**Online Appendix:**

**Real, but Limited: A Meta-Analytic Assessment of Framing Effects in the Political Domain**

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Online Appendix A: Studies Included in the Meta-Analysis

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Online Appendix B: Moderator Analyses

Table B1

*Moderator Analyses for the Effects of Positive vs. Negative Frames*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *k* | Cohen's *d* | 95% CI | Test |
| Framing Conceptualization |  |  |  | *Q*(1) = 1.35 |
| Emphasis Framing | 144 | .40 | [.35, .45] |  |
| Equivalency Framing | 17 | .52 | [.33, .70] |  |
| Type of Outcome |  |  |  | *Q*(2) = 90.58\*\*\* |
| Attitudes | 161 | .41 | [.36, .47] |  |
| Emotions | 14 | .47 | [.33, .61] |  |
| Behavior | 26 | .11 | [.06 .15] |  |
| Medium |  |  |  | *Q*(3) = 2.26 |
| Written | 133 | .43 | [.37, .48] |  |
| Visual | 8 | .34 | [.19, .48] |  |
| Textual & Visual Combined | 2 | .61 | [.18, 1.03] |  |
| Oral | 16 | .37 | [.20, .54] |  |
| Frame Source |  |  |  | *Q*(4) = 6.16 |
| Media | 63 | .44 | [.37, .51] |  |
| Political Source | 7 | .31 | [.13, .49] |  |
| Interest Group | 1 | .13 | [-.24, .50] |  |
| General Source | 86 | .41 | [.34, .49] |  |
| Other | 4 | .29 | [.13, .45] |  |
| Country |  |  |  | *Q*(1) = .21 |
| US | 81 | .40 | [.33, .47] |  |
| Non-US | 80 | .43 | [.35, .50] |  |
| Sample Composition |  |  |  | *Q*(3) = 2.77 |
| Student Sample | 64 | .44 | [.37, .51] |  |
| General Population (Representative) | 42 | .42 | [.32, .52] |  |
| General Population (Non-Representative) | 40 | .35 | [.26, .45] |  |
| Mixed | 11 | .48 | [.35, .60] |  |
| Period |  |  |  | *Q*(1) = .02 |
| Elections | 10 | .40 | [.19, .61] |  |
| Routine | 150 | .41 | [.36, .46] |  |
| Behavior Type (Behavior Only) |  |  |  | *Q*(1) = 2.84 |
| Behavior Intention | 15 | .15 | [.10, .20] |  |
| Actual Behavior | 10 | .08 | [.01, .14] |  |

*Notes*. (1) All moderator analyses were conducted on the attitudes DV unless mentioned otherwise. (2) In the moderator analysis of Frame Source, the “General Source” category includes cases where no specific source was mentioned, and the “Other” category includes texts from commercials or academic journals. In the Sample Composition moderator, the “Mixed” category refers to samples mixing students and the general population. (3) For the moderator analysis of Behavior Type, we had to exclude the study of Leeper (2017; cited in the text) since he measured both actual and intended behavior on the same sample, which would violate the assumption of independent effect sizes. (4) *k* = number of effect sizes; CI = confidence interval; *Q* = test statistic of *Q* test for heterogeneity.

\* *p* < .05. \*\* *p* < .01. \*\*\* *p* < .001.

Table B2

*Moderator Analyses for the Effects of Competitive Frames*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *k* | Cohen's *d* | 95% CI | Test |
| Medium |  |  |  | *Q*(1) = 5.52\* |
| Written | 23 | .15 | [.10, .19] |  |
| Oral | 11 | .25 | [.18, .33] |  |
| Country |  |  |  | *Q*(1) = .18 |
| US | 26 | .18 | [.12, .23] |  |
| Non-US | 8 | .20 | [.13, .27] |  |
| Sample Composition |  |  |  | *Q*(4) = 2.61 |
| Student Sample | 2 | .12 | [–.16, .40] |  |
| General Population (Representative) | 17 | .20 | [.14, .26] |  |
| General Population (Non-Representative) | 7 | .17 | [.08, .25] |  |
| Mixed | 6 | .13 | [.04, .23] |  |
| Other | 1 | .26 | [.08, .44] |  |
| Period |  |  |  | *Q*(1) = 10.61\*\*\* |
| Elections | 5 | .08 | [.03, .14] |  |
| Routine | 29 | .20 | [.16, .25] |  |

*Notes*. (1) We did not perform moderator analyses for variables in which one category was examined by a single study only. These moderators were Framing Conceptualization, Type of Outcome, and Frame Source. (2) In the Sample Composition moderator, the “Mixed” category refers to samples mixing students and the general population. In the Sample Composition moderator, the “Other” category includes a youth sample. (3) *k* = number of effect sizes; CI = confidence interval; *Q* = test statistic of *Q* test for heterogeneity.

\* *p* < .05. \*\* *p* < .01. \*\*\* *p* < .001.

Table B3

*Comparison Between Positive vs. Negative Framing and Competitive Framing vs. Control (on Attitudes)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *k* | Cohen's *d* | 95% CI | Test |
| Framing Type |  |  |  | *Q*(1) = 48.95\*\*\* |
| Positive vs. Negative | 141 | .40 | [.35, .46] |  |
| Competition vs. Control | 14 | .16 | [.11, .20] |  |

*Notes*. (1) Twenty original studies belong to both framing types, since they examine the effects of positive vs. negative frames both separately (i.e., as a comparison of two single frames) and combined into a single frame (i.e., in a separate, competitive framing condition). Including these studies in this moderator analysis would violate the assumption of independent effect sizes. Therefore, we only included unique studies that belong to one framing type. (2) *k* = number of effect sizes; CI = confidence interval; *Q* = test statistic of *Q* test for heterogeneity.

\* *p* < .05. \*\* *p* < .01. \*\*\* *p* < .001.

In addition to directly comparing positive versus negative framing, we have meta-analyzed the effects of positive or negative frames compared to a control group receiving a neutral or no stimulus. These analyses allow us to examine whether framing effects are driven by people’s tendency to put more weight on negative information, a phenomenon known as negativity bias. Table B4 below presents the full results. When examining effects on attitudes, we find similar effect sizes for positive (*d* = .24, 95% CI [.19, .29], *z* = 9.11, *p* < .001, *k* = 69) and negative frames (*d* = .30, 95% CI [.24, .37], *z* = 9.02, *p* < .001, *k* = 60), both compared to a control group. As for behavior, we find that negative frames can drive people to action, compared to a control group (*d* = .21, 95% CI [.08, .35], *z* = 3.04, *p* < .01, *k* = 8). However, positive frames, compared to a control group, have no significant effect on behavior (*d* = .06, 95% CI [–.04, .15], *z* = 1.19, *p* > .05, *k* = 7). In other words, attitudes are affected equally by positive and negative frames, whereas behavior is only affected by negative frames.[[1]](#footnote-1)

Table B4

*Framing Effects of Positive and Negative Frames vs. a Control Group*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Frame type** | **DV** | ***k*** | **Unadjusted effect size** | | **Adjusted for publication bias** | | **Adjusted for measurement error** | |
|  |  |  | ***d***  **95% CI** | ***z*** | ***d***  **95% CI** | ***z*** | ***d***  **95% CI** | ***z*** |
| Positive vs. Control | Attitudes | 69 | .24\*\*\*  [.19, .29] | 9.11 | .27\*\*\*  [.22, .32] | 11.02 | .27\*\*\*  [.21, .33] | 8.96 |
| Emotions | 2 | .21\*  [.03, .39] | 2.28 | — | — | .21\*  [.03, .40] | 2.28 |
| Behavior | 7 | .06  [–.04, .15] | 1.19 | .03  [–.06, .12] | 0.70 | .05  [–.04, .15] | 1.12 |
| Negative vs. Control | Attitudes | 60 | .30\*\*\*  [.24, .37] | 9.02 | .19\*\*\*  [.11, .27] | 4.88 | .36\*\*\*  [.28, .44] | 9.03 |
| Behavior | 8 | .21\*\*  [.08, .35] | 3.04 | .15\*  [.01, .29] | 2.12 | .25\*\*  [.09, .41] | 3.03 |

*Notes*. (1) We could not perform a meta-analysis of the effects of negative frames vs. control group on emotions because only one study examined this. Moreover, we could not perform separate meta-analyses for the two outcome variables, positive emotions and negative emotions, because neither was tested in more than one study. (2) We could not adjust the effects of positive frames (vs. control) on emotions for publication bias due to low statistical power (*k* = 2). (3) *k* = number of effect sizes; CI = confidence interval; *z* = test statistic of *z*-test.

