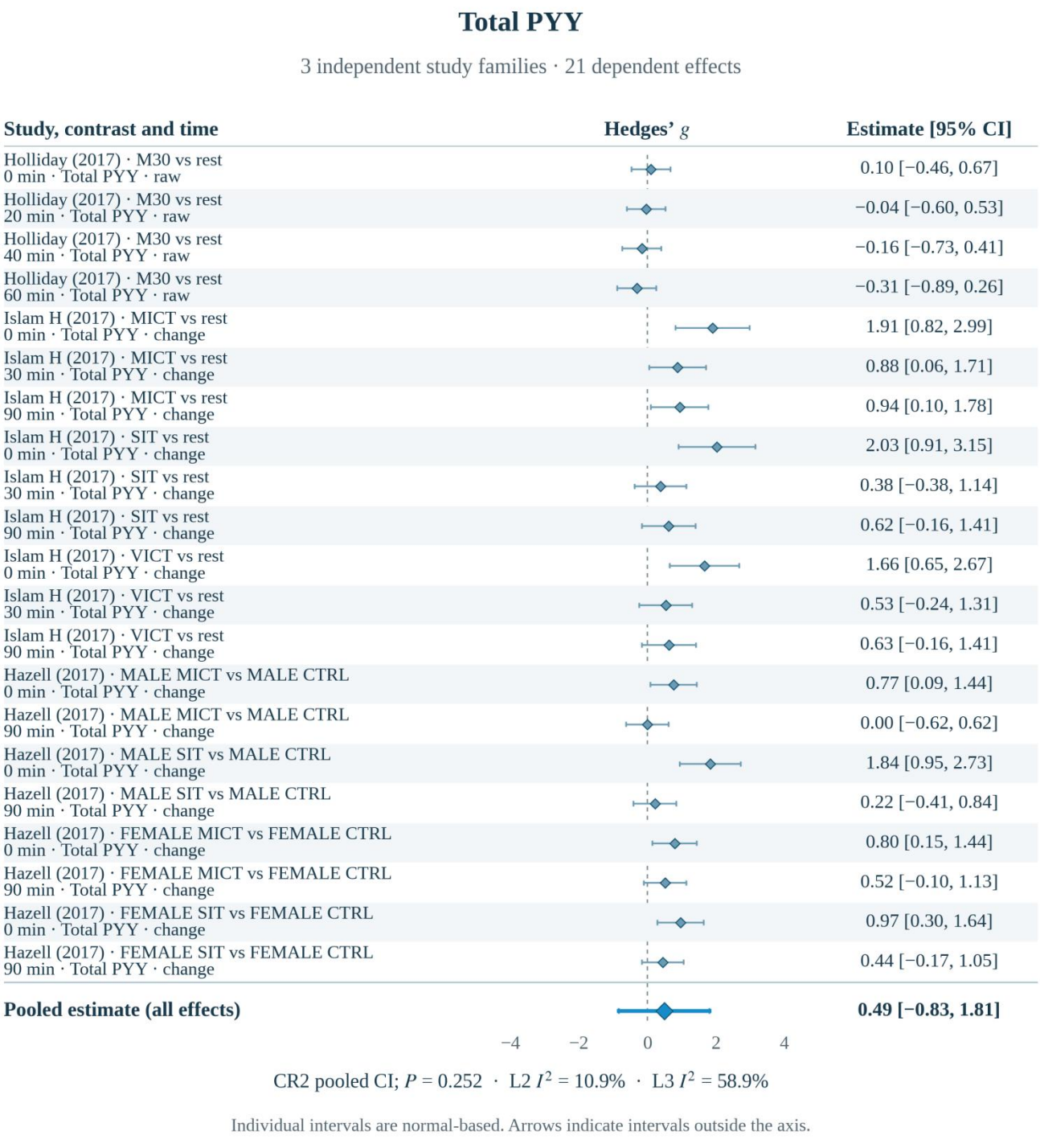
B



Supplementary Figure S6. Forest plots for peptide YY responses (continued).

Panel C. The corresponding methods and interpretation are given in the caption on the first page of this figure.

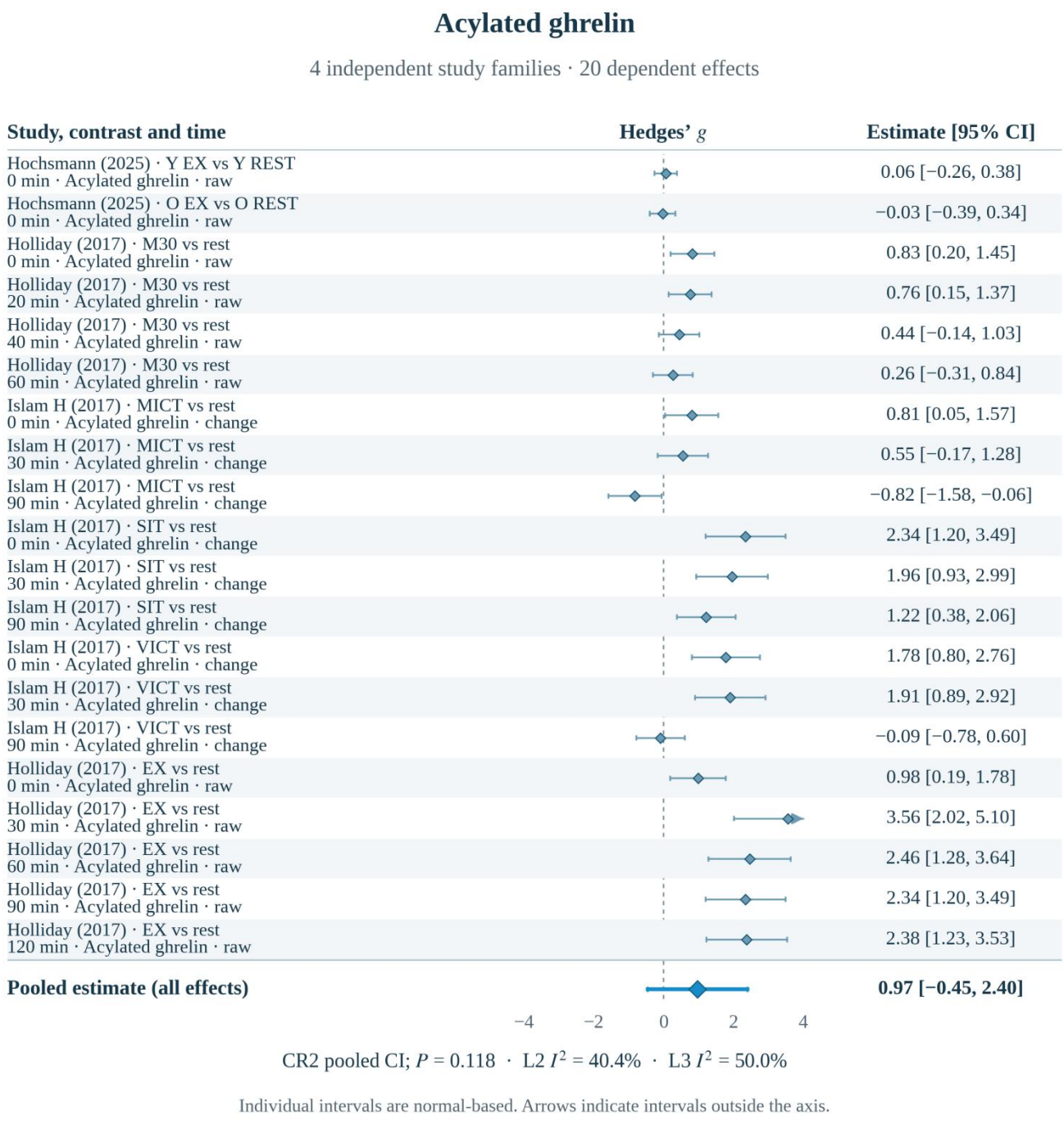
C



Supplementary Figure S7. Forest plots for ghrelin responses.

A, acylated ghrelin; B, total ghrelin. Ghrelin effects were multiplied by −1 so that positive values indicate lower concentrations after exercise. This direction convention does not establish appetite suppression.

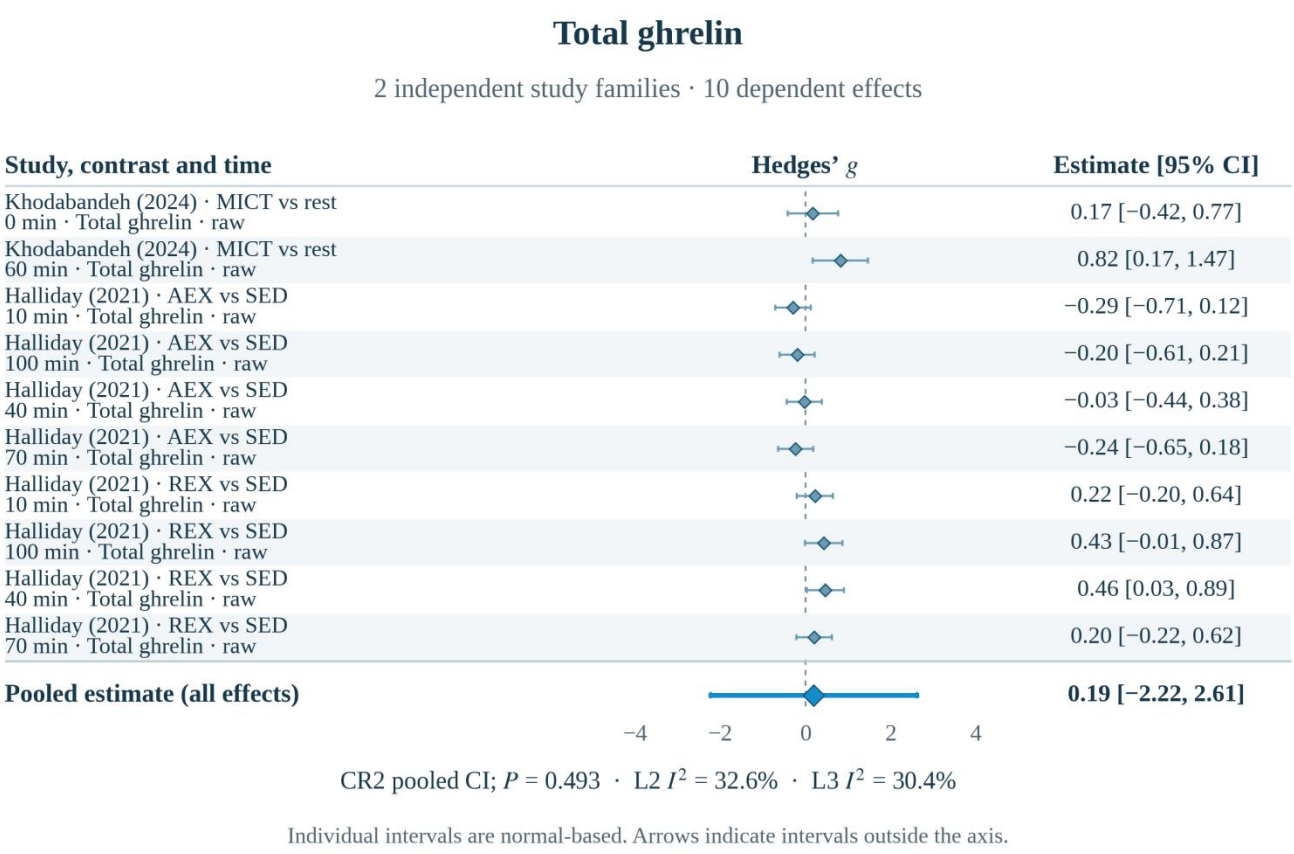
A



Supplementary Figure S7. Forest plots for ghrelin responses (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

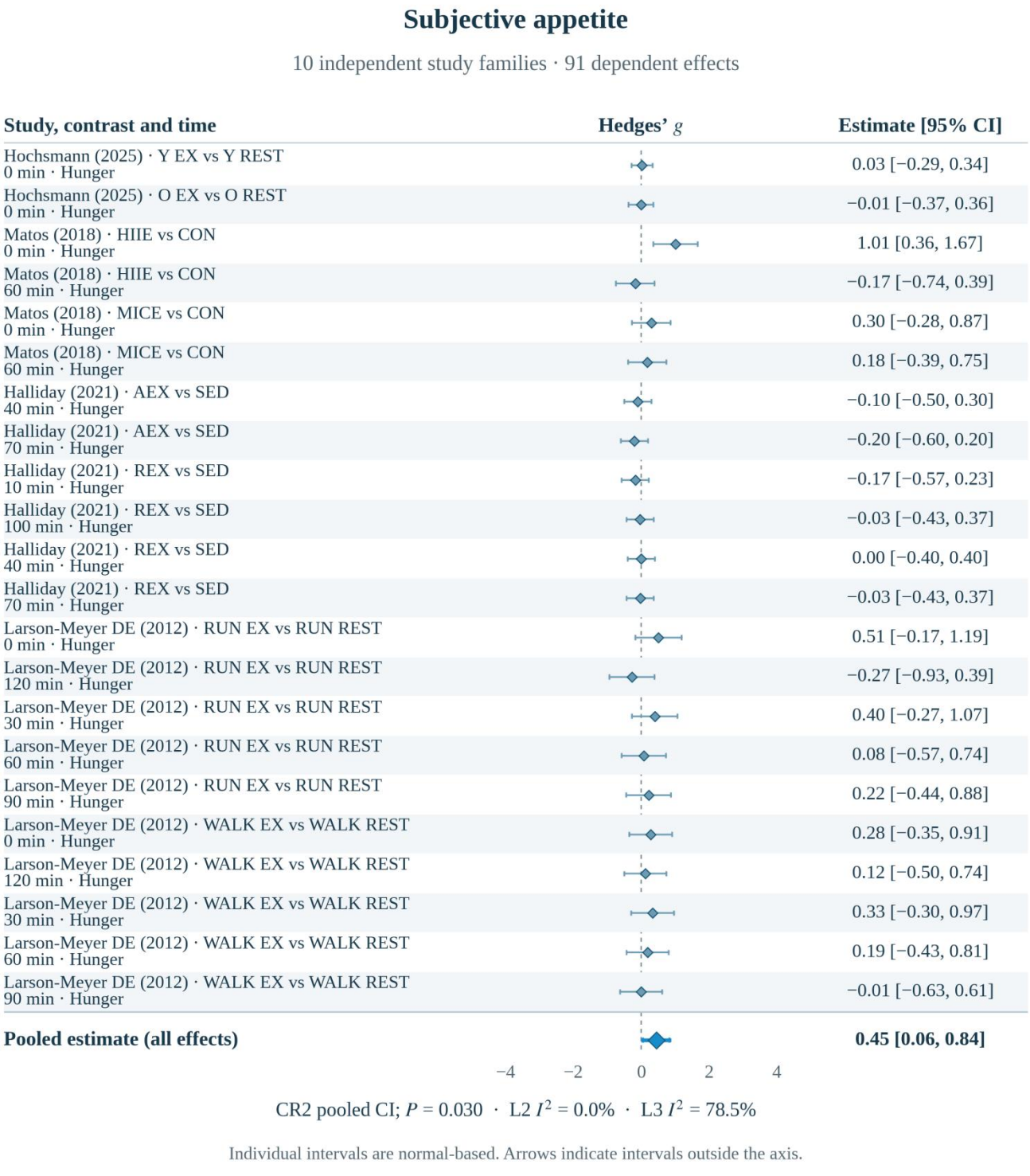
B



Supplementary Figure S8. Forest plot for the overall subjective appetite response.

Subjective-appetite effects are shown on continuation panels. Positive *g* indicates a direction-harmonised response toward lower hunger or prospective consumption, or greater fullness or satiety. This synthesis does not test mediation by GLP-1.

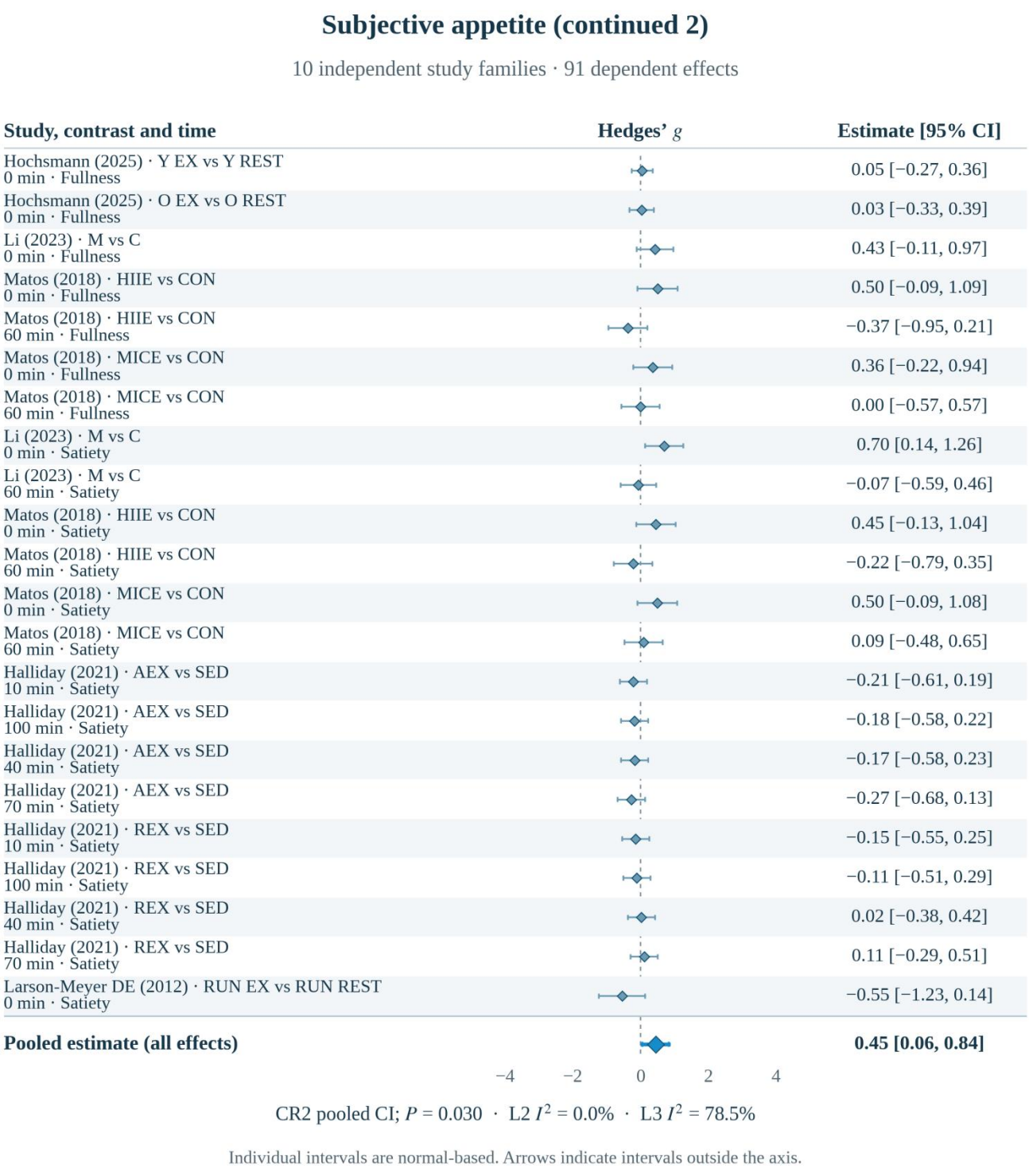
A1



Supplementary Figure S8. Forest plot for the overall subjective appetite response (continued).

