Summer 2020

The Prevalent Misuse of Fisher's Partial Eta Squared Formula

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THE PREVALENT MISUSE OF FISHER'S PARTIAL ETA SQUARED FORMULA

by

Mariah Cooper

A thesis submitted in partial fulfillment of the requirements
for graduation with Honors in the Psychology

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Thesis Mentor

Summer 2020

All requirements for graduation with Honors in the
Psychology have been completed.

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The recording of an estimate of effect size is an essential tool for empirical science because it allows for statistical power. In addition, it enables researchers to replicate studies because it assists in choosing subject amounts effectively. A popular measure of effect size is partial eta squared and is often calculated using Fisher's formula (Fisher 1928):

$$\hat{\eta}_p^2 = \frac{SS_{effect}}{SS_{effect} + SS_{error}}$$

Despite the positive impact that partial eta provides to empirical researchers, it comes with two problems. One is that researchers are misusing this formula because it was initially made for between-subject designs. When measuring the effect size via partial eta squared in a between-subject design, it measures by means of the ratio of variance related to an effect, and that effect added to its associated error variance. It works specifically for between-subjects because the values are independent of any other aspects of the design. However, researchers have been using it for the past decade on repeated measures designs, which do not have independent values. When using Fisher's partial eta squared on repeated measures designs, they are technically using the following equation to estimate this value:

$$within\ subjects\ \ \eta_p^2 = \frac{\sigma_{effect}^2}{\sigma_{effect}^2 + \sigma_{error}^2\left(\frac{m-1}{m}\right)}$$

The problem pertains to the $\left(\frac{m-1}{m}\right)$ portion of the equation because it illustrates that the denominator being smaller makes the effect size more significant than it actually is. So within-subject designs that rely on Fisher's partial eta squared are getting larger effect sizes than reality.

Second, Fisher's formula fails to conform to the general rule that two unbiased estimates are often biased, creating a problem of positive bias. While researchers rely on Fisher's formula, and because it is in popular statistic packages (ex. SPSS), they are reporting false statistical values. This issue is problematic because it feeds into the decade long replication crisis (Ioannidis, 2005).

Therefore, an adjusted partial eta squared should be adopted among empirical researchers (Mordkoff 2019, Kelly 1935)

$$\text{adj } \hat{\eta}_p^2 = \frac{SS_{effect} - (MS_{error} \times df_{effect})}{SS_{effect} + SS_{error}}$$

In this thesis, I will examine how often studies report effect size, which measurement used to estimate effect size, and which subject design they apply it to. I analyze various articles from psychological journals in their latest December 2019 edition to see how many researchers continue to use Fisher's partial eta squared. The results are summarized in the following table. Complete details are given in the Appendix.

Journal	Design Type	Tests reporting η_p^2	Tests using Fisher's η_p^2	Percent
JEP: Human Perception & Performance	Between-Ss	0	0	100%
	Within-Ss	67	67	100%
	Mixed-factor	0	0	100%
Psychological Science	Between-Ss	10	10	100%
	Within-Ss	51	51	100%
	Mixed-factor	6	6	100%
Journal of Experimental Psychology: General	Between-Ss	18	18	100%
	Within-Ss	9	8	88%
	Mixed-factor	9	9	100%
JEP: Learning, Memory, & Cognition	Between-Ss	6	5	83%
	Within-Ss	26	26	100%
	Mixed-factor	45	45	100%
Psychonomic Bulletin & Review	Between-Ss	9	9	100%
	Within-Ss	37	25	67%
	Mixed-factor	34	32	94%
Attention, Perception & Psychophysics	Between-Ss	13	13	100%
	Within-Ss	232	225	96%

	Mixed-factor	35	32	91%
Sum	Between-Ss	56	55	100%
	Within-Ss	422	402	95%
	Mixed-factor	129	124	96%

The analysis depicts that between-subjects designs always use Fisher's formula, which was the expectation. Looking at the repeated measures designs it seems as though roughly 95-96% were utilizing Fisher's formula. It is important to note that the remaining 4-5% that were not counted towards using Fisher's formula does not automatically mean that they did not attempt to. For example, after analyzing Ashinoff et al. to see if their studies had operated with an alternative formula, it appeared that they had not. This is apparent because the values were more substantial than both alternative and Fisher's formulas. Alternative formulas have less bias than Fisher's, creating smaller effect sizes. The values that Ashinoff et al. reported surpassed Fisher's values. This presumes that the F tests had a technical error creating a more significant effect size.