\*p < .05. \*\*p < .01. \*\*\*p < .001.

Online Appendix C: *p*-Curve

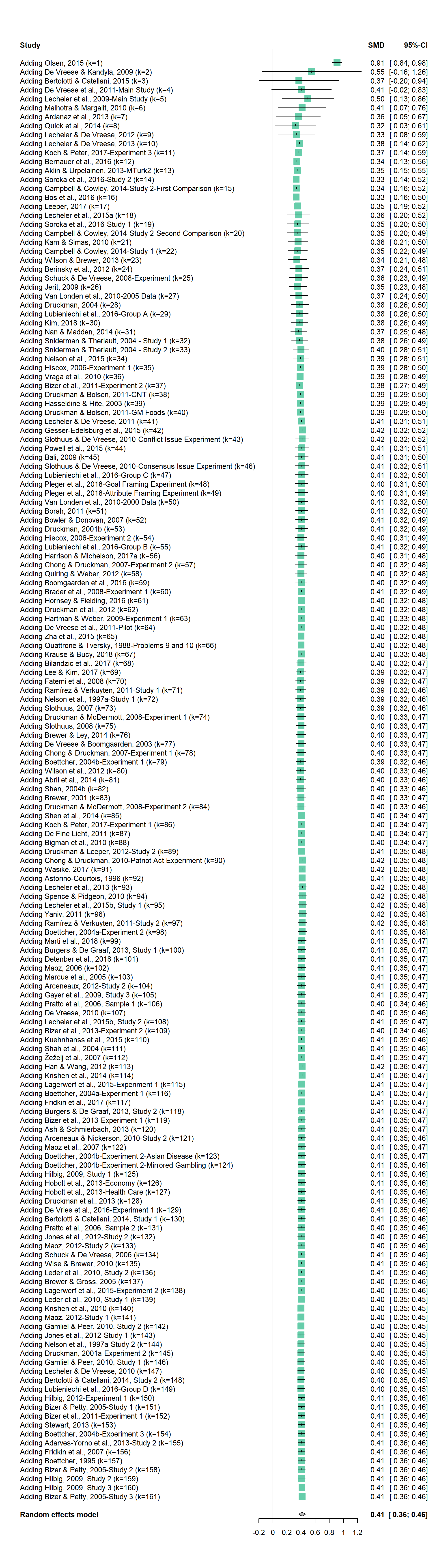
According to Simonsohn et al. (2014:535), "a set of significant findings contains evidential value when we can rule out selective reporting as the sole explanation of those findings." Using the *p*-curve online diagnostic tool[[2]](#footnote-2), we examined the distribution of all significant *p*-values in all of our main meta-analyses.

We find that when examining framing in non-competitive settings, the distributions of *p*-values for effects on attitudes, emotions (in general), positive emotions, negative emotions (all *p* < .001), and behavior (*p* < .05) are significantly right-skewed. This implies that the number of “small” significant *p*-values (e.g., *p* = .001) is larger than the number of “large” significant *p*-values (e.g., *p* = .045). In other words, it is highly unlikely that selective reporting is the cause for the effects of framing on all outcome variables. These effects have evidential value. Finally, when examining the effects of competitive framing on attitudes, the distribution of *p*-values is also significantly right-skewed (*p* < .001), which indicates evidential value for this effect as well.

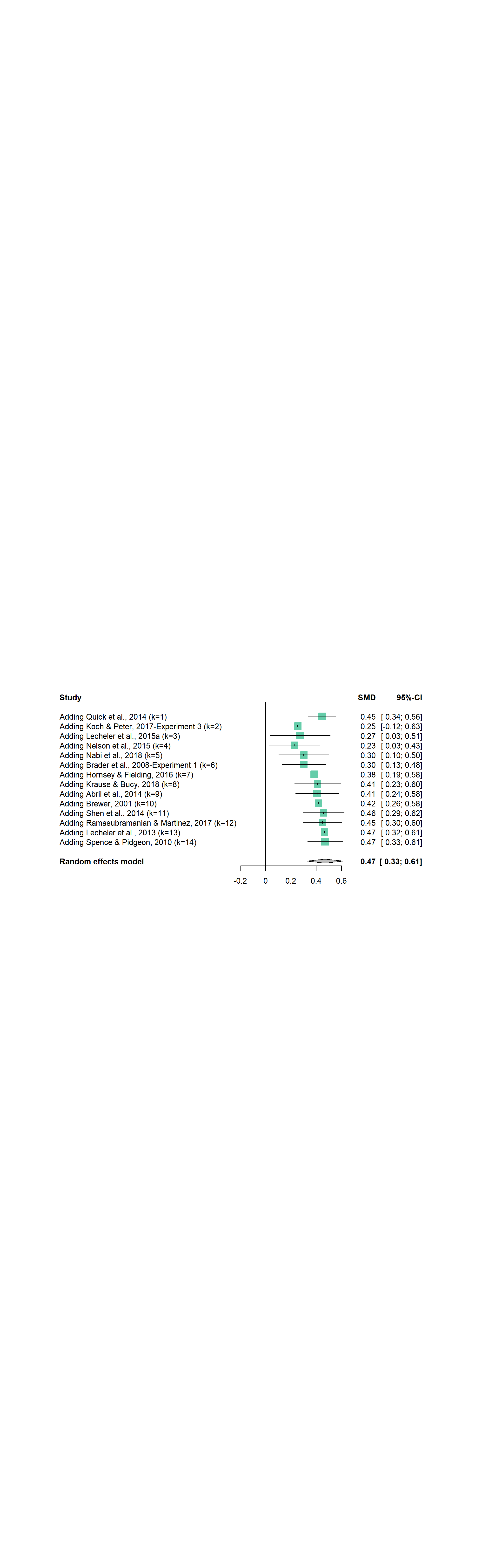
Online Appendix D: Cumulative Meta-Analyses

To further assess the possibility of publication bias in the framing effects literature, we performed cumulative meta-analyses, sorting effect sizes according to (1) the precision of studies and (2) their publication year. First, we performed this procedure by adding individual studies one at a time, beginning with the most precise estimate in the sample and continuing to the least precise estimate. This enables displaying whether the original effect size is a factor of the precision of the study: if the studies at the bottom of the plot (those with a small *N*) yield larger effects than those at the top (large *N*), this may indicate publication bias. We report the results graphically in Figures D1-D6. For positive vs. negative framing (Figures D1, D2, D3, and D5), we find no evidence of substantial publication bias in the context of attitudes, emotions (in general), positive emotions, and behavior. In all those cases, as we move down the plot, smaller (i.e., less precise) studies do not yield larger effect sizes. However, we do find evidence of publication bias for negative emotions as an outcome variable (Figure D4). For competitive framing effects on attitudes (Figure D6), we also find no substantial evidence of publication bias. Smaller studies do not yield substantially larger effects on attitudes.