Panel A2. The corresponding methods and interpretation are given in the caption on the first page of this figure.

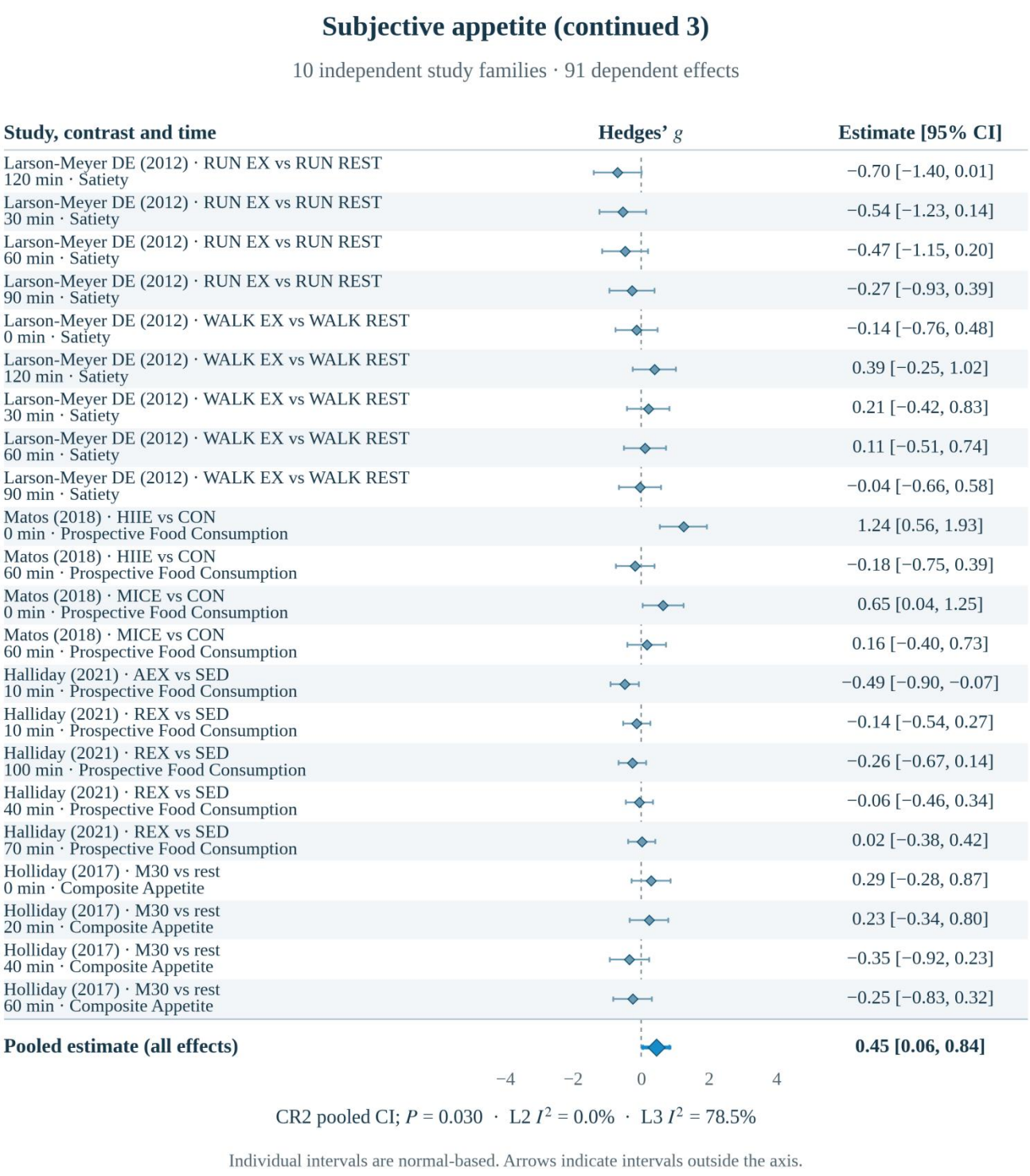
A2



Supplementary Figure S8. Forest plot for the overall subjective appetite response (continued).

Panel A3. The corresponding methods and interpretation are given in the caption on the first page of this figure.

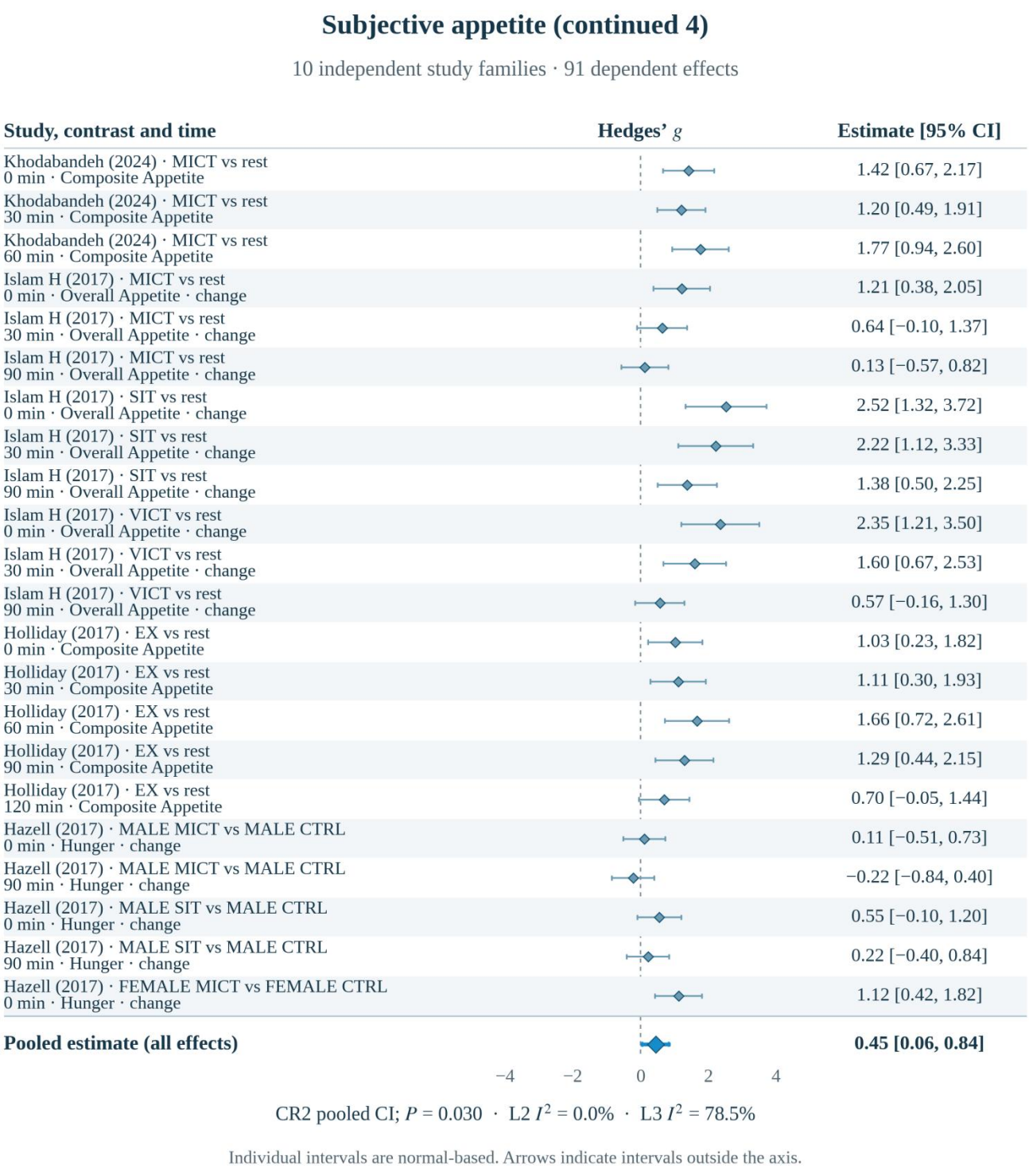
A3



Supplementary Figure S8. Forest plot for the overall subjective appetite response (continued).

Panel A4. The corresponding methods and interpretation are given in the caption on the first page of this figure.

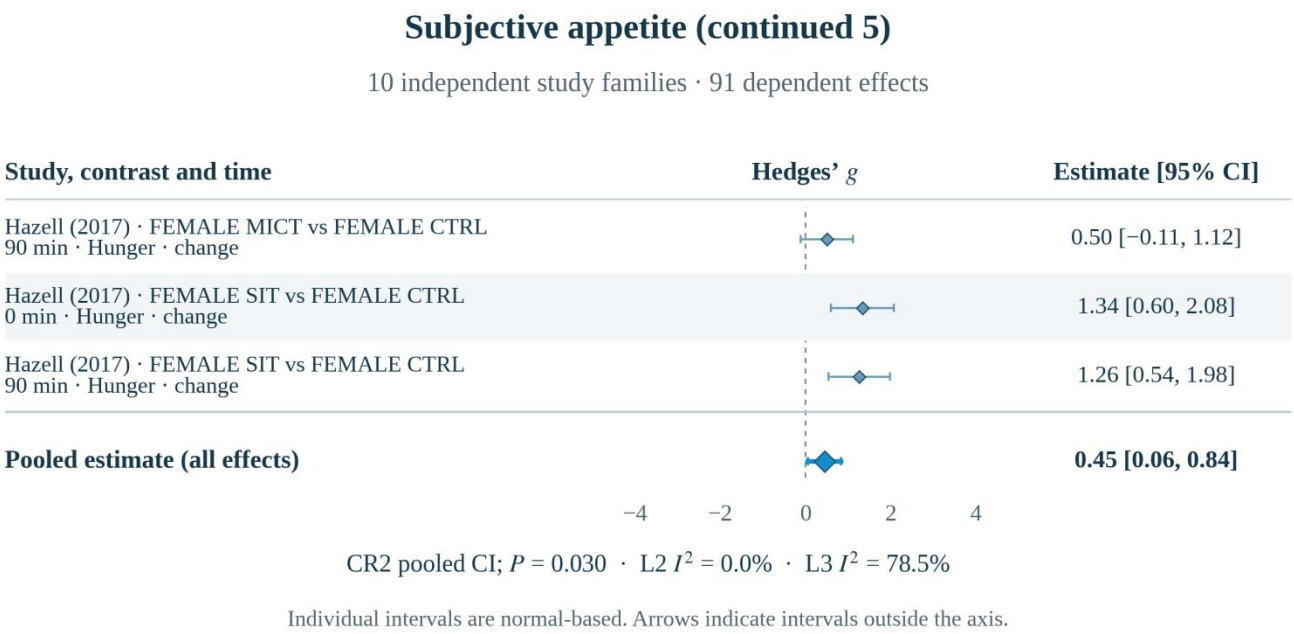
A4



Supplementary Figure S8. Forest plot for the overall subjective appetite response (continued).

Panel A5. The corresponding methods and interpretation are given in the caption on the first page of this figure.

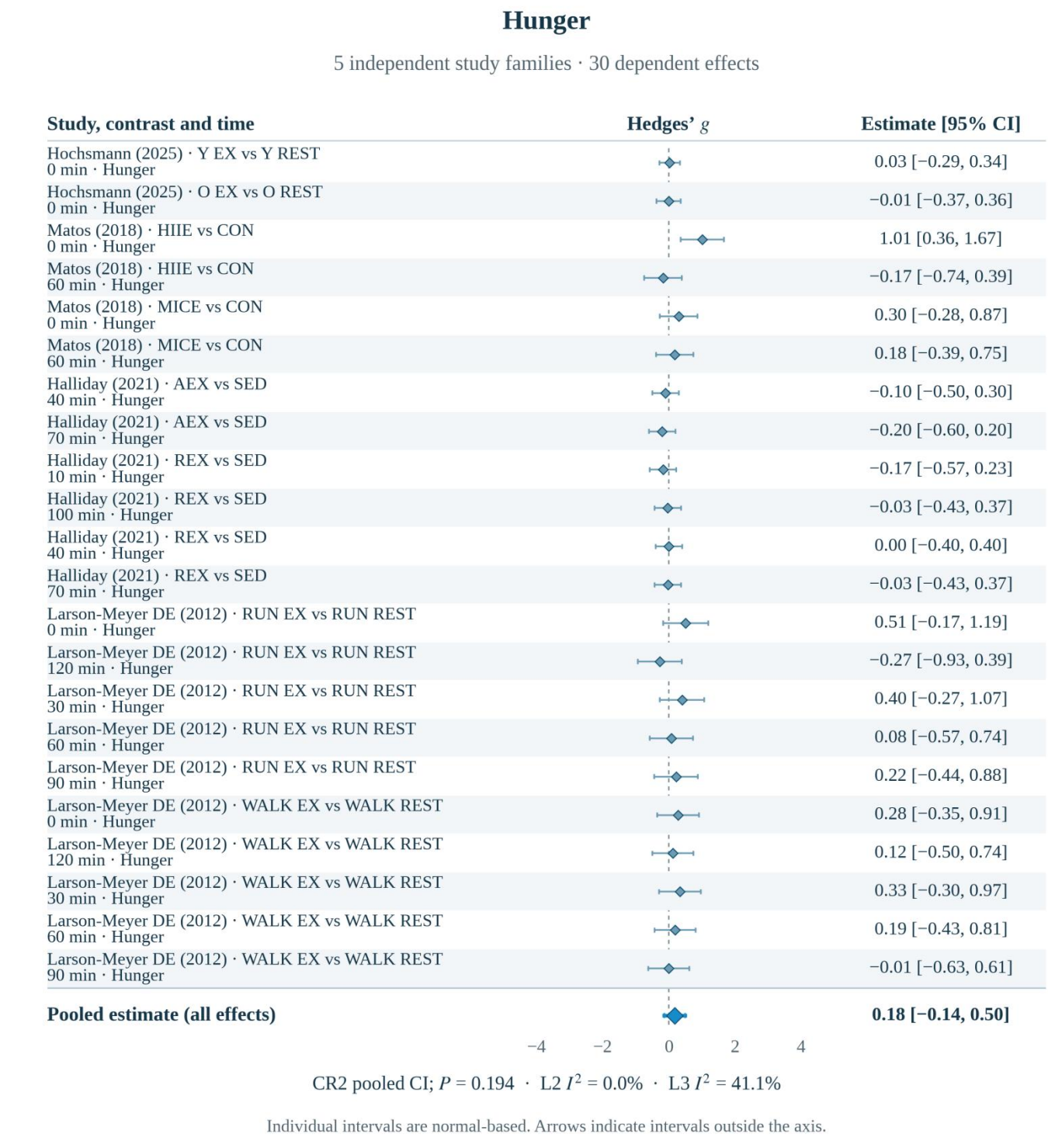
A5



Supplementary Figure S9. Forest plots for individual subjective appetite dimensions.

A, hunger; B, fullness; C, satiety; D, prospective food consumption; E, overall or composite appetite. Positive values consistently indicate the direction toward lower appetite.

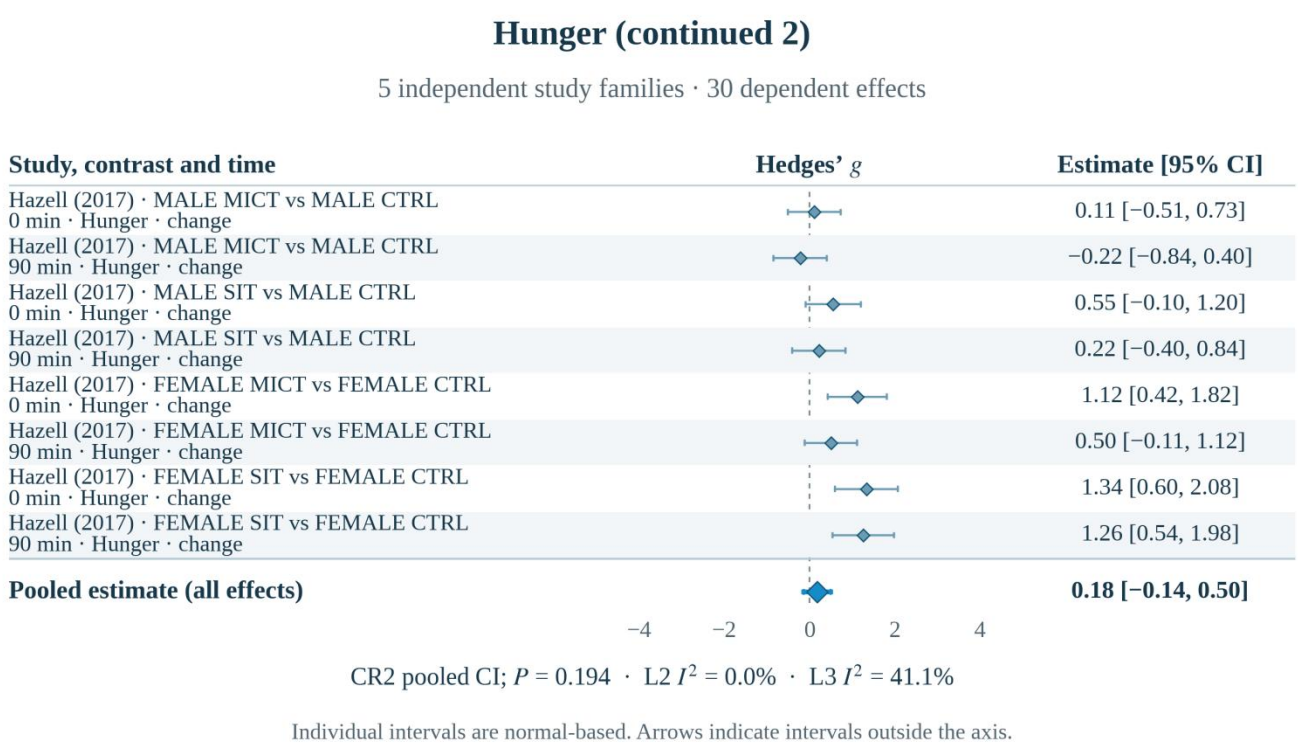
A1



Supplementary Figure S9. Forest plots for individual subjective appetite dimensions (continued).

Panel A2. The corresponding methods and interpretation are given in the caption on the first page of this figure.