Regardless, the results illustrate the severity of the dilemma. The effect sizes that are reported for repeated measures designs are not estimating what the formula seems to imply because, in reality, the values are smaller. The use of Fisher's formula makes researchers who intend to replicate unable to sufficiently conduct an experiment because they lack the accurate number of participants. These outcomes illustrate the peremptory need to implement adjusted partial eta squared moving forward to allow unbiased results and legitimate effect sizes. It is vital to have correct effect sizes because, without them, it limits the power of experiments and is an additional factor that contributes to the replication crisis.

Works Cited

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Mordkoff, J. T. (2019). A simple method for removing bias from a popular measure of standardized effect size: Adjusted partial eta squared. *Advances in Methods and Practices in Psychological Science*, *2* 228-232.

Pearson, K. (1911). On a correction needful in the case of the correlation ratio. *Biometrika, 8*, 254-256.

Appendix

Journal	*JEP: Human Perception & Performance*, Volume 45, Issue 12	
Paper	Mittelstädt, Miller, Kiesel et al., (2019)	
Experiments	**Experiment 1a –** 1 within-subject analysis	
		t test - .82 (.814)
	Experiment 1b – 1 within-subject analysis	
		t test - .86
	Experiment 2 – 4 within-subject analyses	
		t test - .47 (.445)
		t test - .50
		F test - .36
		t test - .36
	Experiment 3 – 7 within-subject analyses	
		t test - .39
		t test - .24
		F test - .66 (.654)
		F test - .67
		F test - .64
		F test - .27
		t test - .14
	Experiment 4 – 8 within-subject analyses	
		t test - .41
		F test - .54
		F test - .66
		F test - .52
		F test - .13
		F test - .10
		F test - .11
		t test - .15
Paper	Holzleitner, Lee, Hahn et al., (2019) **no partial**	
Paper	Liu & Jaeger (2019) **no partial**	
Paper	Liu, Boiangin, Meir et al., (2019)	
Experiments	**Experiment 1 –** 4 within-subject analyses	
		F test - .10
		F test - .29
		F test - .33
		F test - .32
	Experiment 2 – 2 within-subject analyses	
		F test - .33
		F test - .32
	Experiment 3 – 1 within-subject analysis	

		F test - .34
Paper	Parker & Slattery (2019)	
Experiments	**Experiment 1 –** 1 within-subject analysis	
		F test - .97
Paper	Constable, Elekes, Sebanz et al., (2019)	
Experiments	**Experiment 1 match trials –** 3 within-subject design	
		F test - .62
		F test - .24
		F test - .26
	Experiment 1 mismatch trials – 2 within-subject design	
		F test - .46
		F test - .29
	Experiment 1 individual trials – 2 within-subject design	
		F test - .23
		F test - .39
	Experiment 1 group trials – 1 within-subject design	
		F test - .43
	Experiment 1 sensitivity – 3 within-subject design	
		F test - .48
		F test - .04 (.048)
		F test - .13
	Experiment 2 match trials – 3 within-subject design	
		F test - .66
		F test - .43
		F test - .04
	Experiment 2 mismatch trials – 4 within-subject design	
		F test - .49
		F test - .09
		F test - .001
		F test - .46
	Experiment 2 individual trials – 2 within-subject design	
		F test - .39
		F test - .45
	Experiment 2 group trials – 2 within-subject design	
		F test - .36
		F test - .21
	Experiment 2 sensitivity – 2 within-subject design	
		F test - .48
		F test - .28
	Experiment 3 match trials – 3 within-subject design	
		F test - .40
		F test - .57
		F test - .21
	Experiment 3 mismatch trials – 4 within-subject design	

		F test - .68
		F test - .005
		F test - .037
		F test - .31
	Experiment 3 individual trials – 2 within-subject design	
		F test - .32
		F test - .35
	Experiment 3 group trials – 1 within-subject design	
		F test - .64
	Experiment 3 sensitivity – 3 within-subject design	
		F test - .26
		F test - .52
		F test - .10
	Experiment 4 individual entities – 1 within-subject design	
		F test - .27
	Experiment 4 group entities – no partial	
Journal	*Psychological Science*, Volume 30, Issue 12	
Paper	Molouki, Hardisty & Caruso (2019)	
Experiments	**Experiment 1a –** 10 within-subject analyses	
		F test - .10
		F test - .03
		F test - .03
		F test - .07
		F test - .01 (.002)
		F test - .26
		F test - .22
		F test - .41
		F test - .39
		F test - <.01 (1.64E-05)
	Experiment 1b – 6 within-subject analyses	
		F test - .01
		F test - .27
		F test - .40
		F test - .43
		F test - .50
		F test - .03
	Experiment 2a – 14 within-subject analyses	
		F test - .22
		F test - .01
		F test - .03
		F test - .18
		F test - .00
		F test - .11
		F test - .07