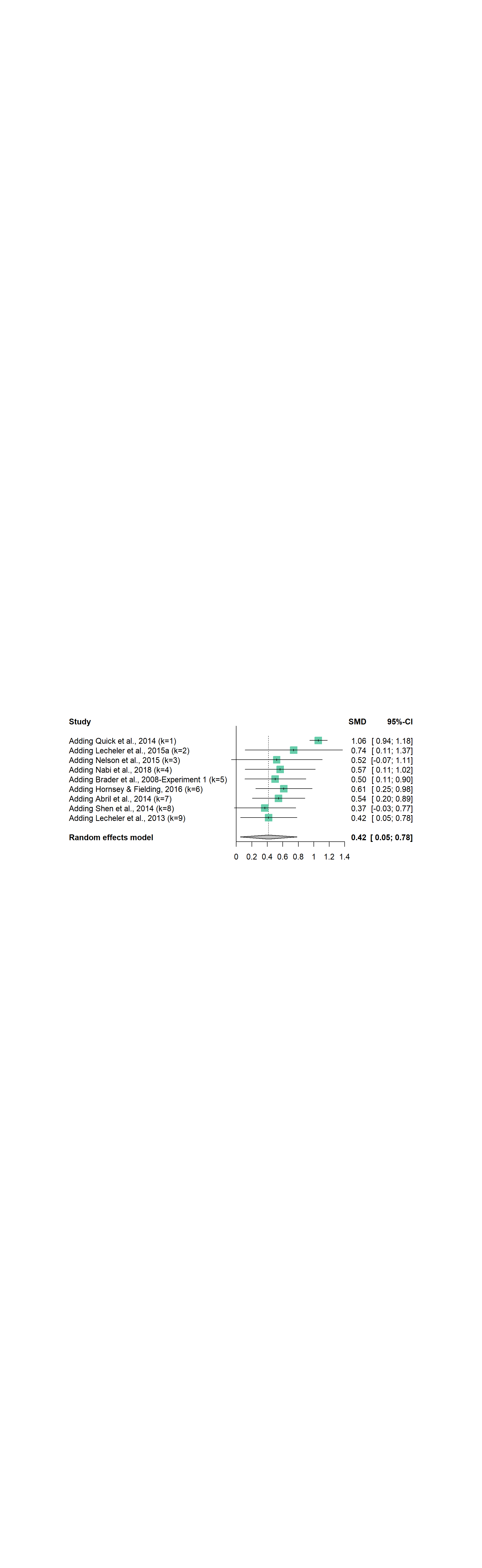
Second, we examined whether earlier studies yield more extreme and contradictory results than later studies, a phenomenon known as the “Proteus phenomenon” (Ioannidis and Trikalinos 2005). This may occur because during the initial stages of a developing research field, contradictory and statistically significant results “are most tantalizing and attractive to investigators and editors” (Ioannidis and Trikalinos 2005, 543). We thus performed additional cumulative meta-analyses, this time adding individual studies one by one according to their publication year, from the earliest to the latest. We report the results graphically in Figures D7-D12. The only case where we find modest evidence for the Proteus phenomenon is framing effects on behavior (Figure D11): earlier studies exhibit larger effect sizes than the average effect (*d* = .11), while later studies yield more modest effect sizes, closer to the average effect on behavior.



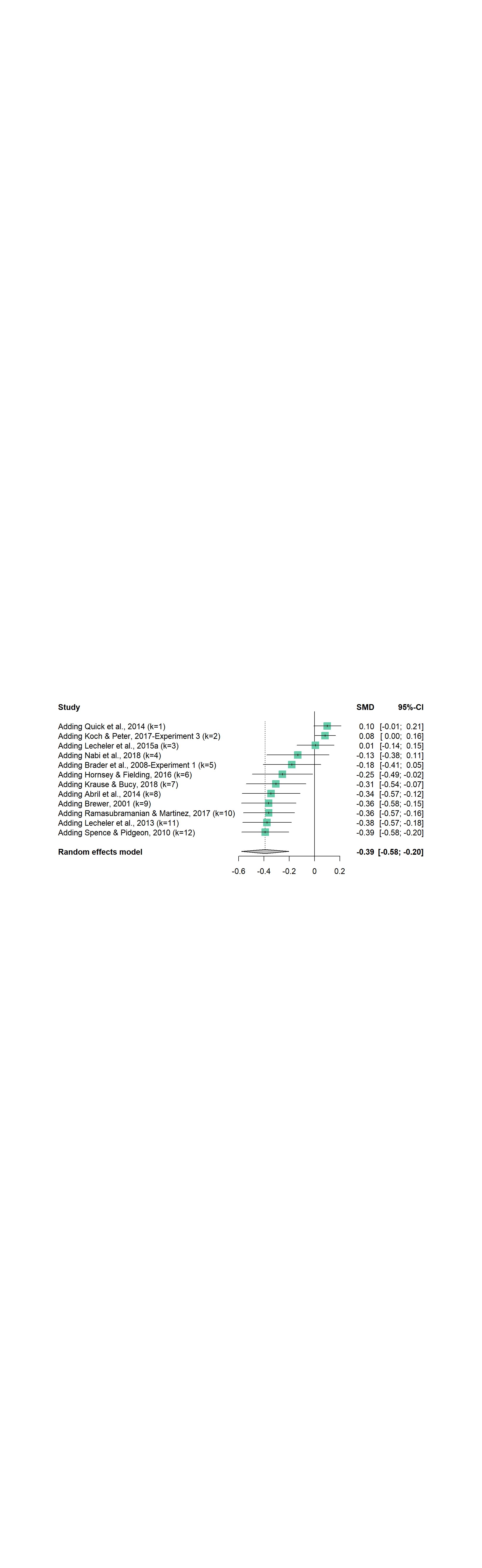
*Figure D1*. A cumulative meta-analysis of framing effects on attitudes (sorted by precision).



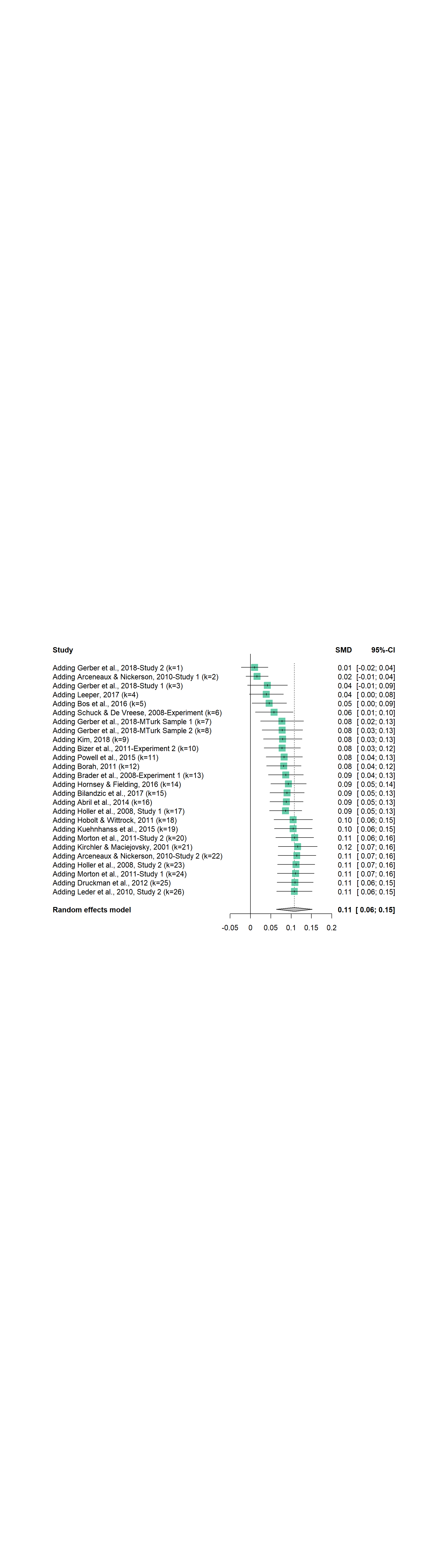
*Figure D2*. A cumulative meta-analysis of framing effects on emotions (general; sorted by precision).