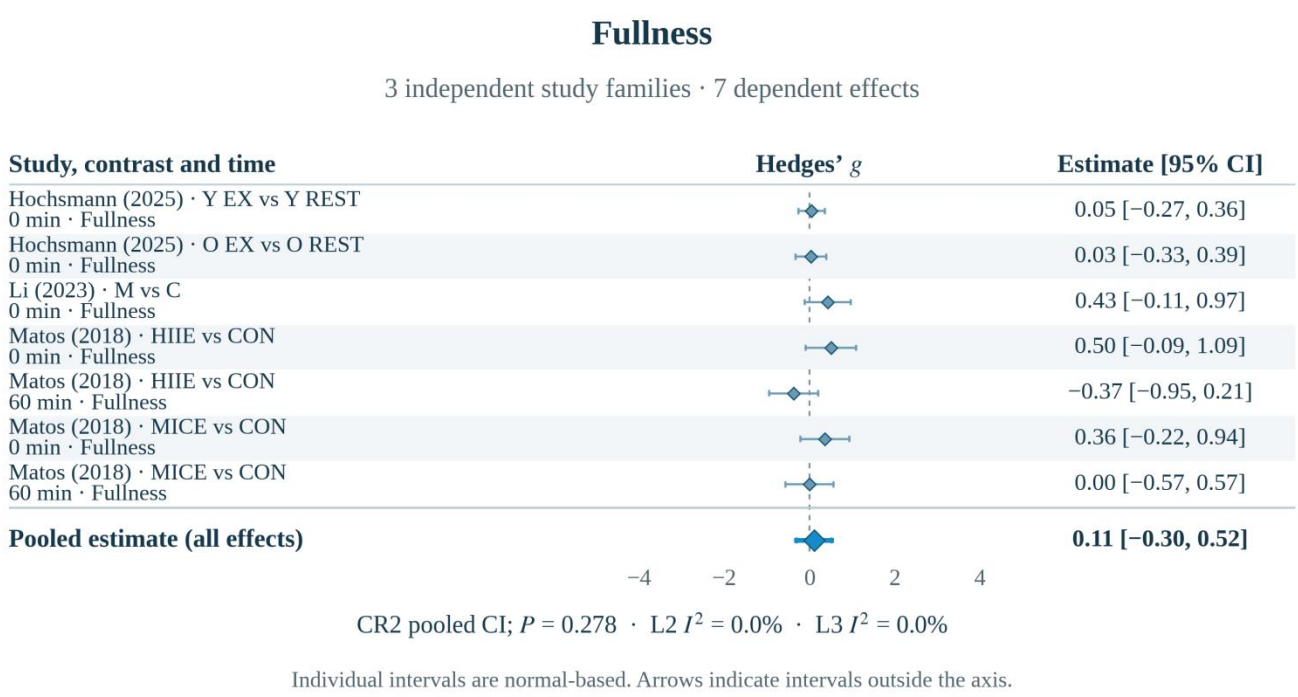
A2



Supplementary Figure S9. Forest plots for individual subjective appetite dimensions (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

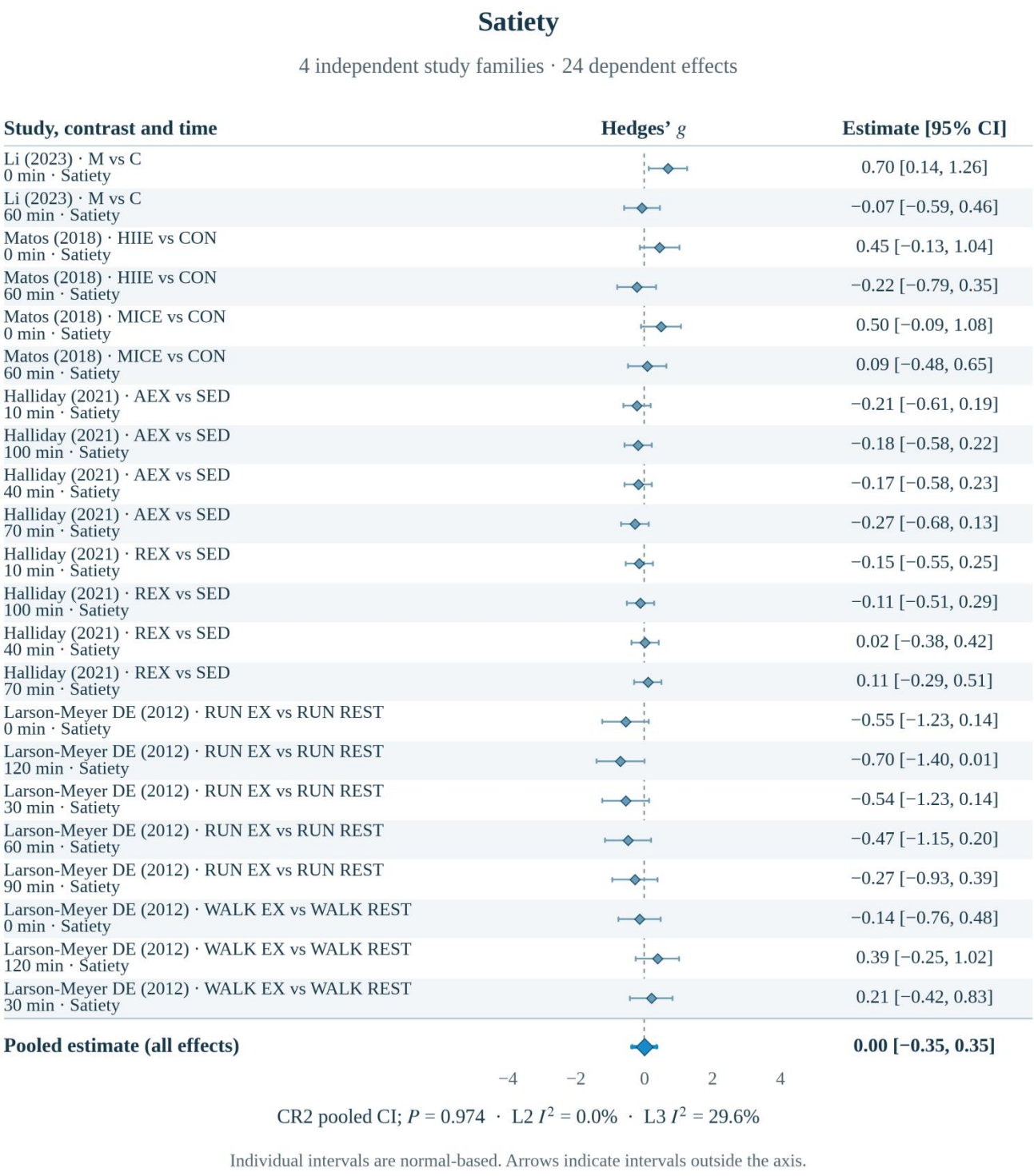
B



Supplementary Figure S9. Forest plots for individual subjective appetite dimensions (continued).

Panel C1. The corresponding methods and interpretation are given in the caption on the first page of this figure.

C1



Supplementary Figure S9. Forest plots for individual subjective appetite dimensions (continued).

Panel C2. The corresponding methods and interpretation are given in the caption on the first page of this figure.

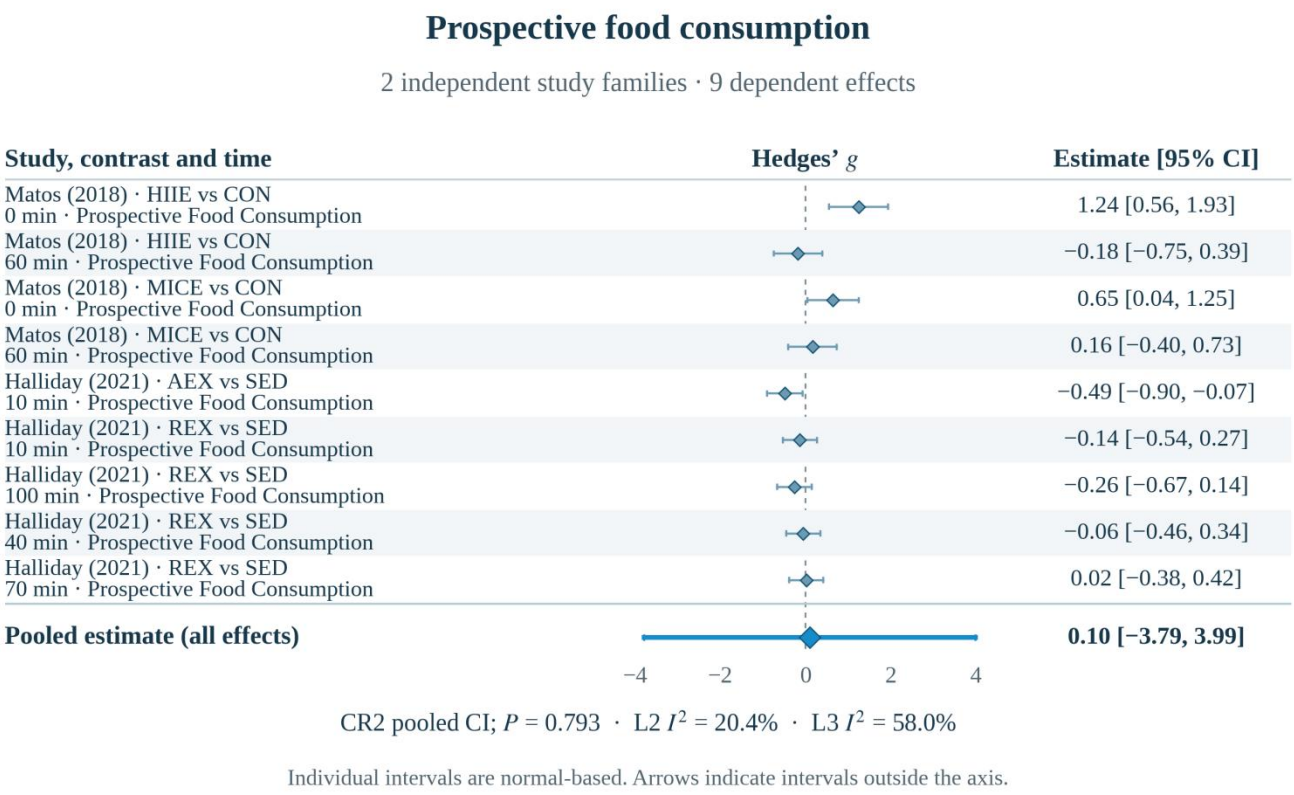
C2



Supplementary Figure S9. Forest plots for individual subjective appetite dimensions (continued).

Panel D. The corresponding methods and interpretation are given in the caption on the first page of this figure.

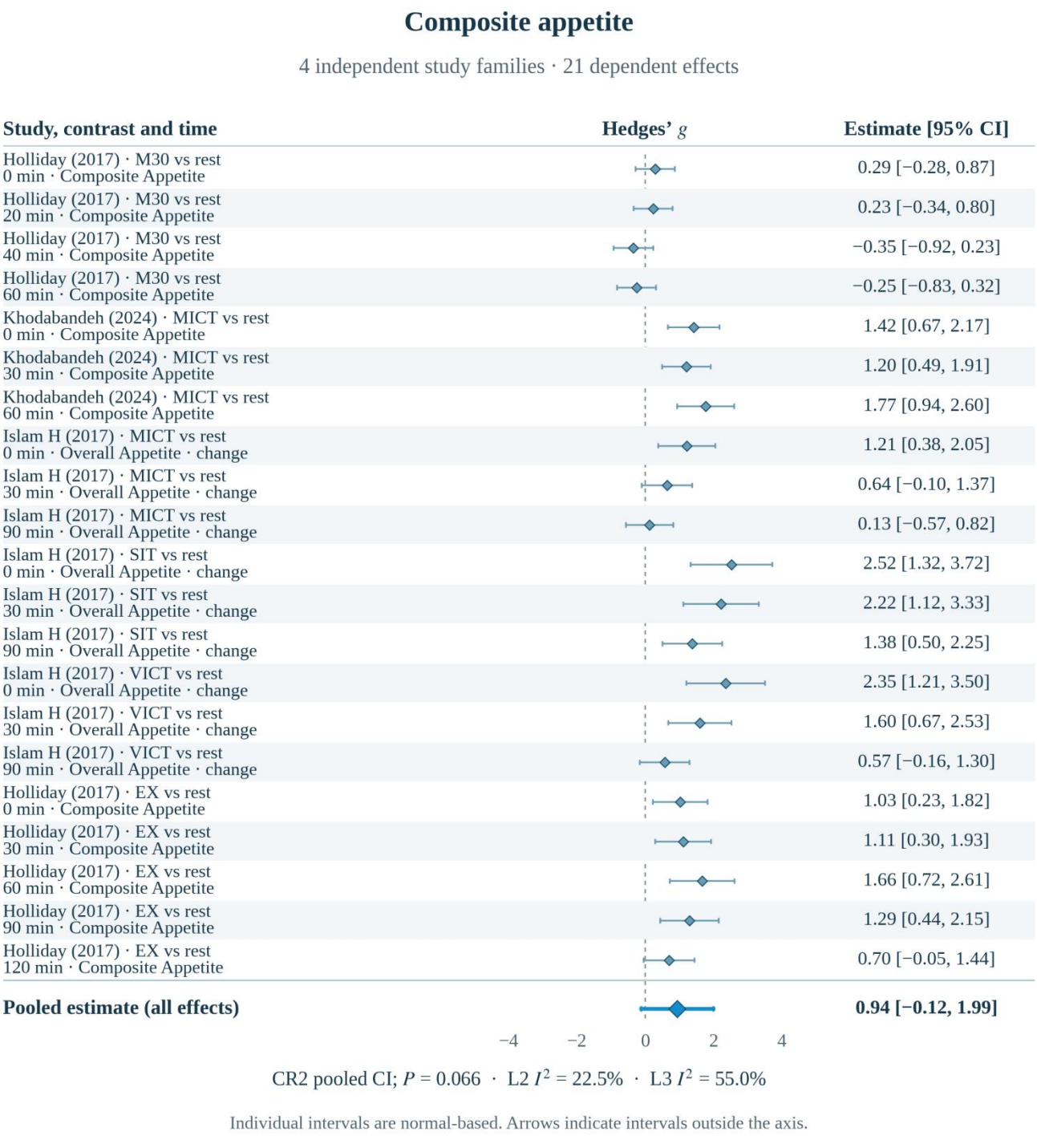
D



Supplementary Figure S9. Forest plots for individual subjective appetite dimensions (continued).

Panel E. The corresponding methods and interpretation are given in the caption on the first page of this figure.

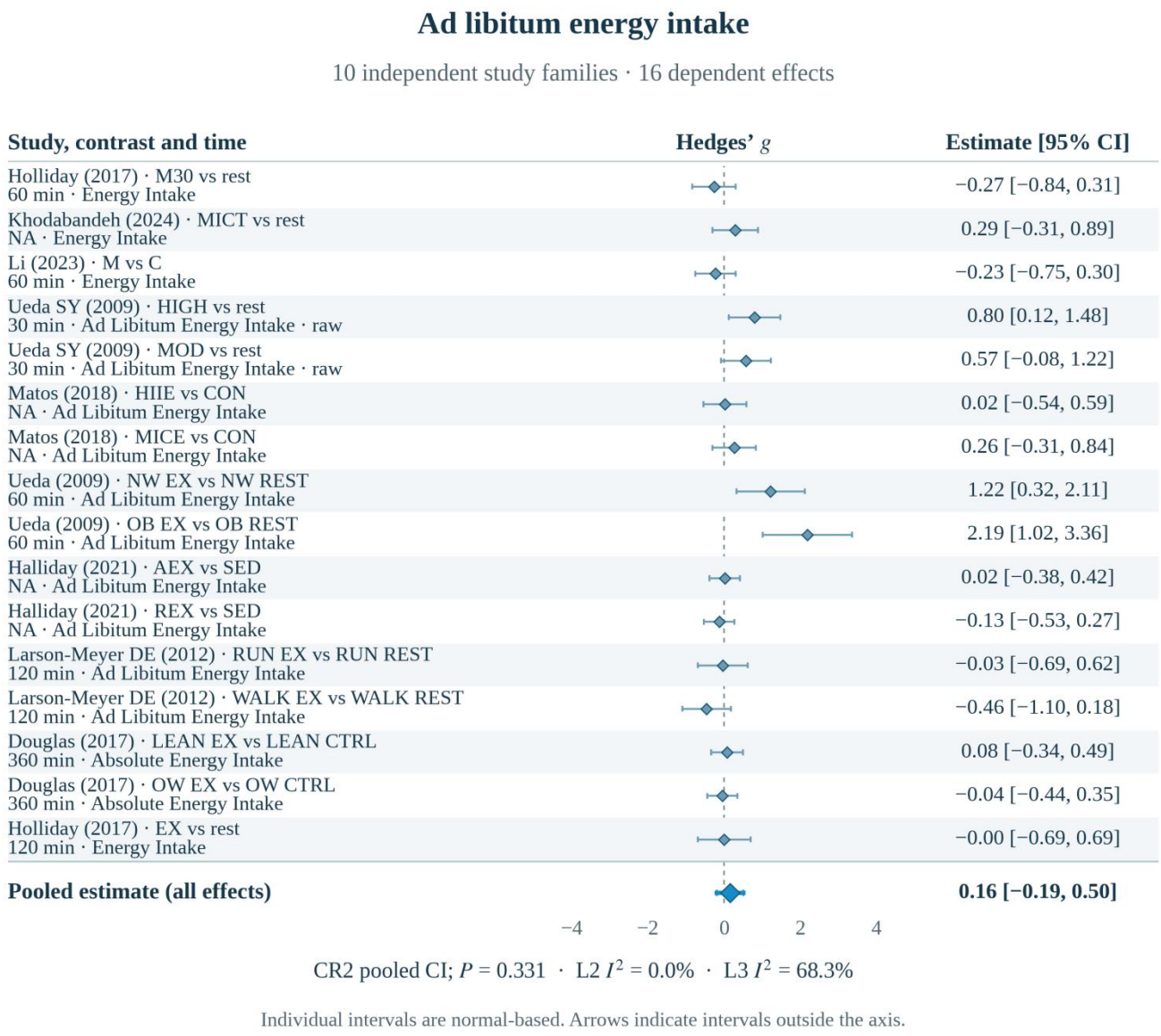
E



Supplementary Figure S10. Forest plot for ad libitum energy intake.

Energy-intake effects were multiplied by −1 so that positive *g* indicates lower subsequent intake after exercise. Uncertainty in this behavioural outcome should not be resolved by the significance of the hormonal outcomes.