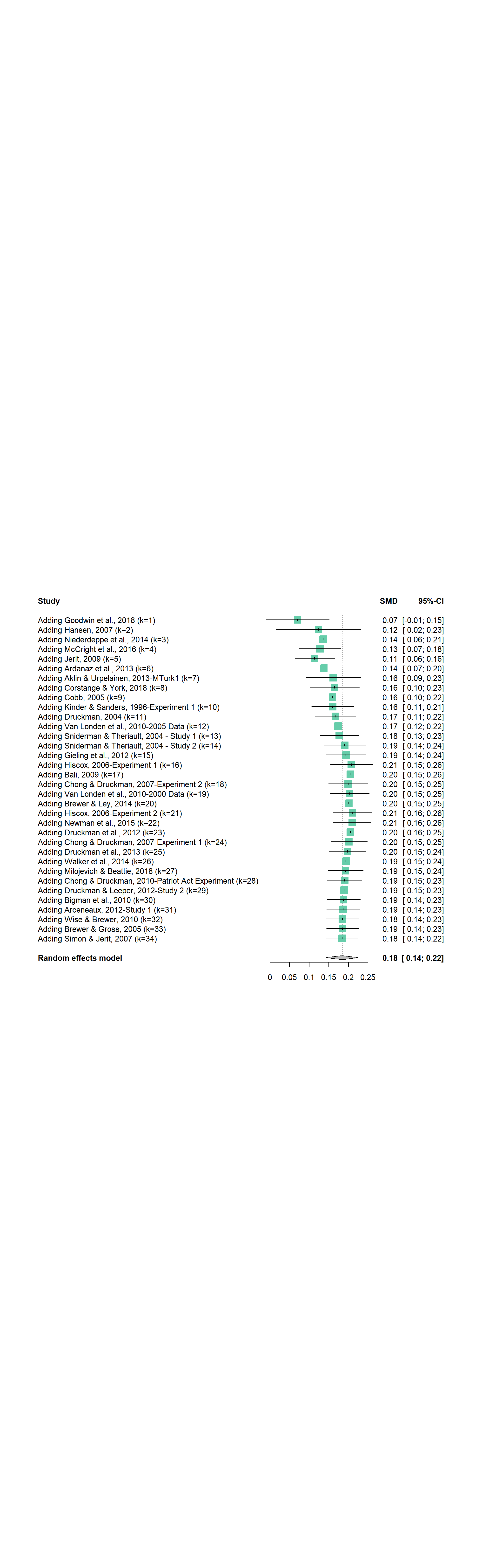
*Figure D3*. A cumulative meta-analysis of framing effects on positive emotions (sorted by precision).



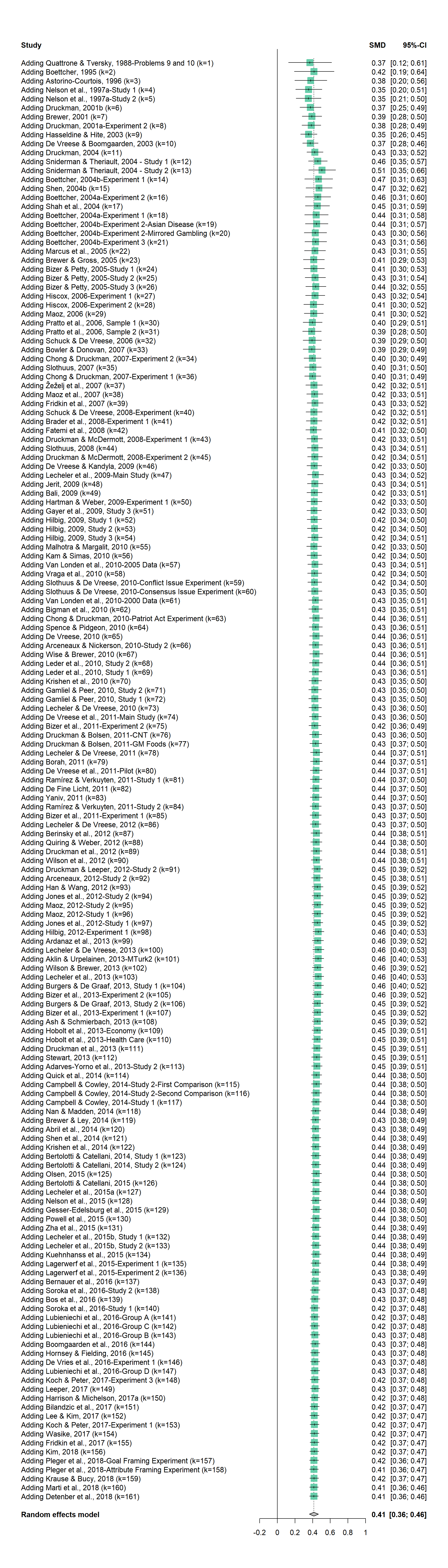
*Figure D4*. A cumulative meta-analysis of framing effects on negative emotions (sorted by precision).



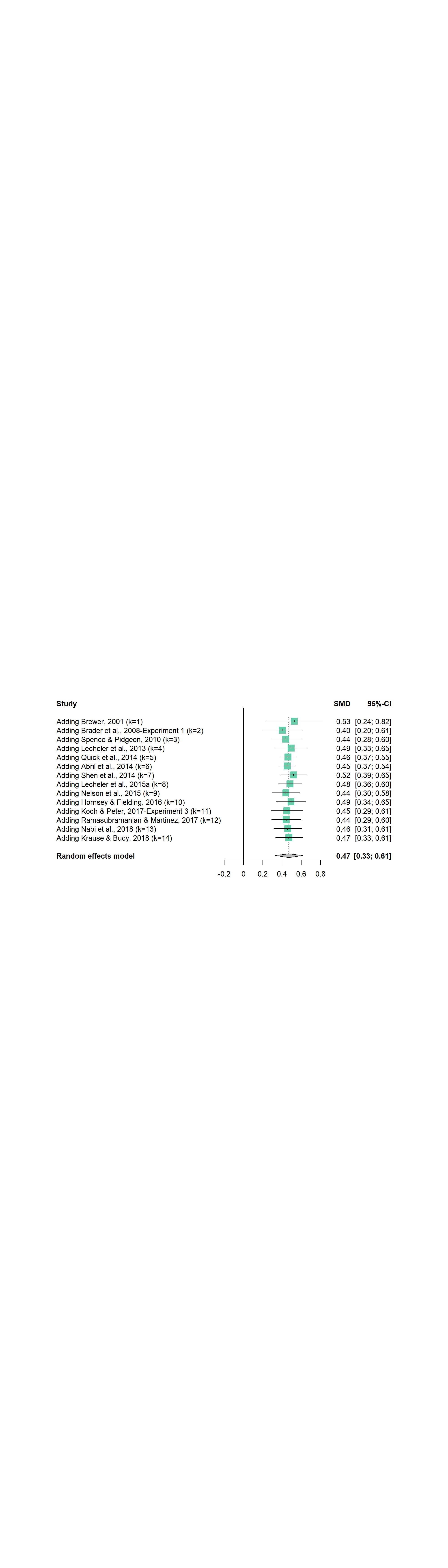
*Figure D5*. A cumulative meta-analysis of framing effects on behavior (sorted by precision).

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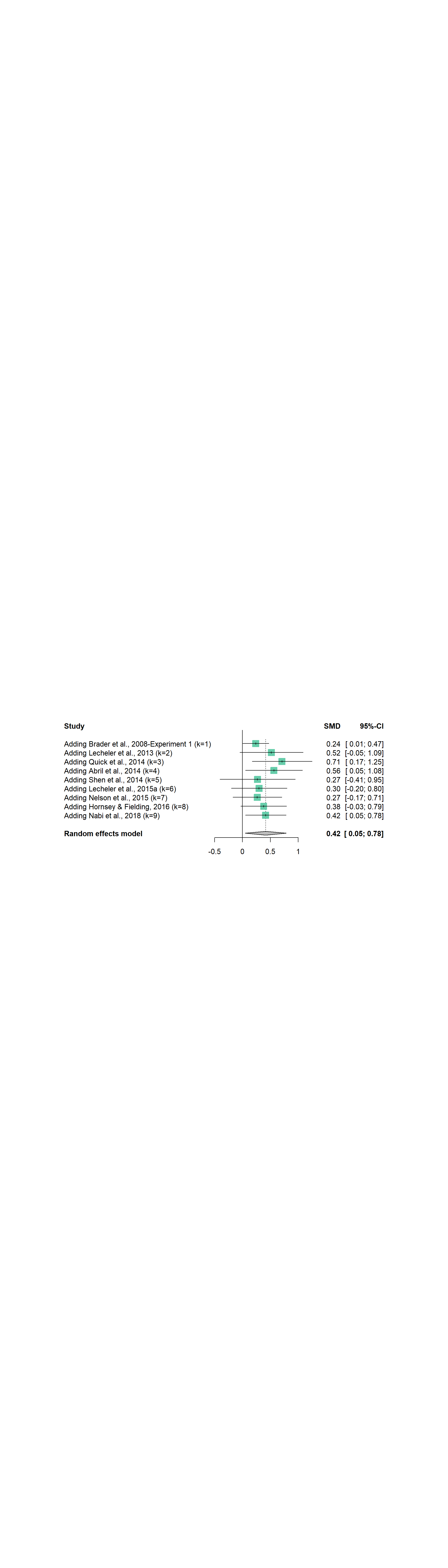
*Figure D6*. A cumulative meta-analysis of competitive framing effects on attitudes (sorted by precision).



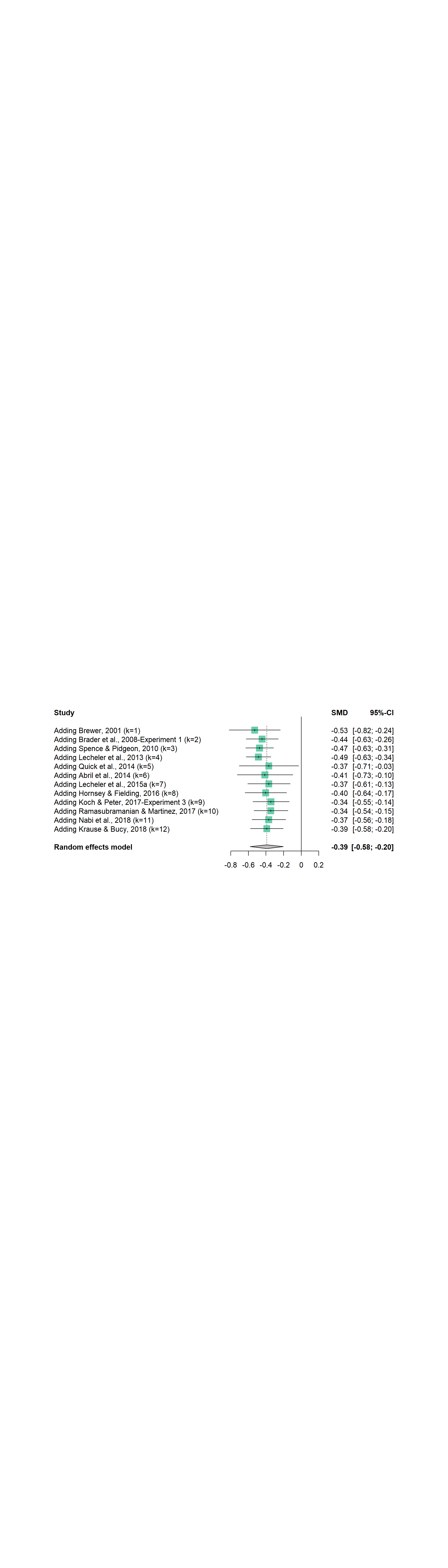
*Figure D7*. A cumulative meta-analysis of framing effects on attitudes (sorted by publication year).



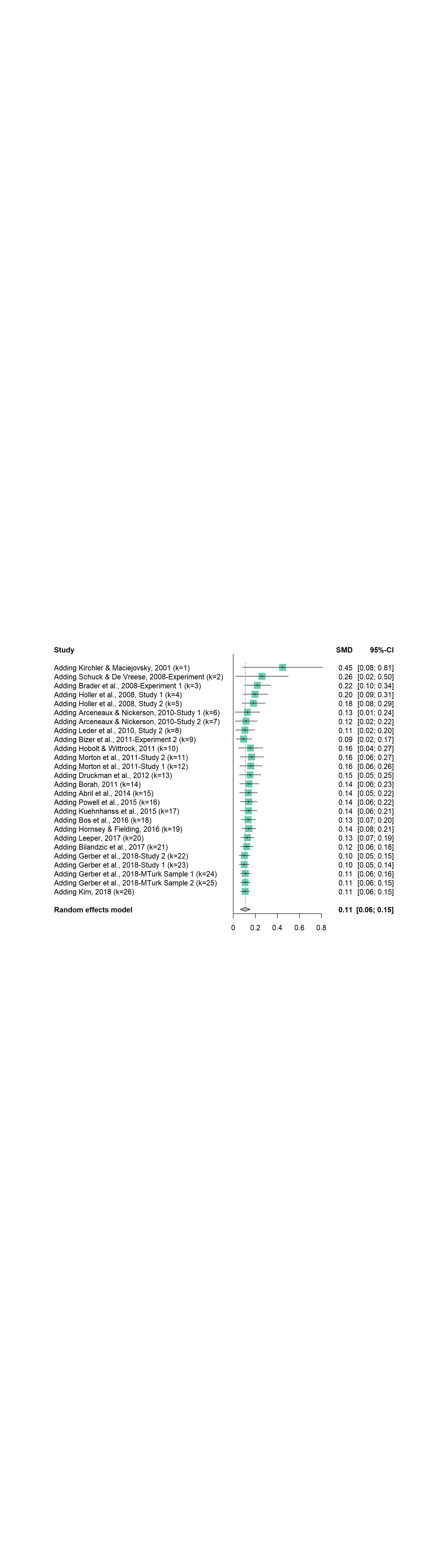
*Figure D8*. A cumulative meta-analysis of framing effects on emotions (general; sorted by publication year).



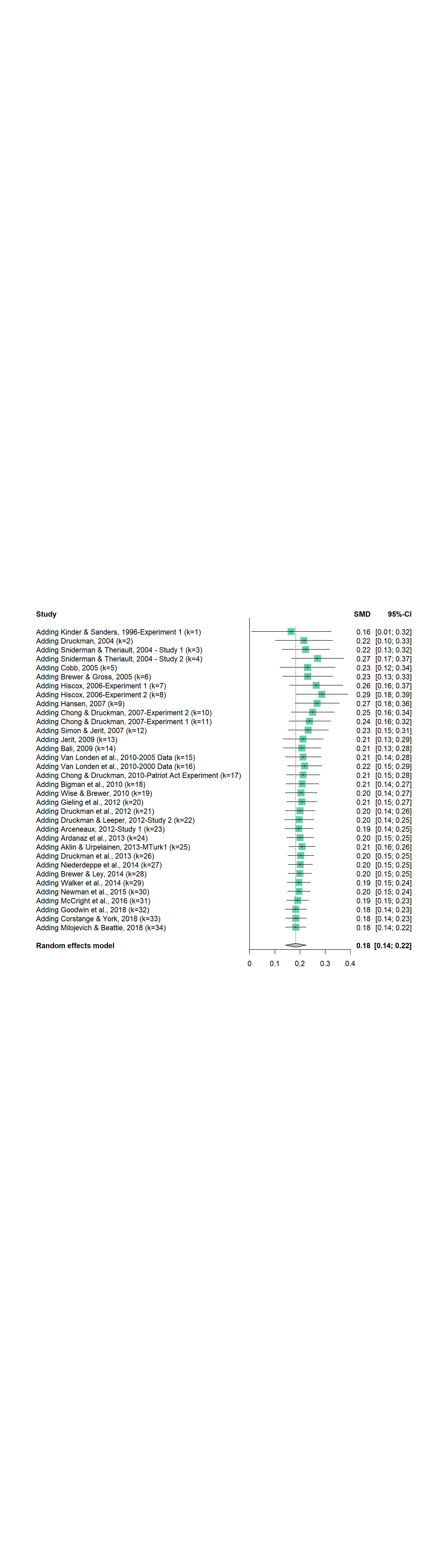
*Figure D9*. A cumulative meta-analysis of framing effects on positive emotions (sorted by publication year).



*Figure D10*. A cumulative meta-analysis of framing effects on negative emotions (sorted by publication year).



*Figure D11*. A cumulative meta-analysis of framing effects on behavior (sorted by publication year).



*Figure D12*. A cumulative meta-analysis of competitive framing effects on attitudes (sorted by publication year).