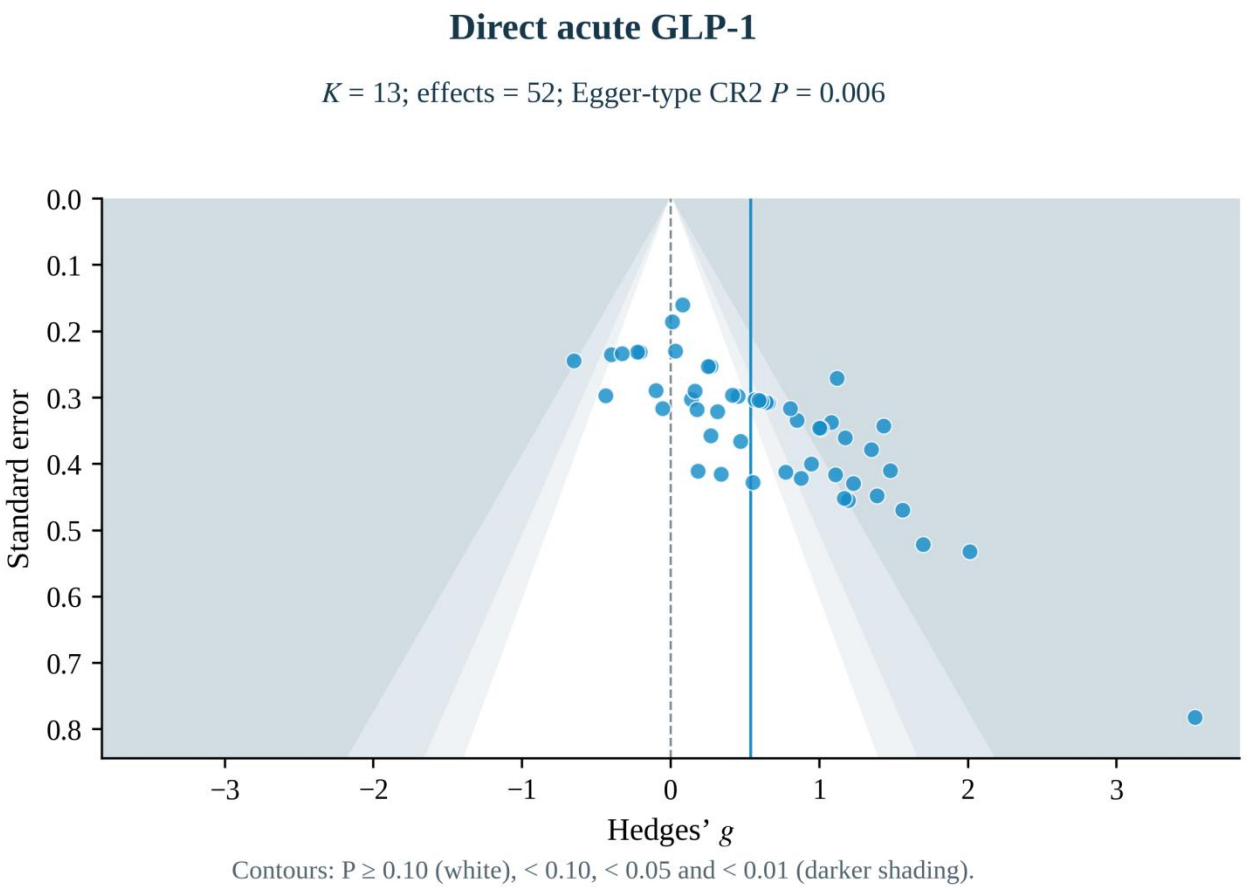
A



Supplementary Figure S11. Contour-enhanced funnel plots for GLP-1 outcomes.

A, overall direct acute GLP-1; B, total direct GLP-1; C, 0–15 min; D, >15–60 min. Each panel reports the Egger-type CR2 test. These tests have limited power with few independent families and do not establish the presence or absence of reporting bias.

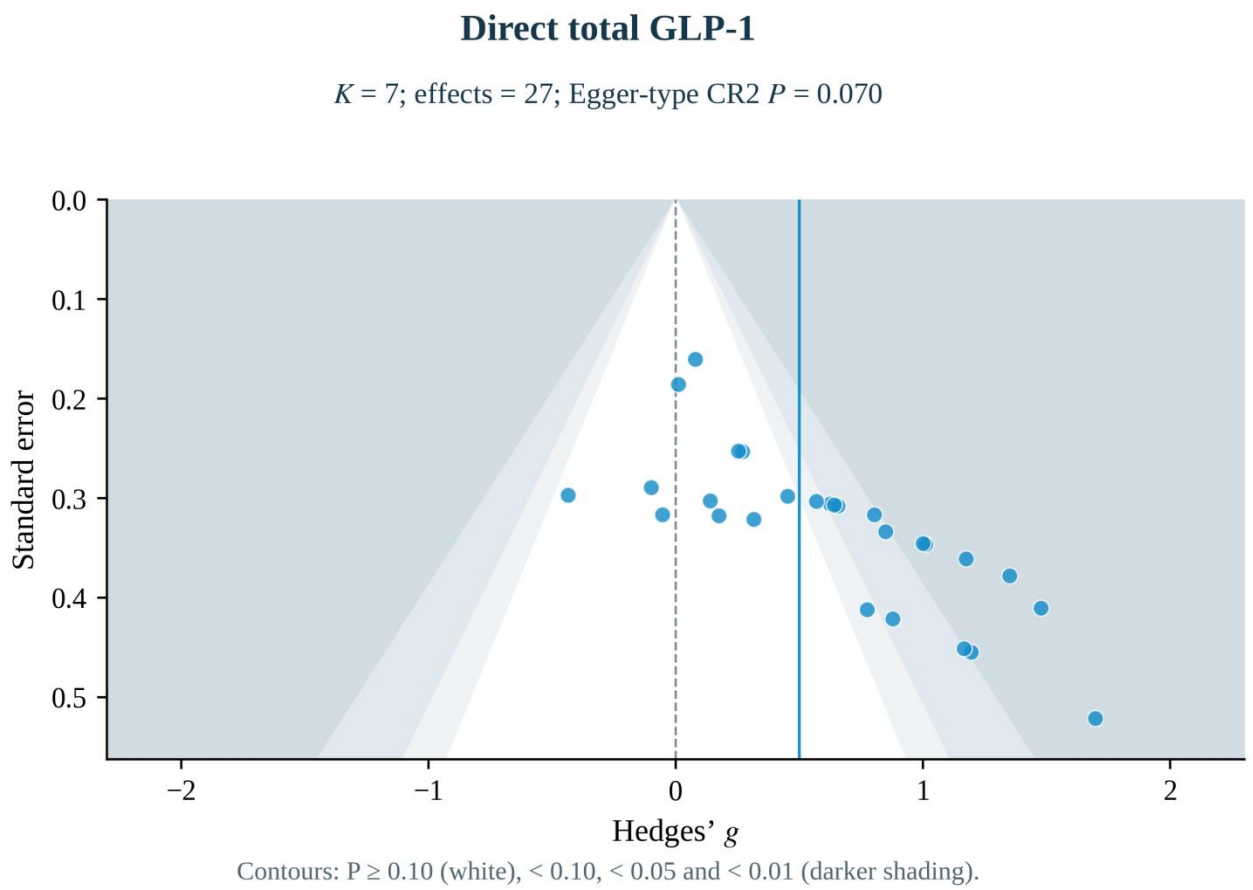
A



Supplementary Figure S11. Contour-enhanced funnel plots for GLP-1 outcomes (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

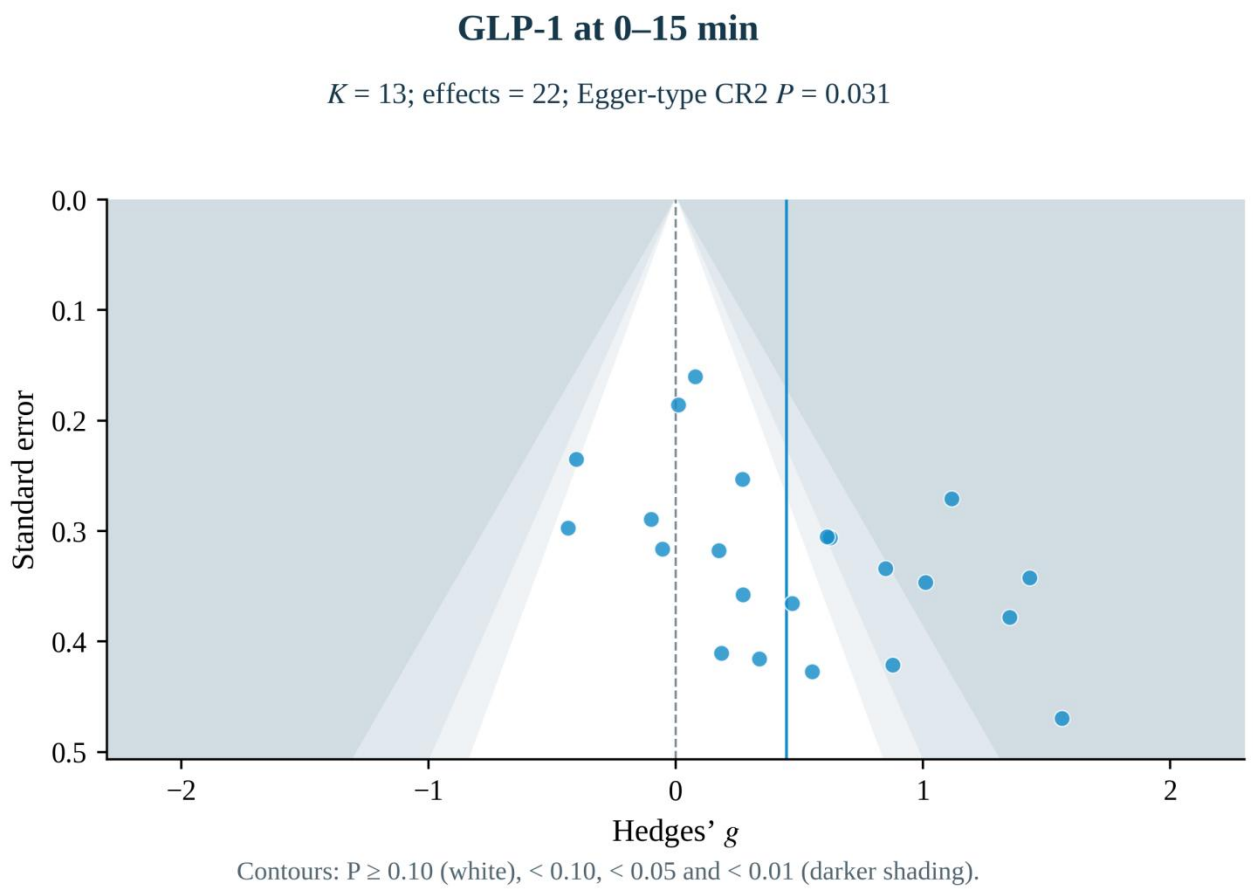
B



Supplementary Figure S11. Contour-enhanced funnel plots for GLP-1 outcomes (continued).

Panel C. The corresponding methods and interpretation are given in the caption on the first page of this figure.

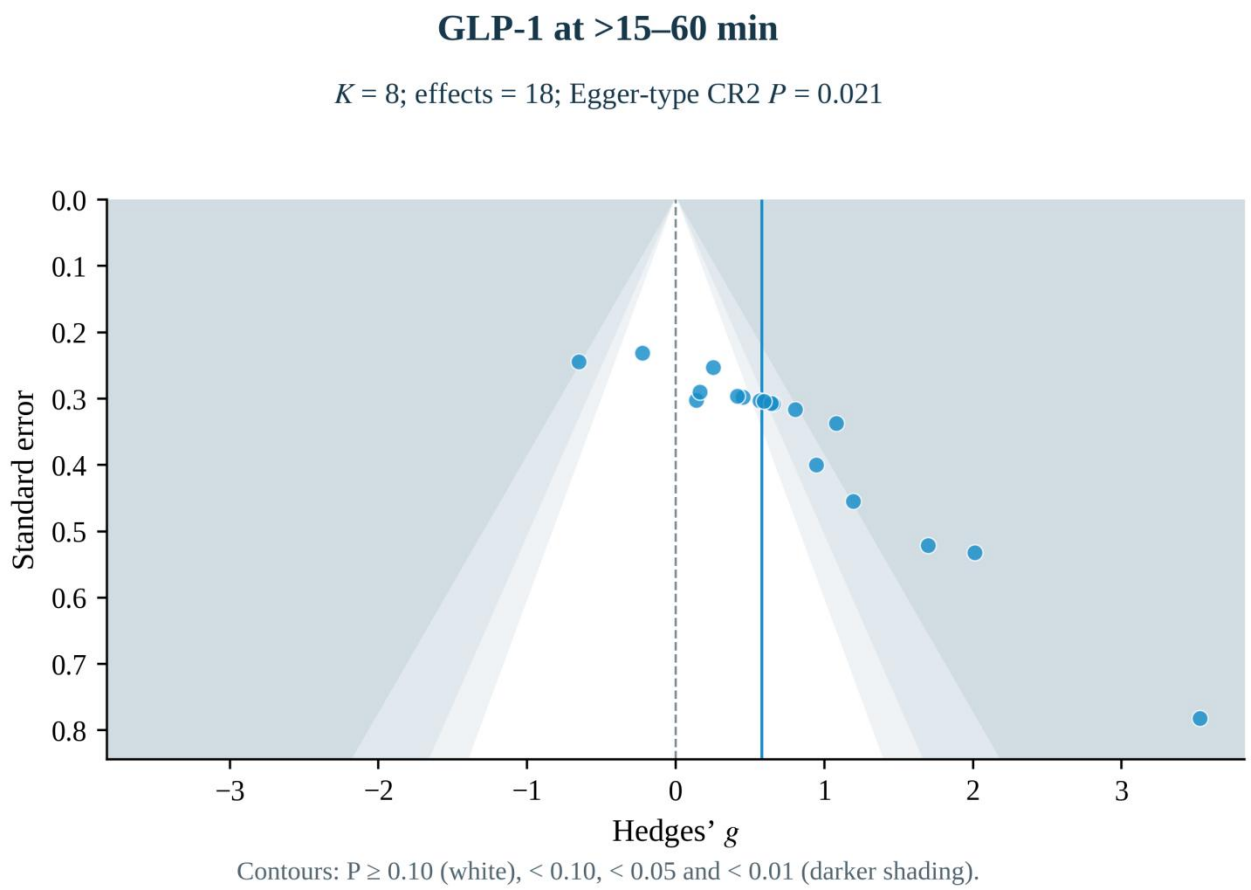
C



Supplementary Figure S11. Contour-enhanced funnel plots for GLP-1 outcomes (continued).

Panel D. The corresponding methods and interpretation are given in the caption on the first page of this figure.

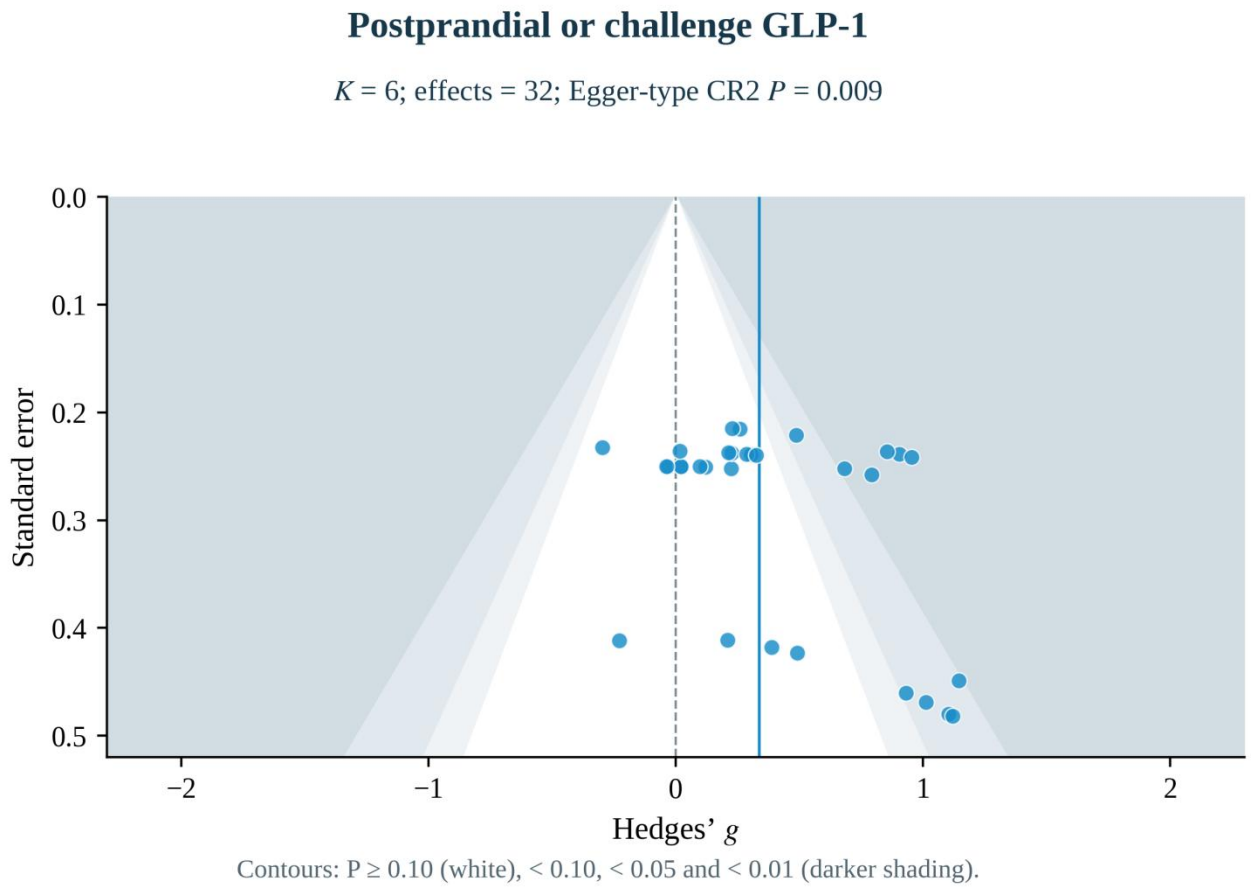
D



Supplementary Figure S12. Contour-enhanced funnel plots for postprandial or challenge and delayed GLP-1.

A, postprandial or nutrient-challenge GLP-1; B, delayed GLP-1. Each panel reports the Egger-type CR2 test. Contours are centred on the null and the vertical blue line marks the pooled estimate.