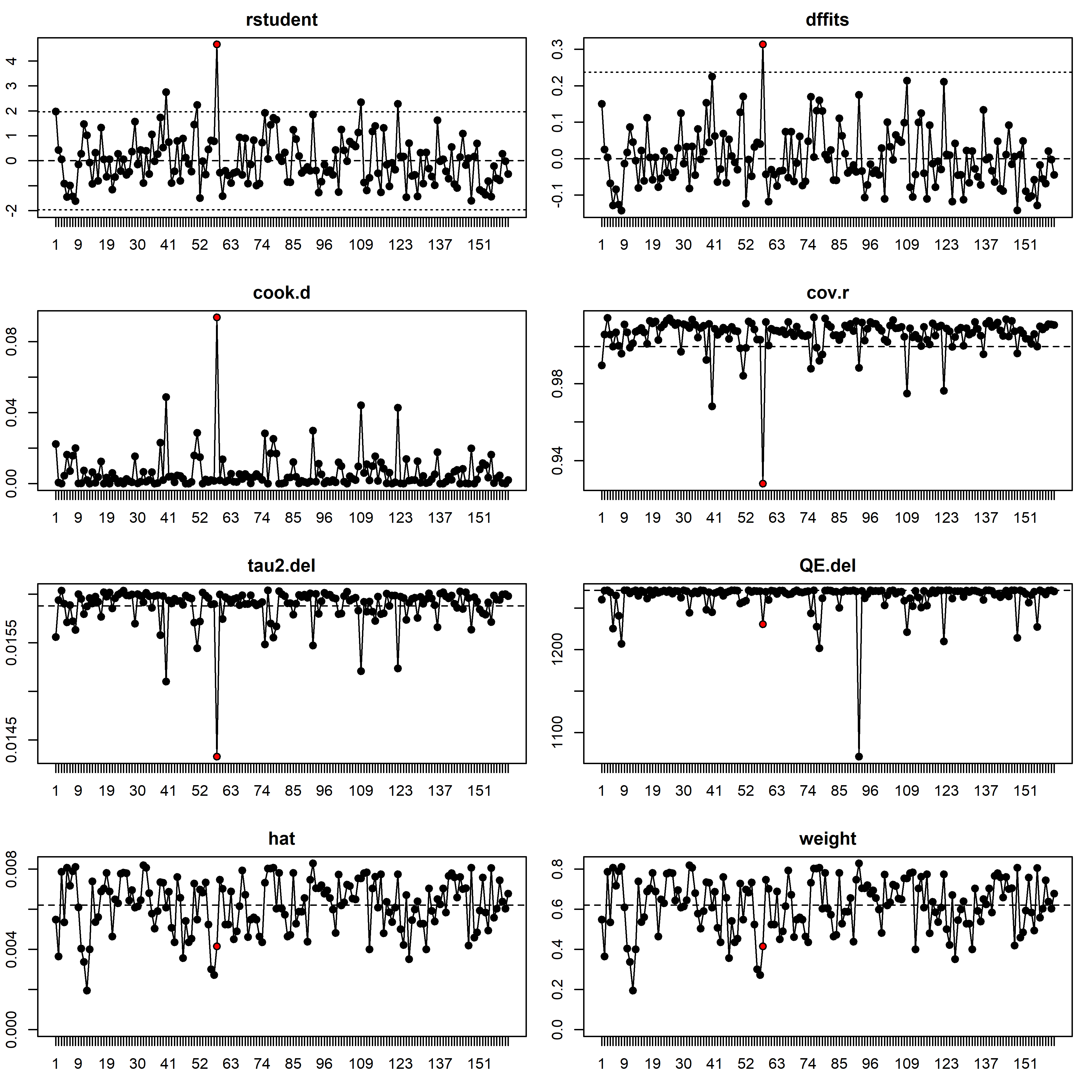
**References**

Ioannidis, John PA, and Thomas A. Trikalinos. 2005. "Early Extreme Contradictory Estimates May Appear in Published Research: The Proteus Phenomenon in Molecular Genetics Research and Randomized Trials." *Journal of Clinical Epidemiology* 58 (6): 543–49.

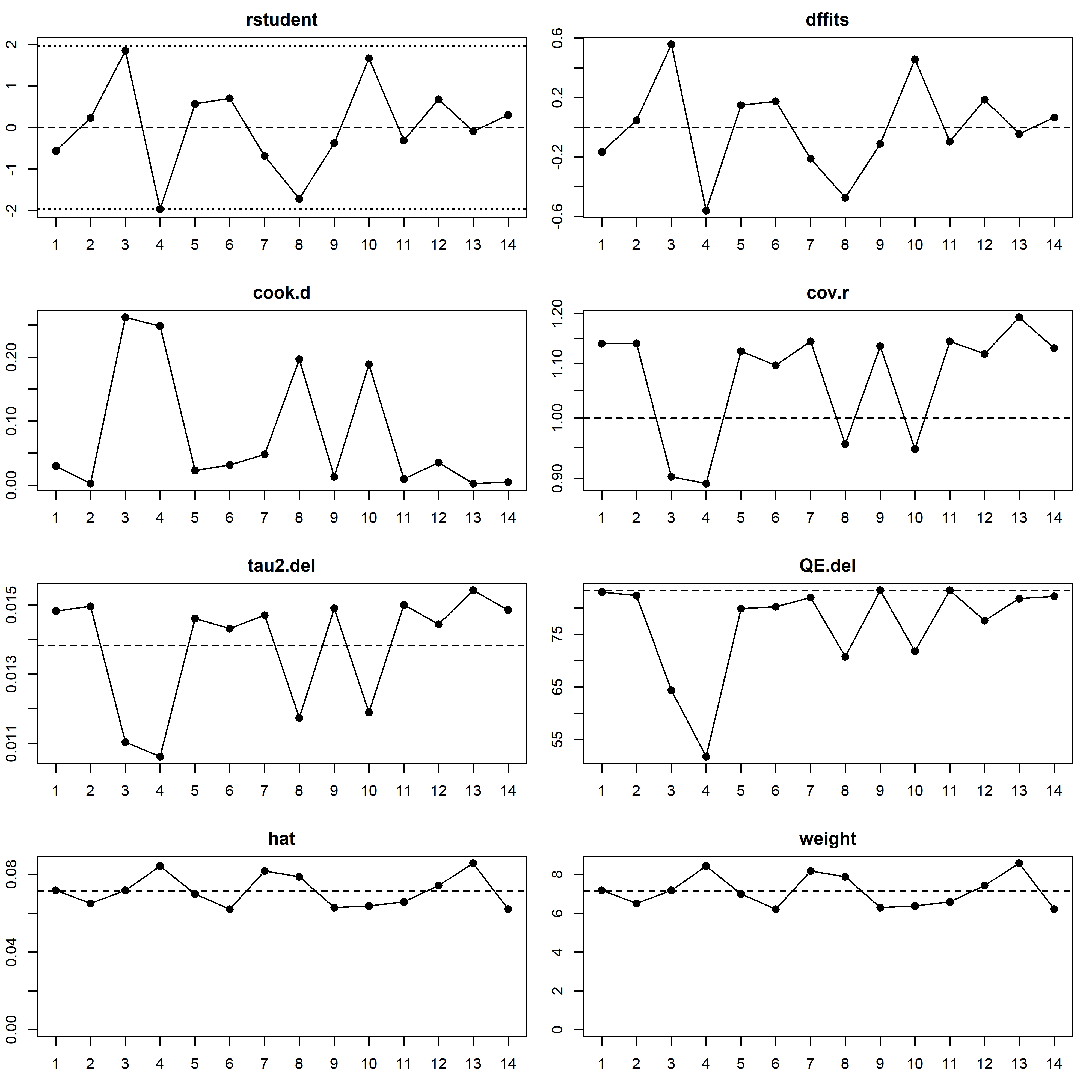
Simonsohn, Uri, Leif D. Nelson, and Joseph P. Simmons. 2014. "P-curve: A Key to the File-Drawer." *Journal of Experimental Psychology: General* 143 (2): 534–47.