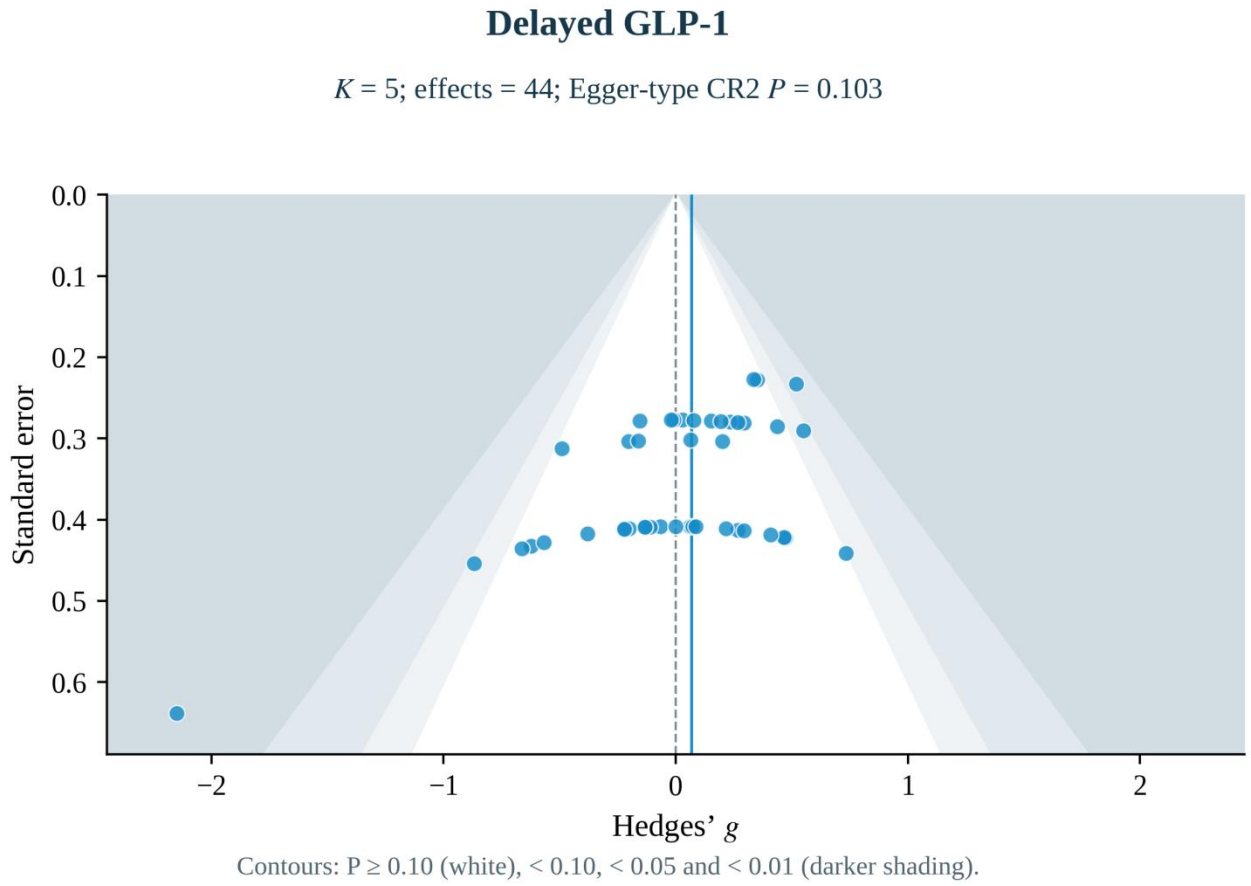
A



Supplementary Figure S12. Contour-enhanced funnel plots for postprandial or challenge and delayed GLP-1 (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

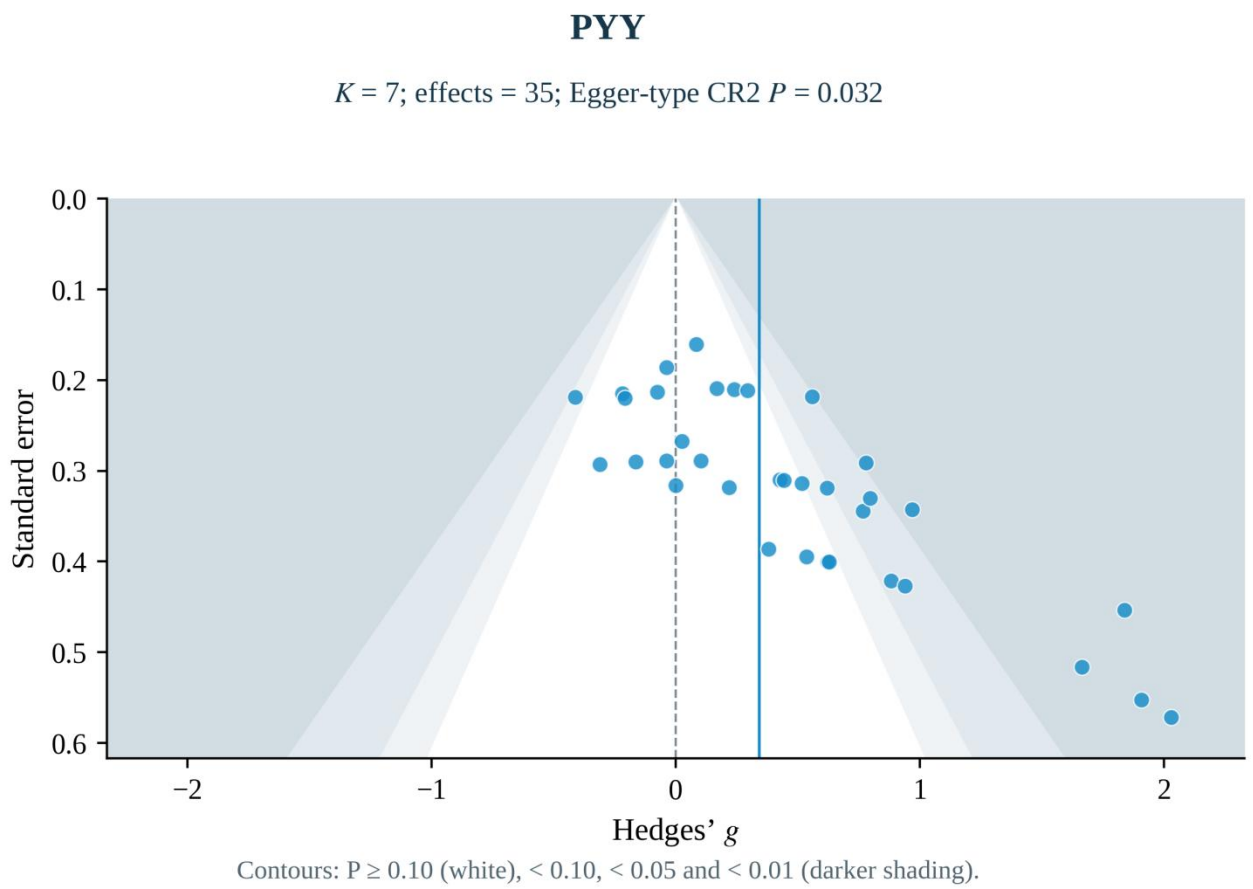
B



Supplementary Figure S13. Contour-enhanced funnel plots for appetite-related secondary outcomes.

A, PYY; B, subjective appetite; C, ad libitum energy intake. Egger-type CR2 test results are shown within each panel. Dependent effect estimates are clustered by study family for inference.

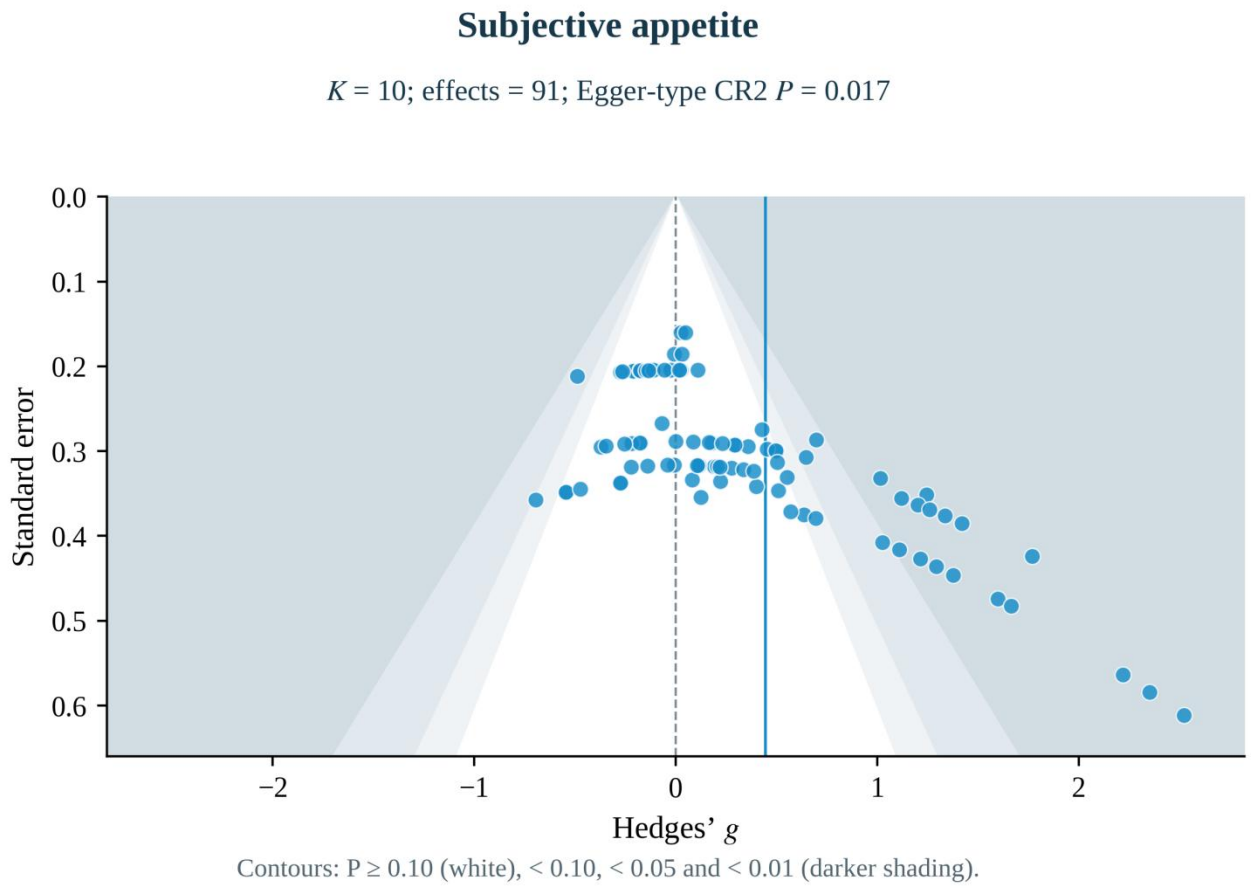
A



Supplementary Figure S13. Contour-enhanced funnel plots for appetite-related secondary outcomes (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

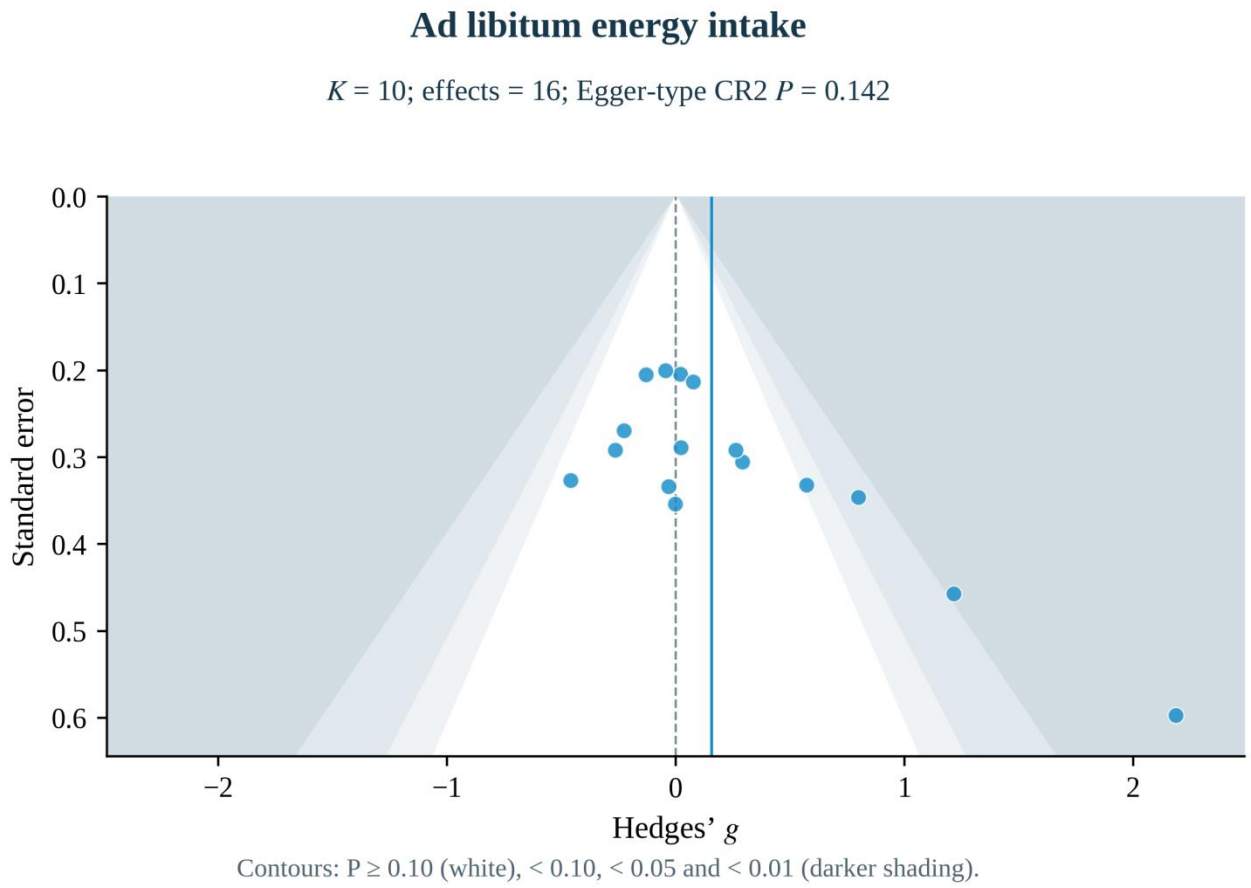
B



Supplementary Figure S13. Contour-enhanced funnel plots for appetite-related secondary outcomes (continued).

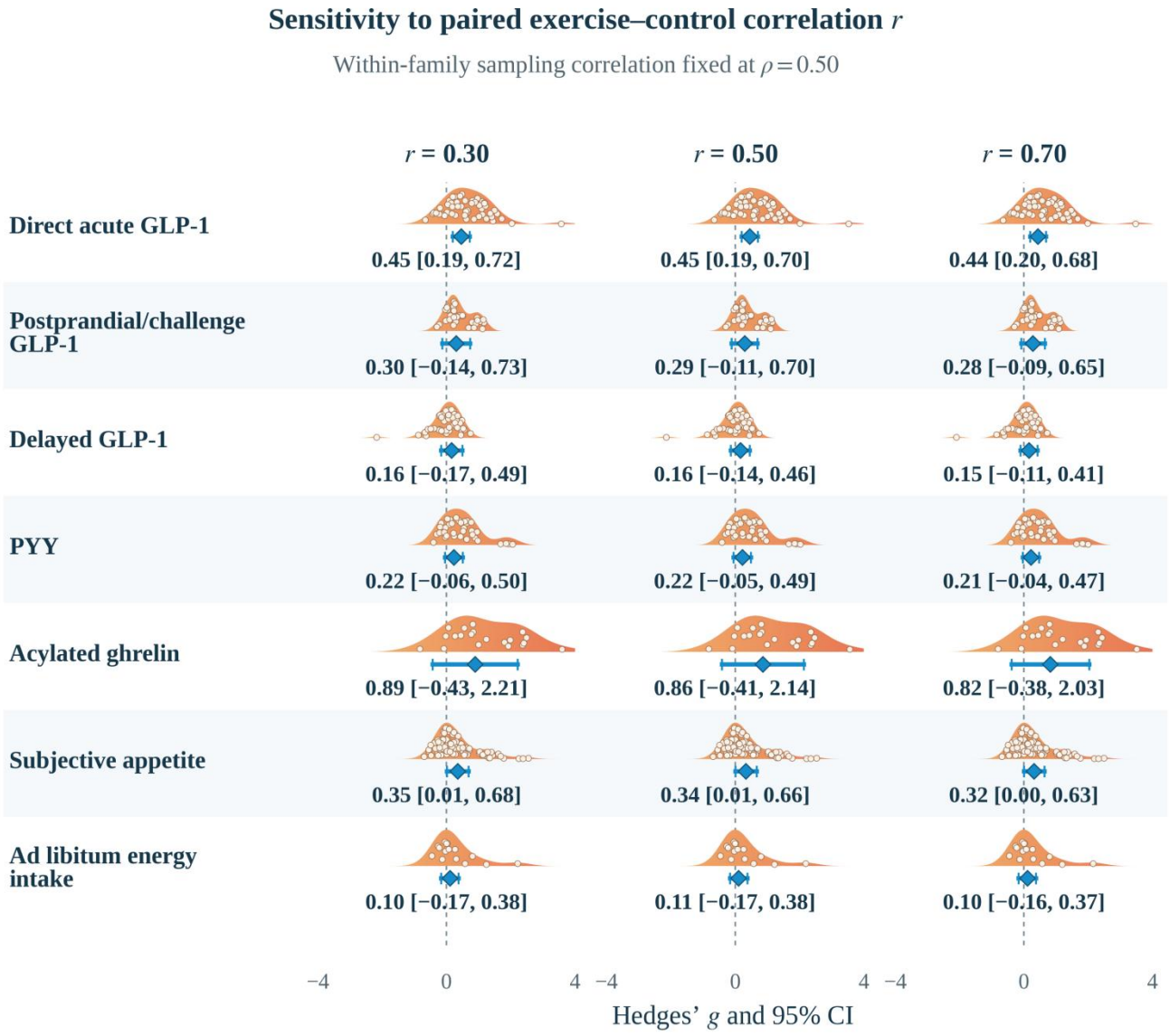
Panel C. The corresponding methods and interpretation are given in the caption on the first page of this figure.