Online Appendix E: Outlier Detection

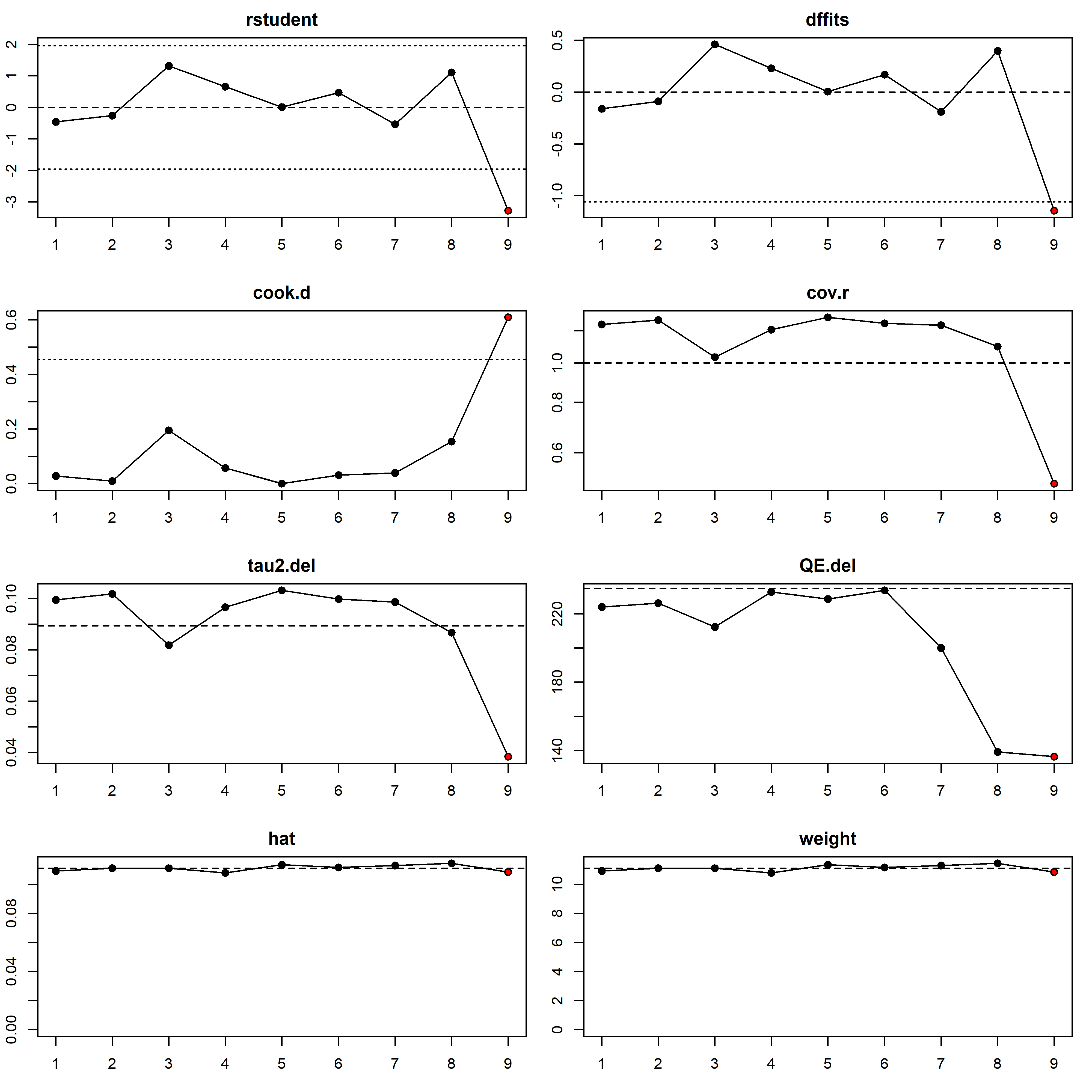
To test whether our conclusions are driven by extreme observations, we applied a comprehensive battery of influence diagnostics (Viechtbauer and Cheung 2010) to each of the six meta-analyses discussed in the Results section. Figures E1-E6 display these diagnostics. We detect two outliers in the meta-analyses of positive versus negative framing: one in the context of attitudes (Hilbig 2012, Experiment 1) and one in the context of behavior (Gerber et al. 2018, Study 2). These outliers are marked with a red dot in Figures E1 and E5. Removing the outlier from the meta-analysis of attitudes does not change the original effect size (*d* = .41; 95% CI [.36, .46], *z* = 16.00, *p* < .001, *k* = 160). Similarly, removing the outlier from the meta-analysis of behavior slightly increases the effect of *d* = .11 to *d* = .12 (95% CI [.07, .16], *z* = 5.29, *p* < .001, *k* = 25). Both re-analyses do not change our original conclusions.



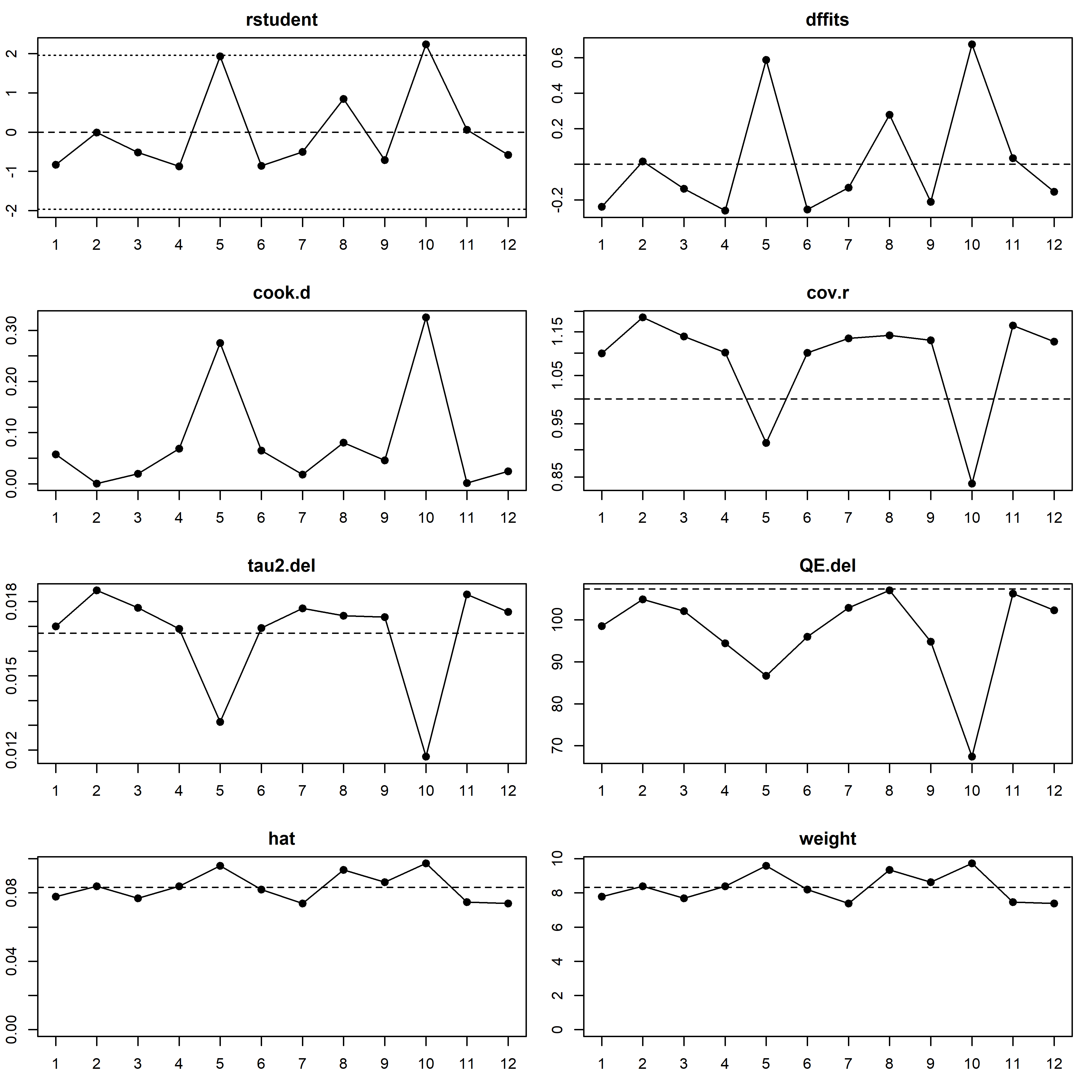
*Figure E1*. Influence diagnostics for framing effects on attitudes.