C



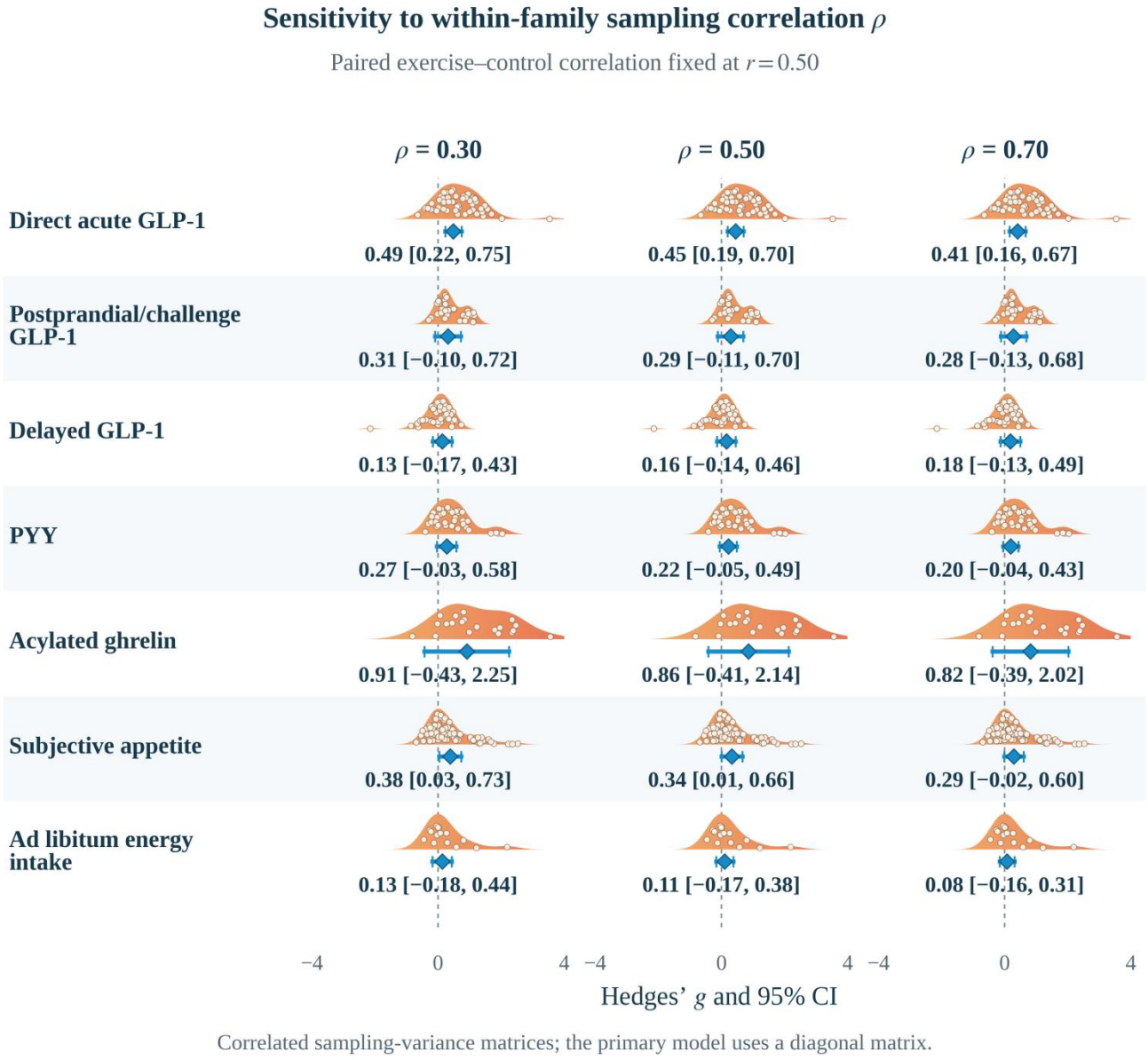
Supplementary Figure S14. Sensitivity analysis for the assumed paired exercise–control correlation.

The paired exercise–control correlation r was varied across 0.30, 0.50 and 0.70, with within-family sampling correlation ρ fixed at 0.50. Every panel uses a correlated sampling-variance matrix. The $r = 0.50$ panel is the correlated-variance reference, not the primary model with a diagonal sampling-variance matrix. Blue diamonds and bars show pooled Hedges' g and 95% confidence intervals.



Supplementary Figure S15. Sensitivity analysis for the assumed within-family sampling correlation.

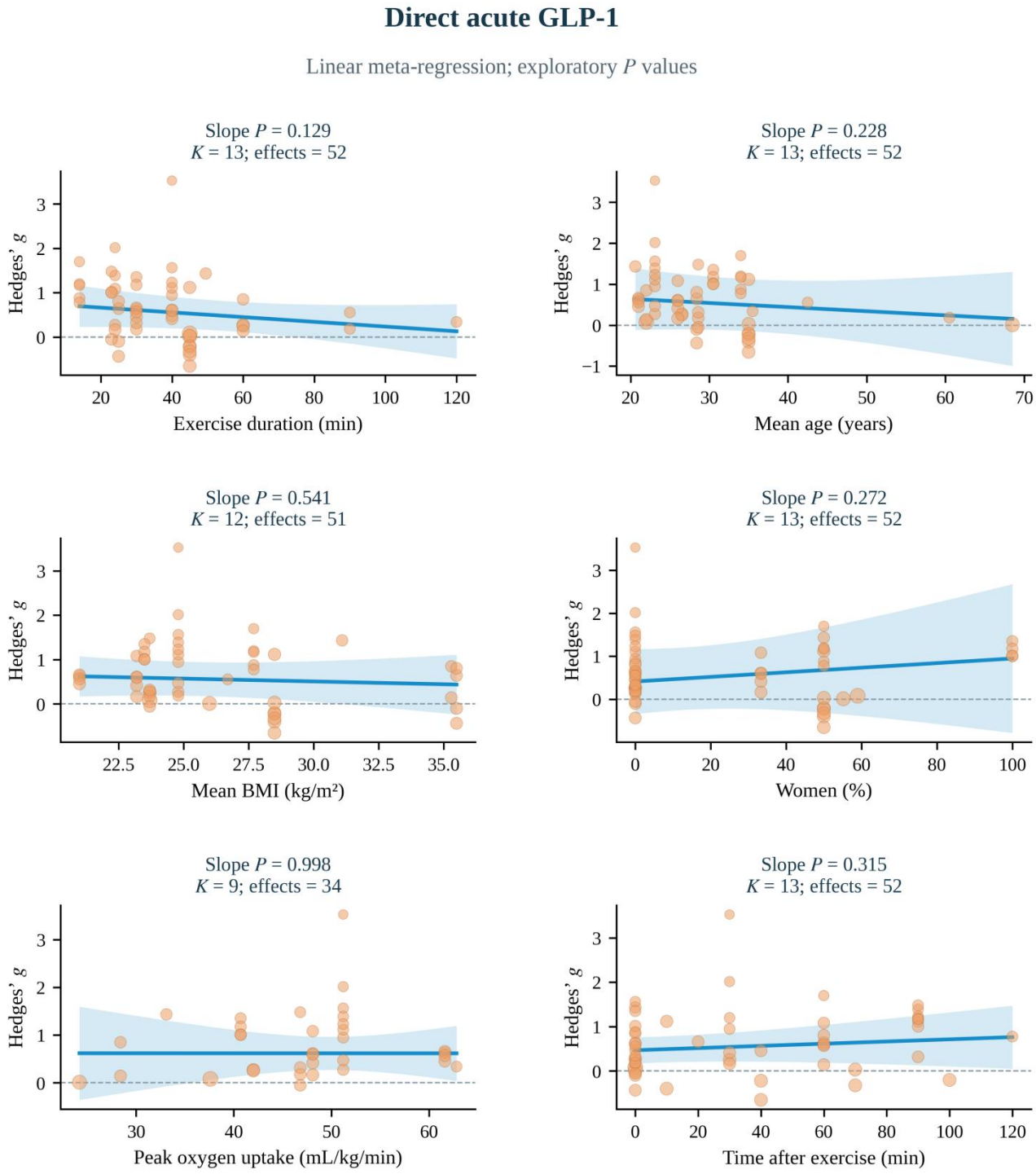
Within-family sampling correlation ρ was varied across 0.30, 0.50 and 0.70, with paired exercise–control correlation r fixed at 0.50. The ρ = 0.50 panel is not the primary diagonal-variance model. Reweighting dependent effects explains why these estimates differ from the primary model even though the same study families and effect estimates are retained.



Supplementary Figure S16. Continuous meta-regression for direct acute GLP-1.

A, linear three-level meta-regression; B, exploratory quadratic three-level meta-regression. Bands indicate 95% confidence intervals. P values are exploratory and nonconfirmatory. Age, BMI, female proportion and fitness are cohort-level characteristics, not participant-level effects. Time after exercise is a temporal moderator distinct from exercise duration.

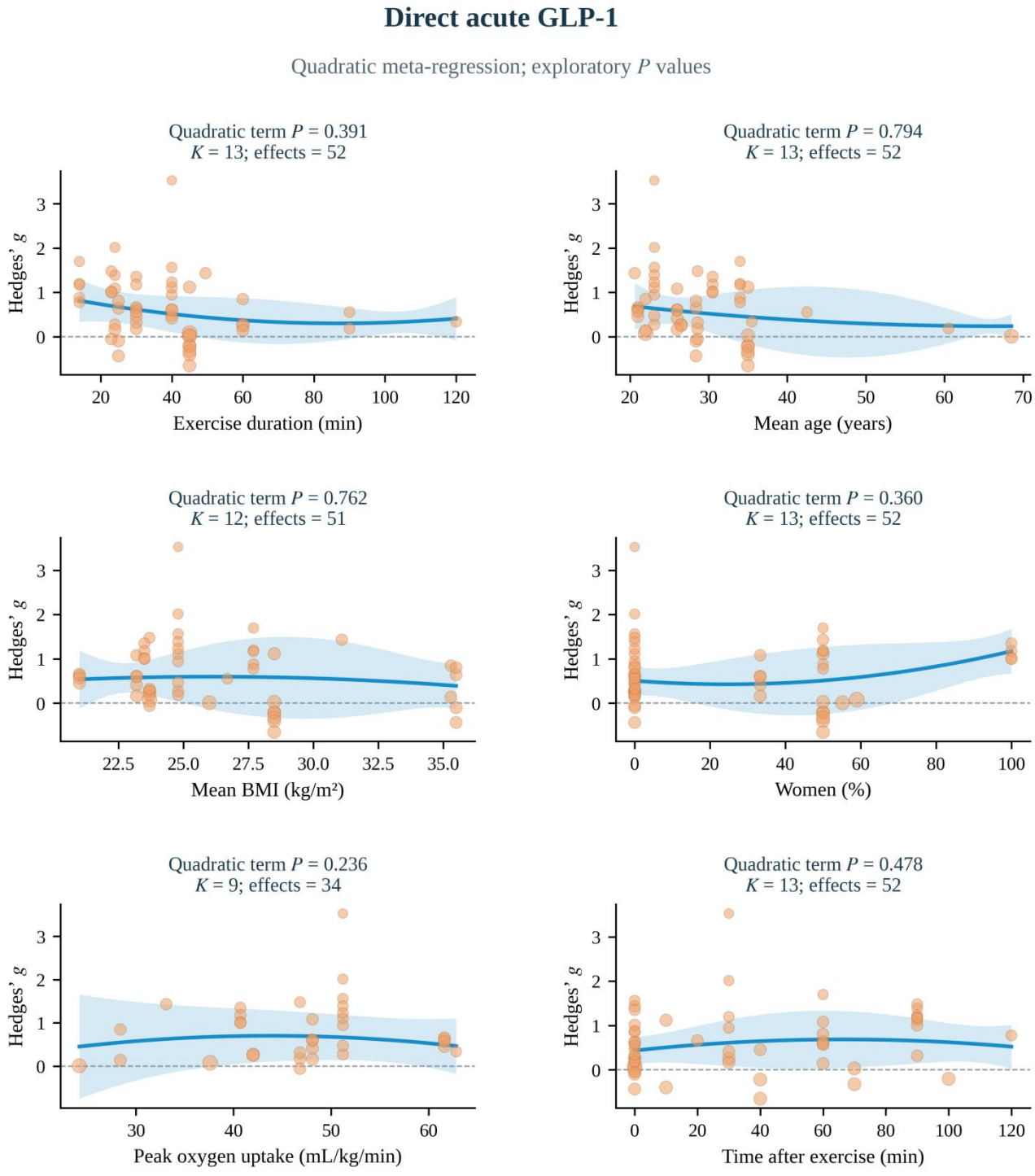
A



Supplementary Figure S16. Continuous meta-regression for direct acute GLP-1 (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

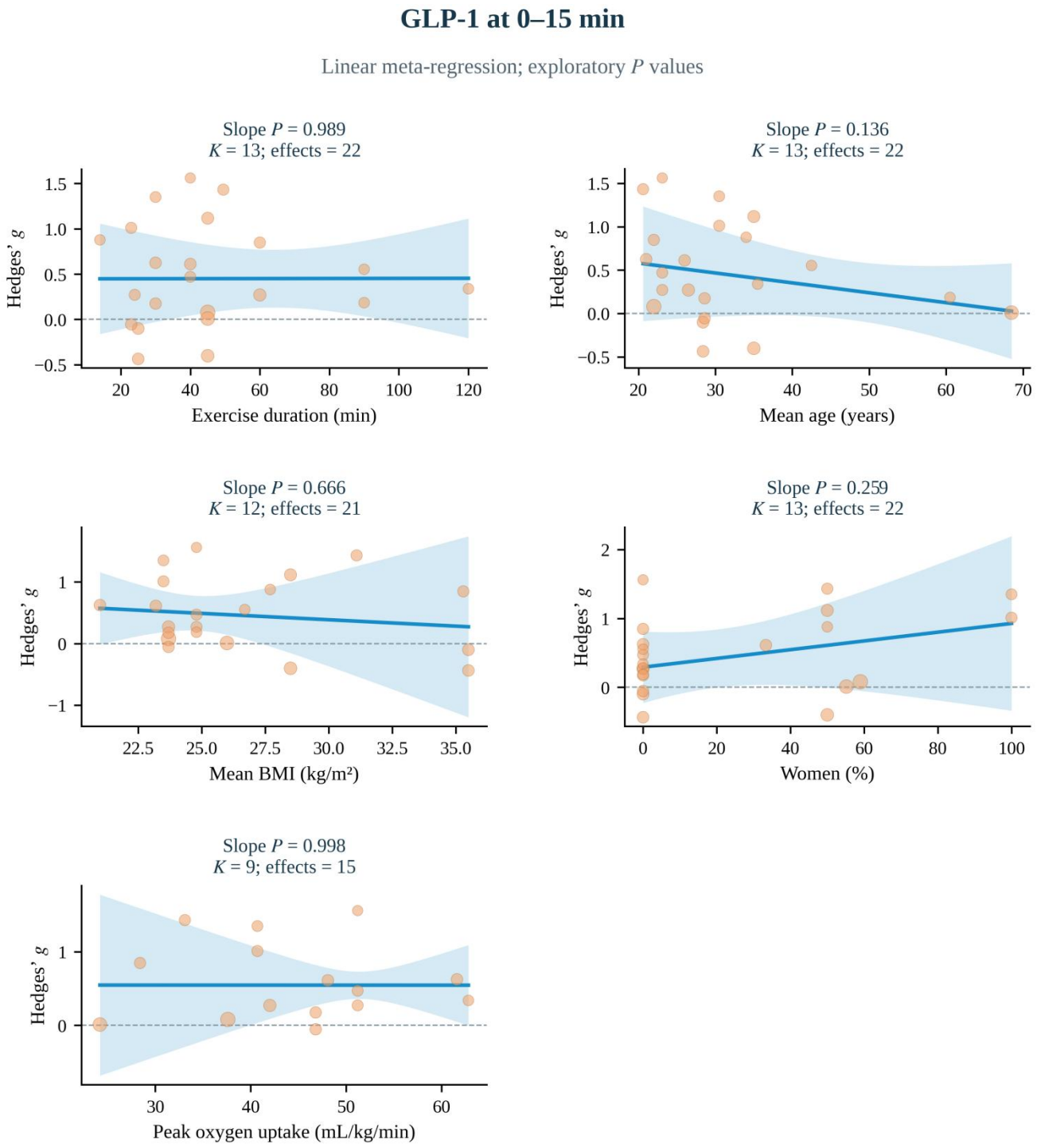
B



Supplementary Figure S17. Continuous meta-regression for GLP-1 at 0–15 min after exercise.

A, linear three-level meta-regression; B, exploratory quadratic three-level meta-regression. Bands indicate 95% confidence intervals. P values are exploratory and nonconfirmatory. Associations with participant characteristics describe differences between cohorts and cannot establish individual-level effect modification.

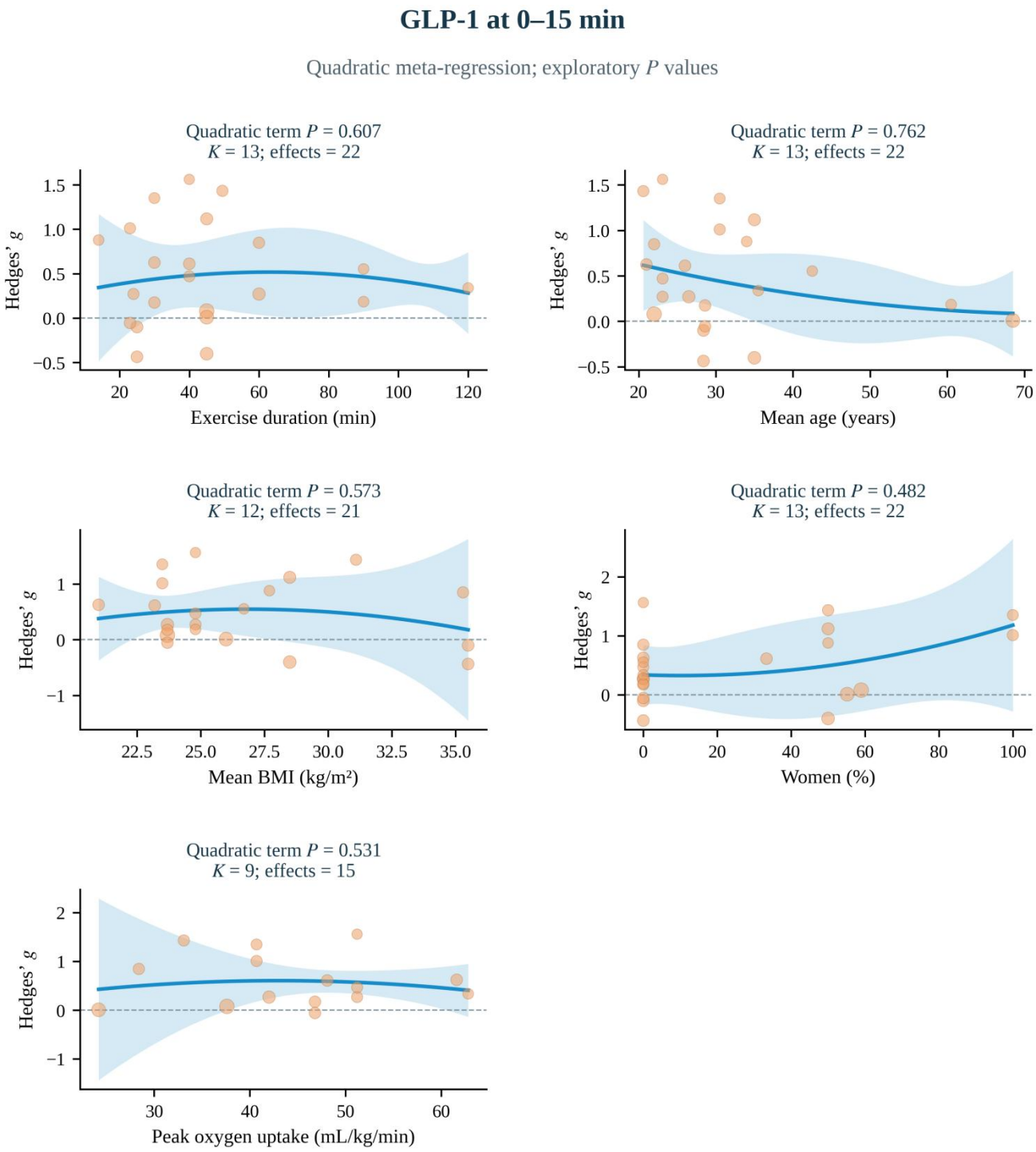
A



Supplementary Figure S17. Continuous meta-regression for GLP-1 at 0–15 min after exercise (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

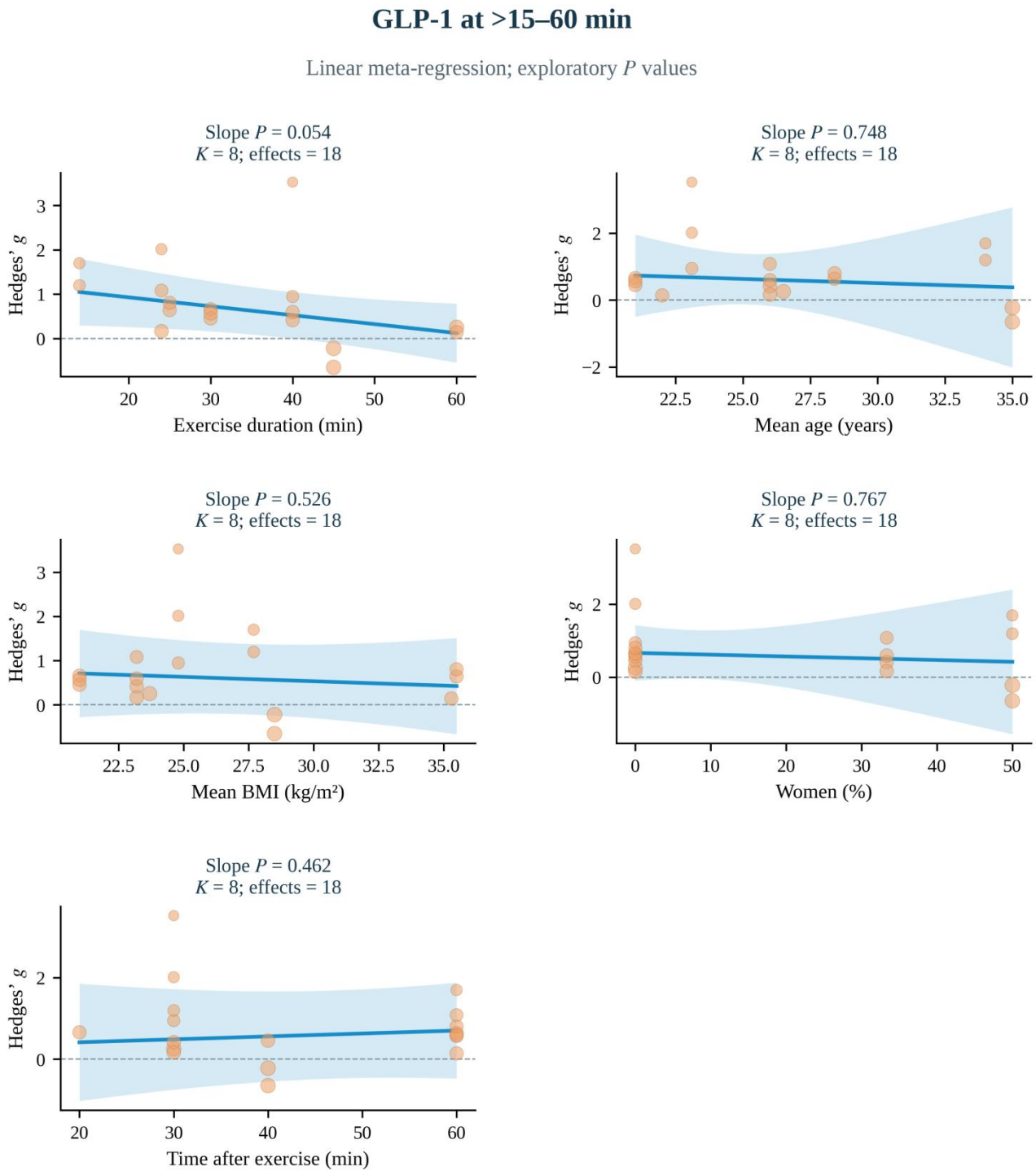
B



Supplementary Figure S18. Continuous meta-regression for GLP-1 at >15–60 min after exercise.

A, linear three-level meta-regression; B, exploratory quadratic three-level meta-regression. Bands indicate 95% confidence intervals. P values are exploratory and nonconfirmatory. Associations with participant characteristics describe differences between cohorts and cannot establish individual-level effect modification.

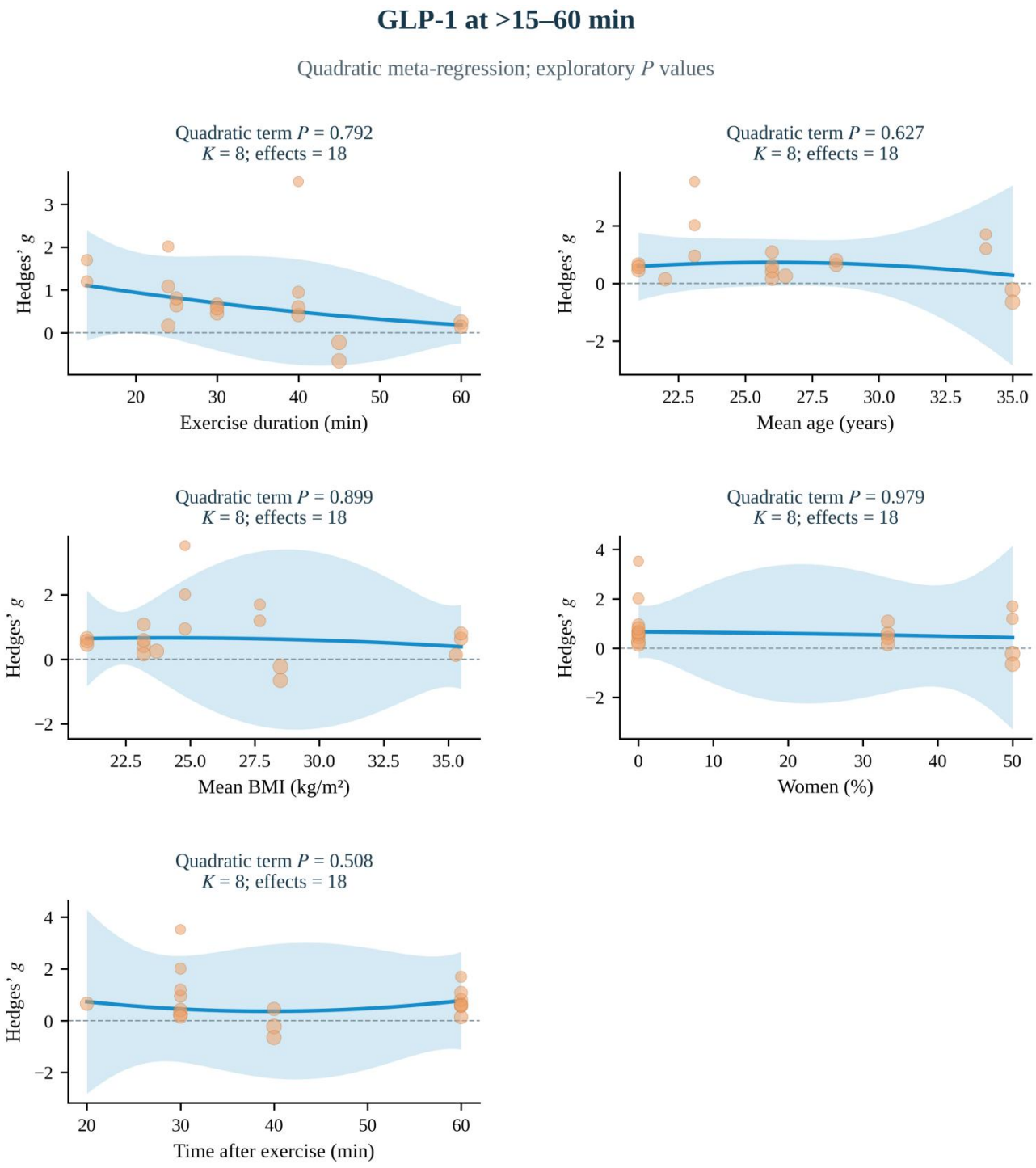
A



Supplementary Figure S18. Continuous meta-regression for GLP-1 at >15–60 min after exercise (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

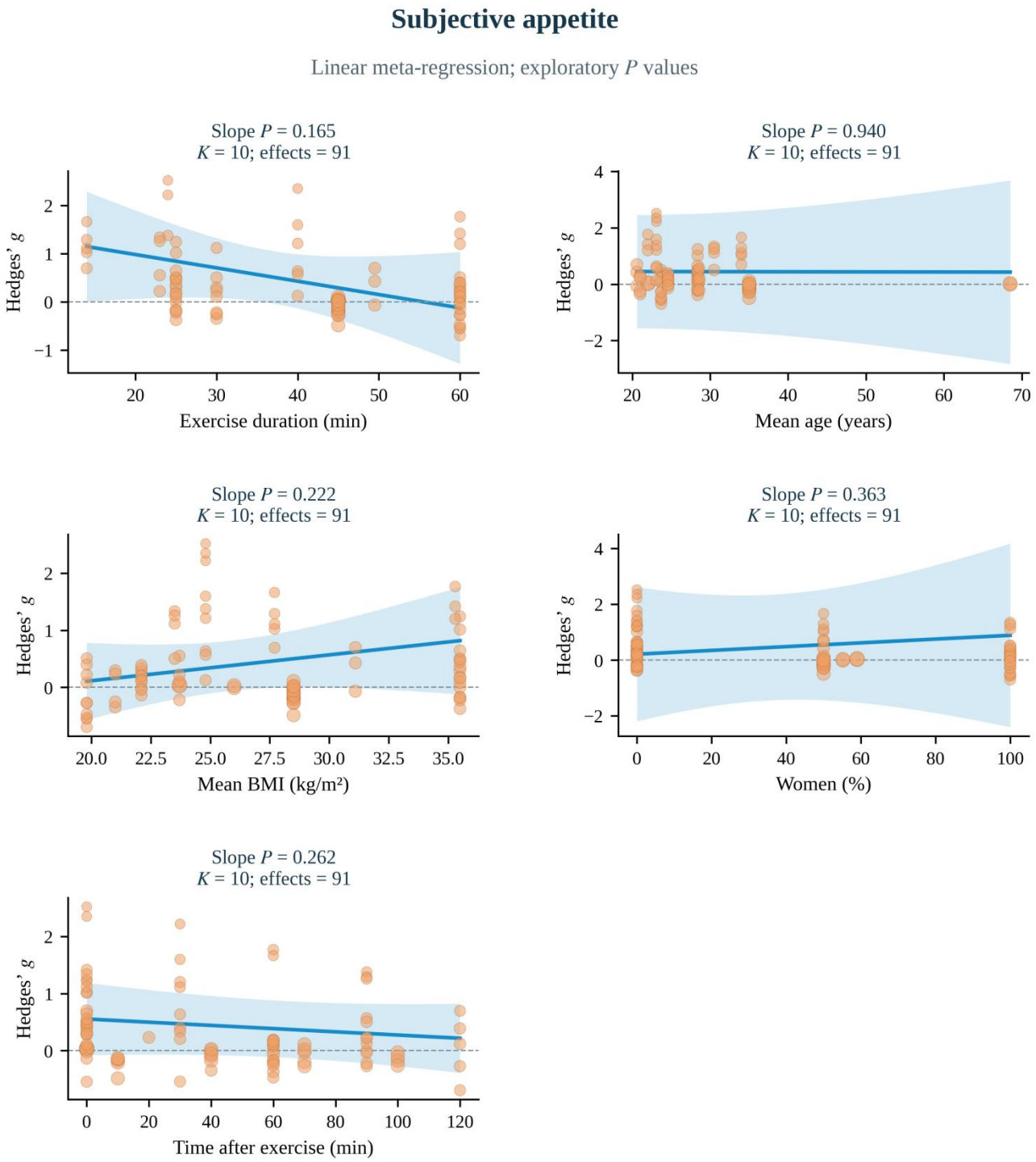
B



Supplementary Figure S19. Continuous meta-regression for subjective appetite.

A, linear three-level meta-regression; B, exploratory quadratic three-level meta-regression. Bands indicate 95% confidence intervals. P values are exploratory and nonconfirmatory. Participant characteristics are cohort-level variables. No mediation analysis linked changes in GLP-1 to subjective appetite.

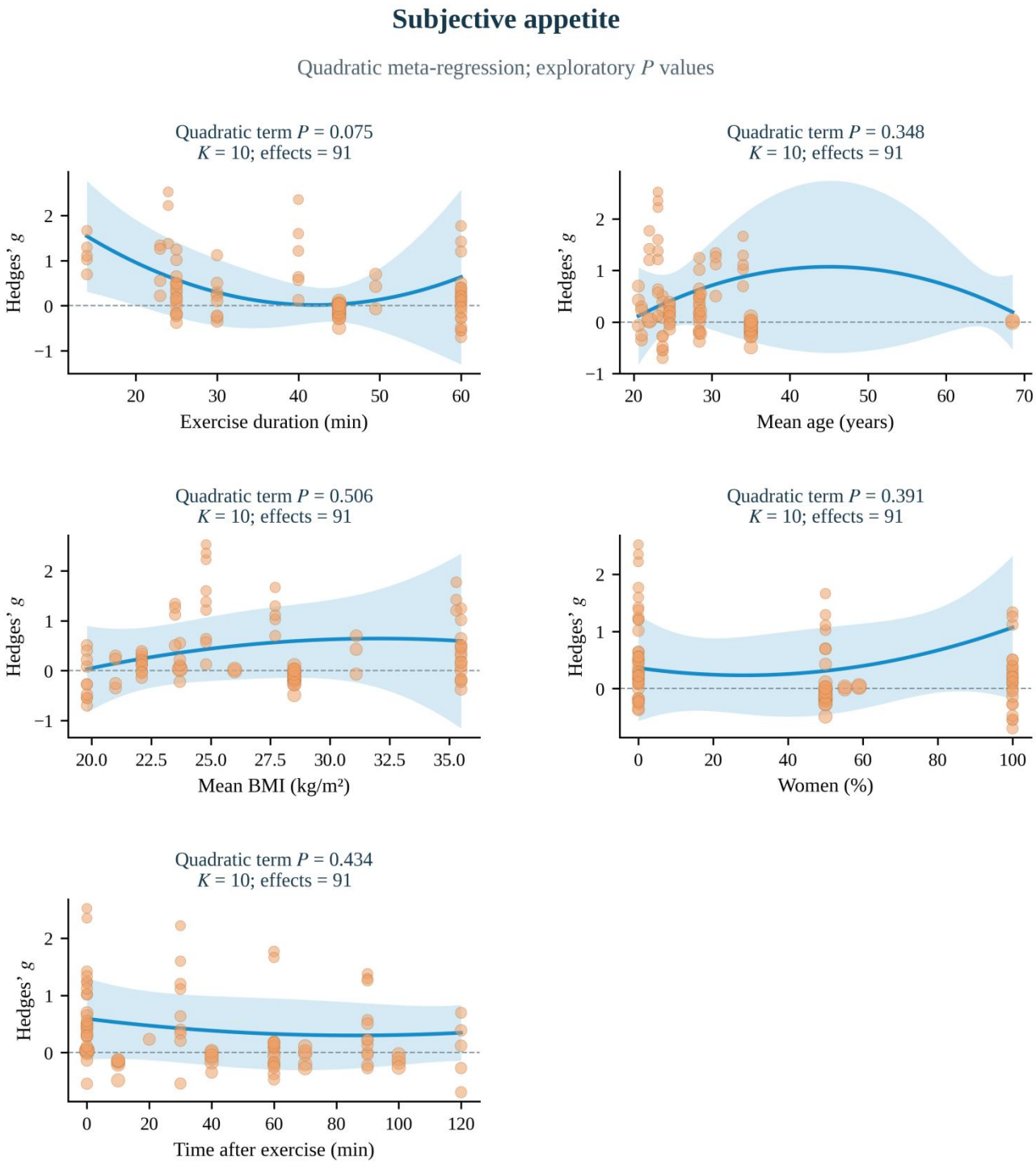
A



Supplementary Figure S19. Continuous meta-regression for subjective appetite (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

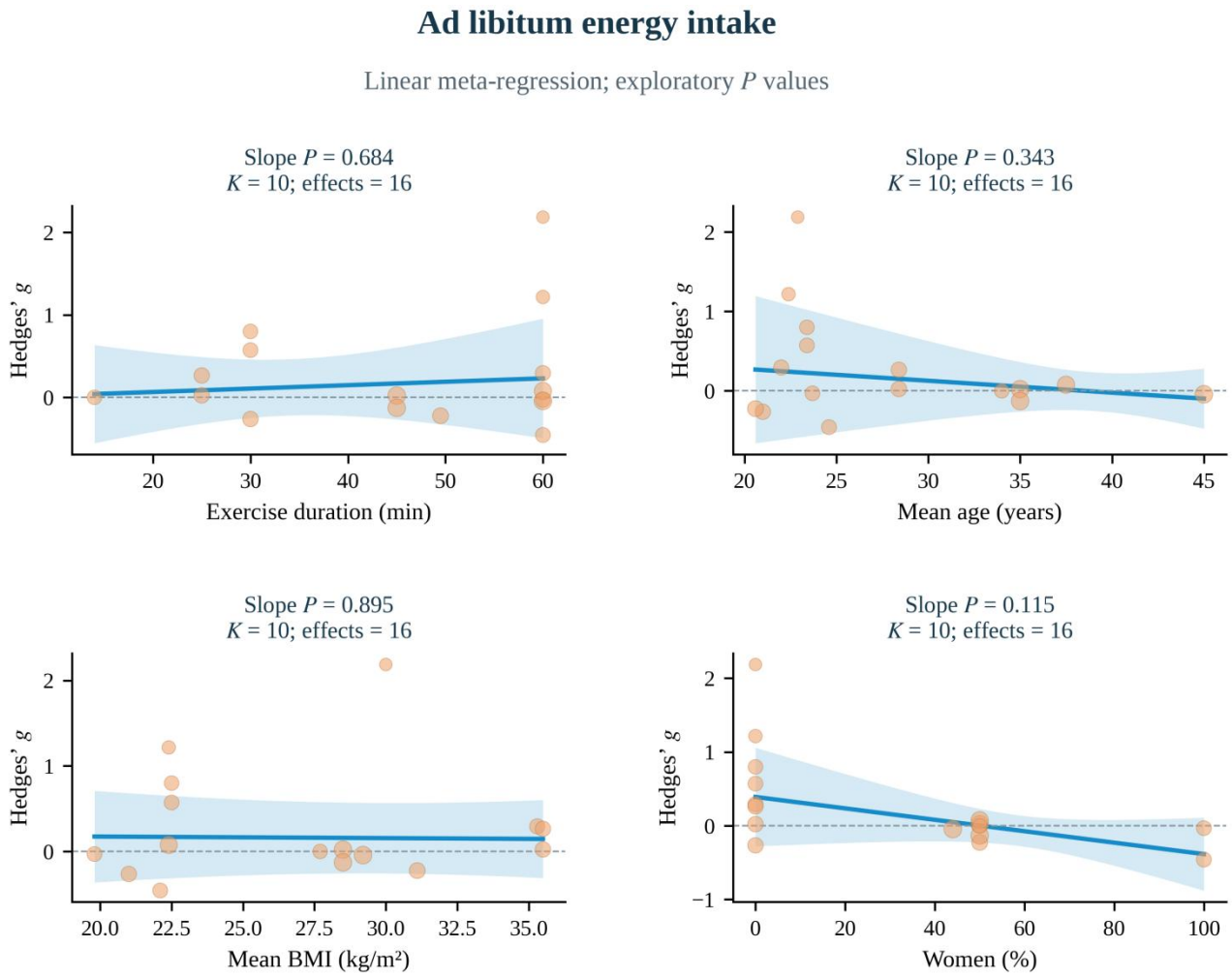
B



Supplementary Figure S20. Continuous meta-regression for ad libitum energy intake.