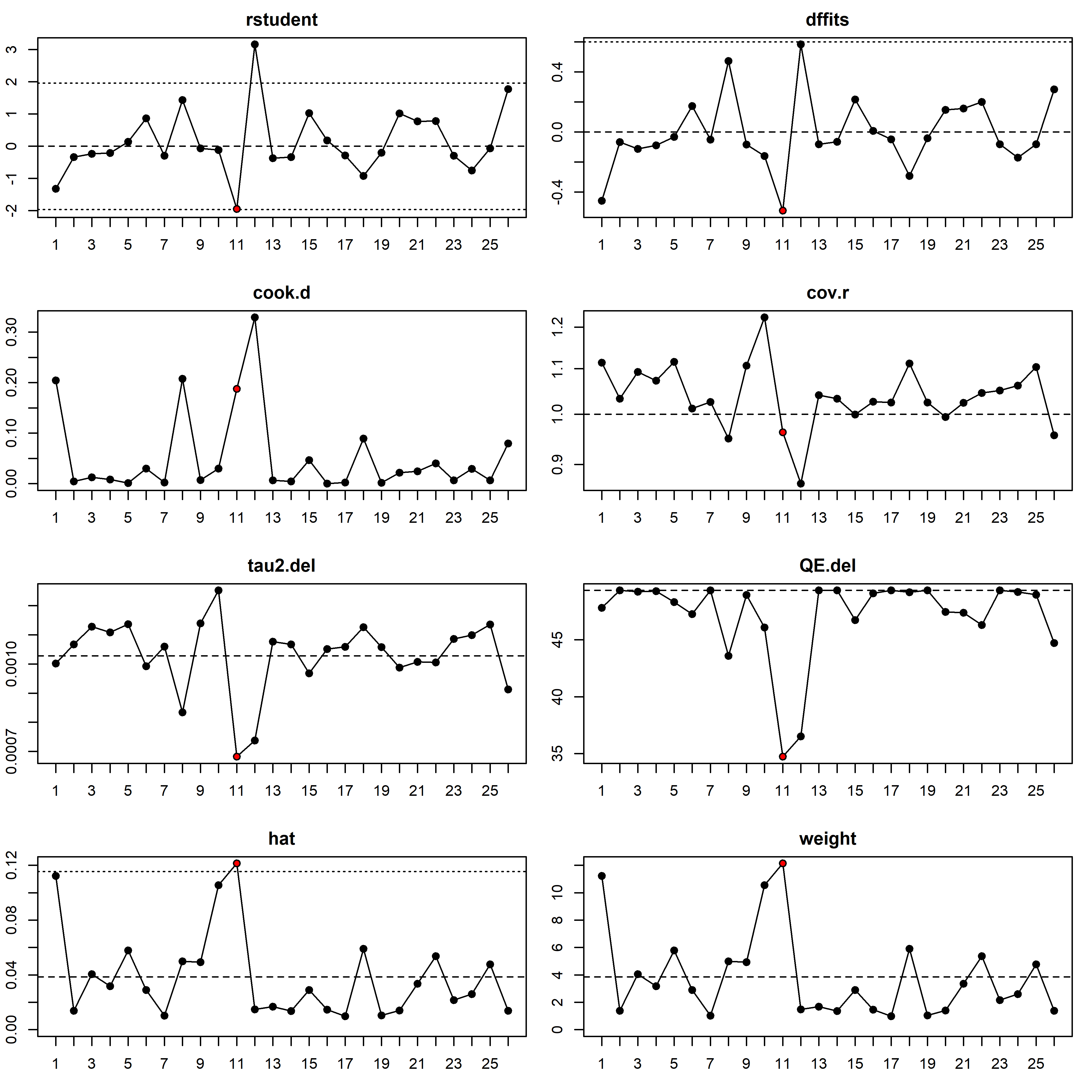
*Figure E2*. Influence diagnostics for framing effects on emotions (in general).



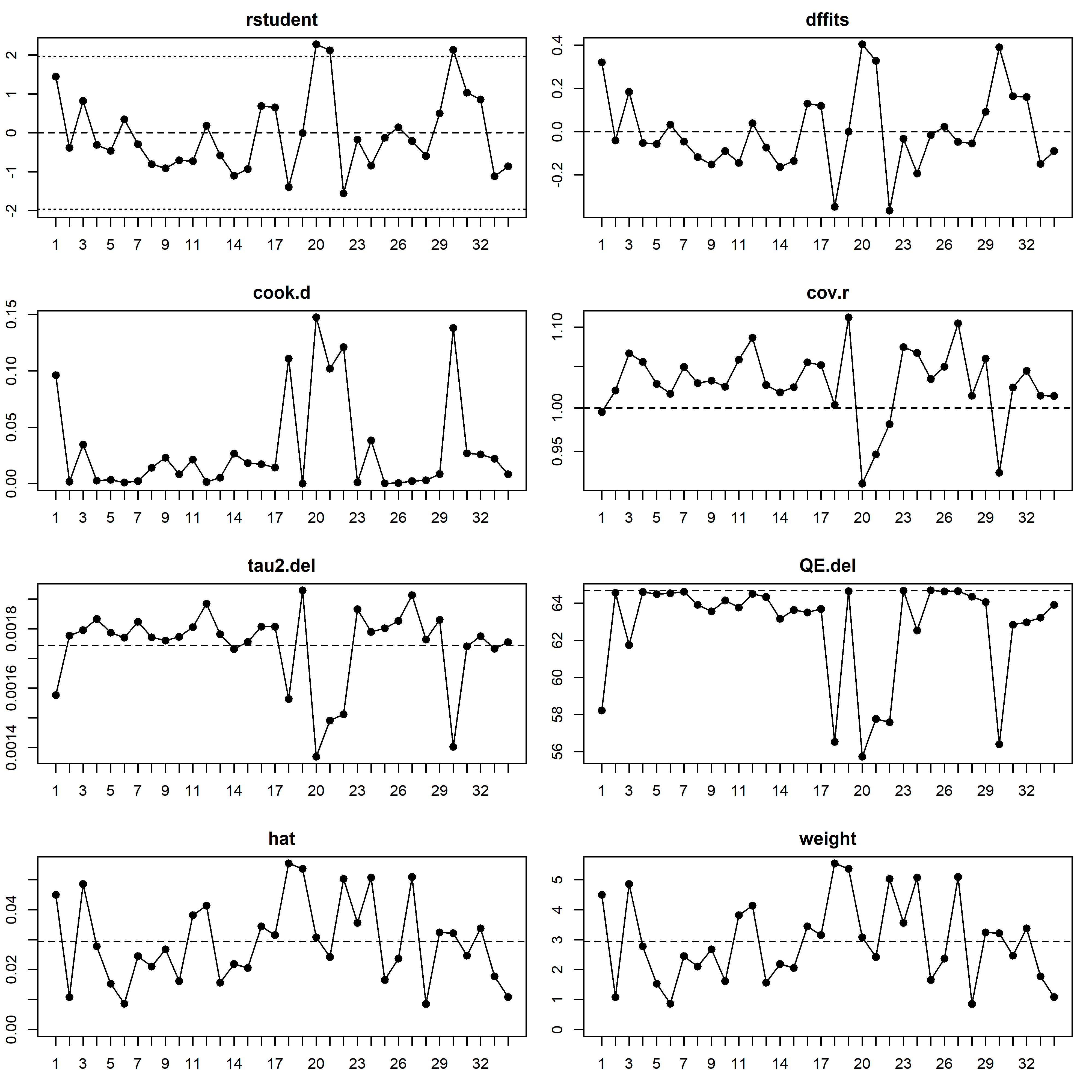
*Figure E3*. Influence diagnostics for framing effects on positive emotions.



*Figure E4*. Influence diagnostics for framing effects on negative emotions.



*Figure E5*. Influence diagnostics for framing effects on behavior.



*Figure E6*. Influence diagnostics for competitive framing effects on attitudes.

**References**

Hilbig, Benjamin E. 2012. “Good Things Don’t Come Easy (to Mind): Explaining Framing Effects in Judgments of Truth.” *Experimental Psychology* 59 (1): 38–46.

Viechtbauer, W., and M. W. L. Cheung. 2010. "Outlier and Influence Diagnostics for Meta-Analysis.” *Research Synthesis Methods*, 1 (2): 112–25.

1. Only one study examined how negative frames vs. a control group affect *emotions*, and only two studies examined how positive frames vs. a control group affect this outcome. Therefore, we could meta-analyze and compare these effects. [↑](#footnote-ref-1)
2. <http://www.p-curve.com/> [↑](#footnote-ref-2)