A, linear three-level meta-regression; B, exploratory quadratic three-level meta-regression. Bands indicate 95% confidence intervals. P values are exploratory and nonconfirmatory. Participant characteristics are cohort-level variables. No mediation analysis linked changes in GLP-1 to energy intake.

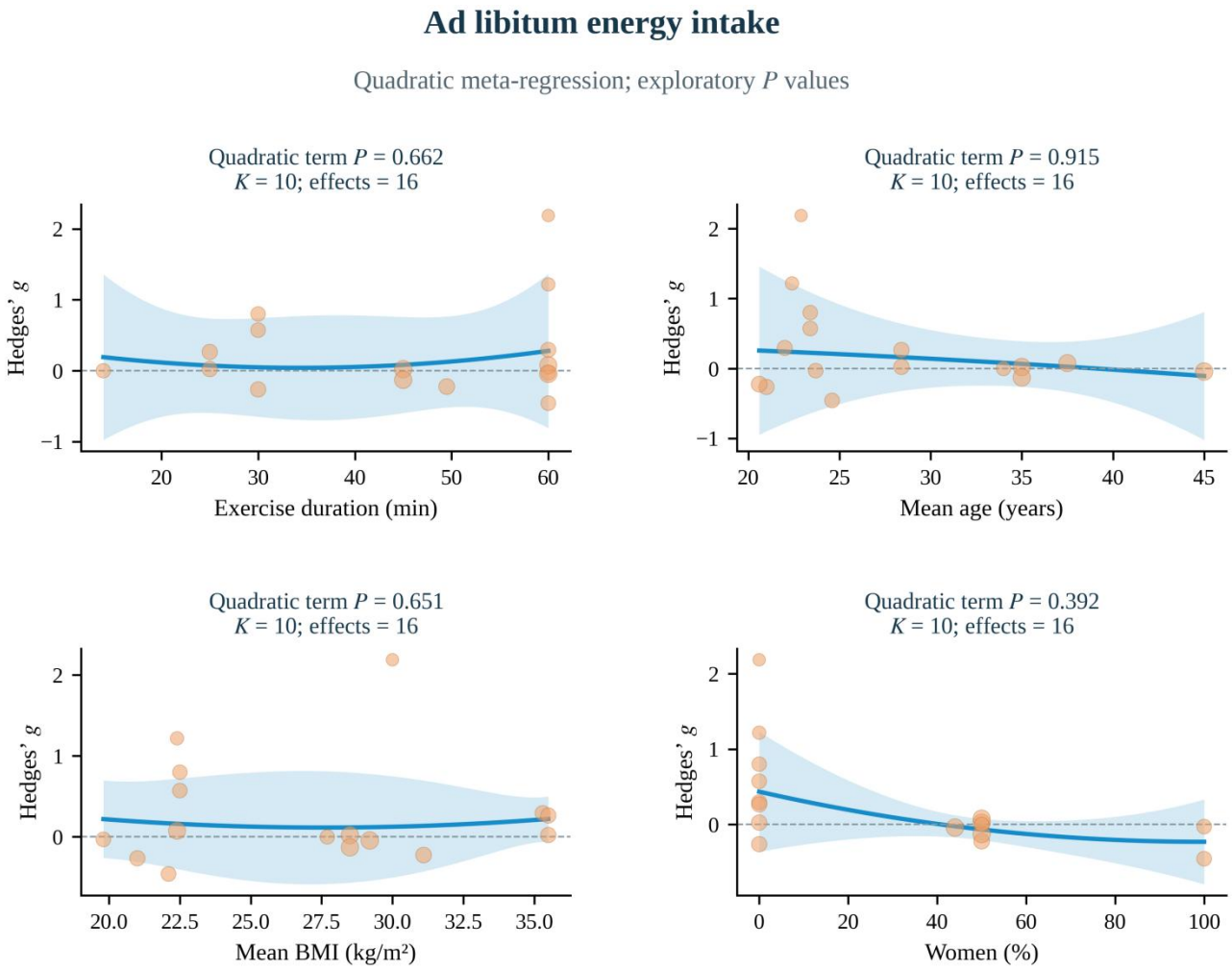
A



Supplementary Figure S20. Continuous meta-regression for ad libitum energy intake (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

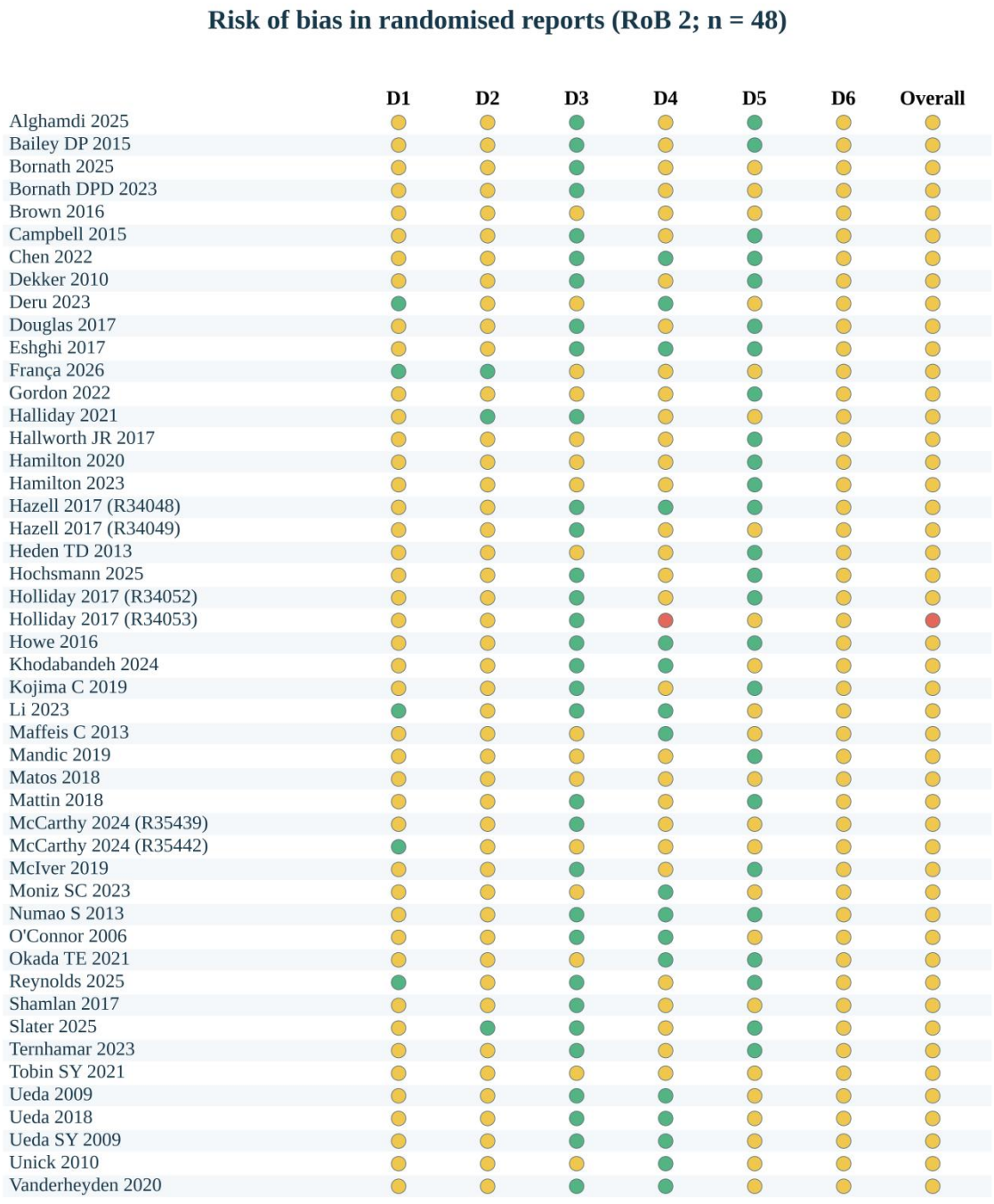
B



Supplementary Figure S21. Report-level risk of bias in randomised studies assessed with RoB 2.

A, report-level traffic-light plot; B, domain-level summary. The 48 assessments correspond to 48 included randomised reports: 47 had some concerns and one was high risk. Multiple reports from the same study family remain distinct report-level assessments and are not counted as independent families in meta-analysis. N/A judgements are excluded from the applicable-domain denominator.

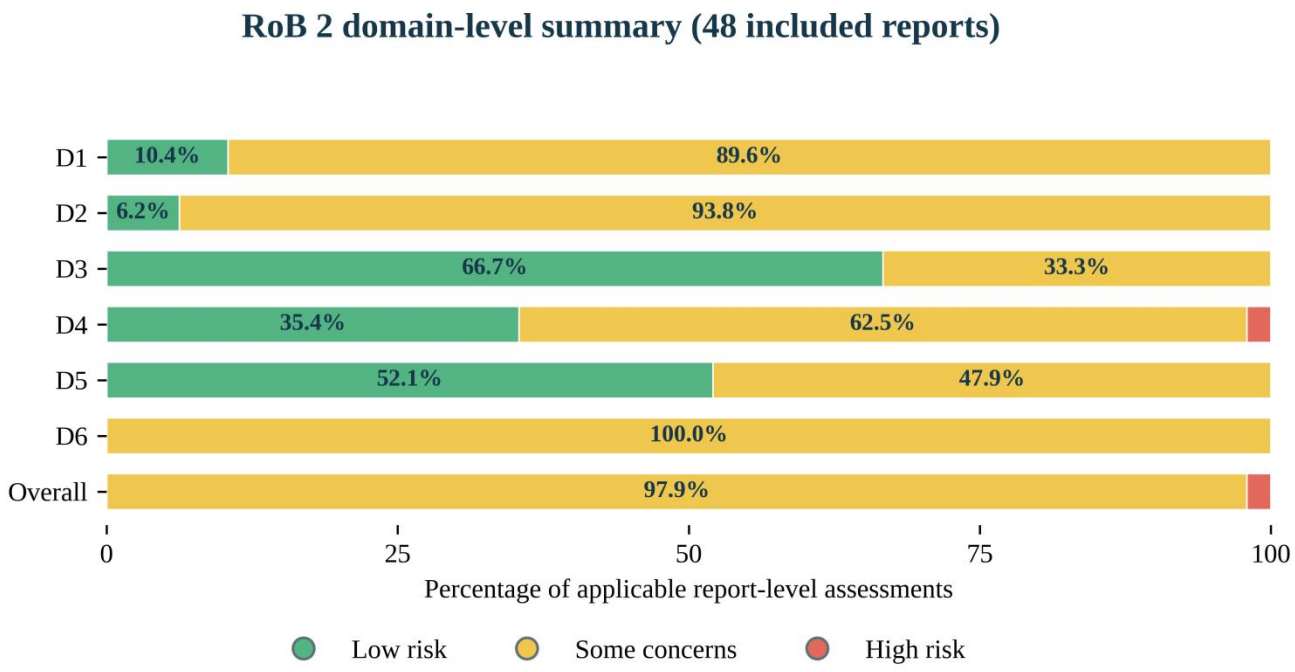
A



Supplementary Figure S21. Report-level risk of bias in randomised studies assessed with RoB 2 (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

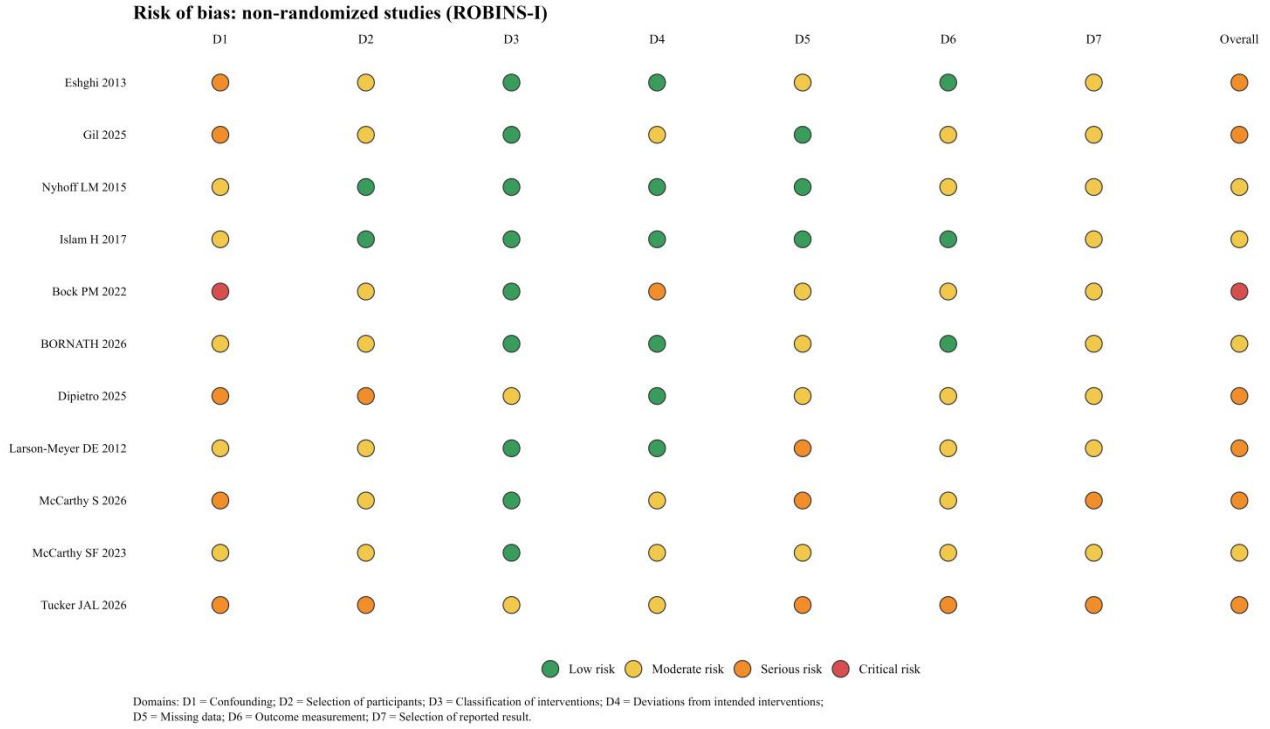
B



Supplementary Figure S22. Report-level risk of bias in non-randomised studies assessed with ROBINS-I.

A, report-level traffic-light plot; B, domain-level summary. The 11 assessments correspond to 11 included non-randomised reports: six serious, four moderate and one critical risk. Together with the 48 RoB 2 assessments, these account for 59 included reports representing 52 study families.

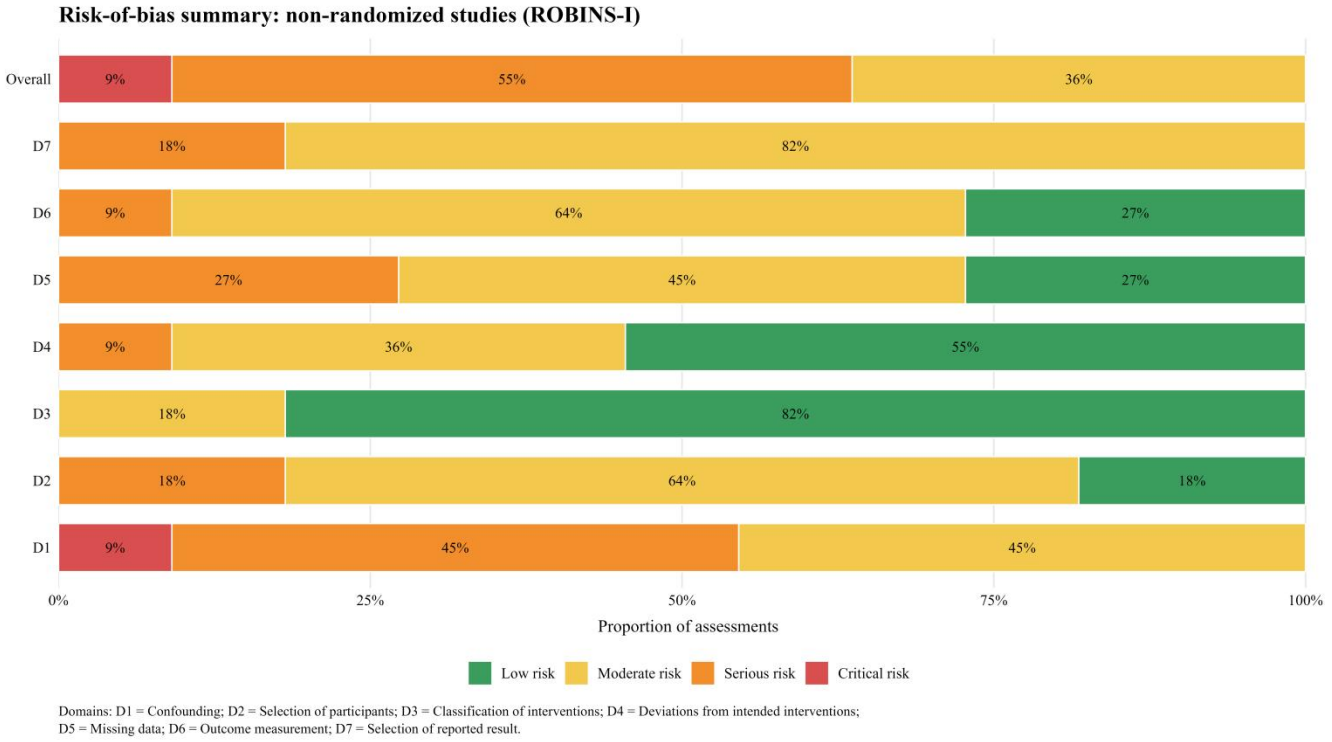
A



Supplementary Figure S22. Report-level risk of bias in non-randomised studies assessed with ROBINS-I (continued).

Panel B. The corresponding methods and interpretation are given in the caption on the first page of this figure.

B



Domains: D1 = Confounding; D2 = Selection of participants; D3 = Classification of interventions; D4 = Deviations from intended interventions; D5 = Missing data; D6 = Outcome measurement; D7 = Selection of reported result.