		F test - .04
		F test - .00
		F test - .07
		F test - .00
		F test - .00
		F test - .18 (.174)
		F test - .03
	Experiment 2b – 15 within-subject analyses	
		F test - .66
		F test - .22
		F test - .19
		F test - .29
		F test - .16
		F test - .25
		F test - .00 (5.02E-05)
		F test - .27
		F test - .08
		F test - .02
		F test - .00
		F test - .00 (.006)
		F test - .71
		F test - .21
		F test - .19
	Experiment 3 – 6 mixed-subject analyses	
		F test - .07
		F test - .07 (.076)
		F test - .12
		F test - .24
		F test - .01
		F test - .53
	Experiment 4 – 10 between-subject analyses	
		F test - .14
		F test - .29
		F test - .00
		F test - .30
		F test - .00
		F test - .03
		F test - .03
		F test - .00
		F test - .01
		F test - .00
Paper	Manczak & Gotlib (2019) **no partial**	
Paper	Hotaling, Jarvstad, Donkin et al. (2019) **no partial**	

Paper	Kouchaki, Gino, & Feldman (2019) **no partial**	
Paper	Ngo, Horner, Newcombe et al., (2019) **no partial**	
Experiments	**Experiment 1 –** 1 within-subject analysis	
		F test - .07
Paper	Chang & Egeth (2019) **no partial**	
Experiments	**Experiment 1 –** 5 within-subject analysis	
		F test - .575
		F test - .012
		F test - .374
		F test - .181
		F test - .013
Paper	Eskreis-Winkler & Fishbach **no partial**	
Paper	Agrawal, Hari, & Arun **no partial**	
Journal	*Journal of Experimental Psychology: General*, Volume 148, Issue 12	
Paper	Zhu, Henson, & Holmes (2019)	
Experiments	**Experiment 1 –** 3 mixed-subject analysis	
		F test - .135
		F test - .147
		F test - .182

	Experiment 2 – 2 mixed-subject analyses	
		F test - .172
		F test - .157
	Experiment 3 – 4 mixed-subject analyses	
		F test - .257
		F test - .167
		F test - .212 (.2125)
		F test - .108
Paper	Gustavson, Panizzon, Franz et al., (2019) **no partial**	
Paper	Dejesus, Du, Shutts et al., (2019) **no partial**	
Paper	Niese, Libby & Eibach (2019) **no partial**	
Paper	Brewin, Li, Ntarantana, et al., (2019)	
Experiments	**Experiment 1 –** 3 within-subject	
		F test -.134
		F test -.009
		F test -.002
	Experiment 2 – 1 within-subject	
		F test - .167
	Experiment 3 – no partial	

Paper	Cooley, Brown-Iannuzzi, Lei et al.,	
Experiments	**Experiment 1 –** 5 between-subject design	
		F test - .05
		F test - .01
		F test - .02
		F test - .01
		F test - .02 (.014)
	Experiment 2 – 4 between-subject design	
		F test - .06 (.054)
		F test - .03
		F test - .01
		F test - .01
Paper	Heiphetz (2019)	
Experiments	**Experiment 1 –** 2 within-subject analysis	
		F test - .27
		F test - .24
	Experiment 2 – 2 within-subject analyses	
		F test - .16 (.323)
		F test - .28
	Experiment 3 – 1 within-subject analyses	
		F test - .12
Paper	Pesowski & Friedman (2019) **no partial**	
Paper	Patel, Baker, & Scherer (2019)	
Experiments	**Experiment 1 –** 3 between-subject analysis	
		F test - .02
		F test - .00
		F test - .07
	Experiment 2 – 2 between-subject analyses	
		F test - .11
		F test - .00
	Experiment 3 – 4 between-subject design	
		F test - .02
		F test - .00
		F test - .09
		F test - .16
	Experiment 4 – no partial	
Journal	*JEP: Learning, Memory, & Cognition*, Volume 45, Issue 12	
Paper	Born, Puntiroli, Jordan et al., (2019) **no partial**	
Paper	Król & Król (2019) **no partial**	
Paper	Kliegl, Carls & Bäuml (2019)	
Experiments	**Experiment 1 –** 2 within-subject analysis	

		F test - .335
		F test - .061
	Experiment 2 – 2 within-subject analyses	
		F test - .234
		F test - .058
	Experiment 3 – 4 between-subject design	
		F test - .27
		F test - .69 (.81)
		F test - .09
		F test - .04
Paper	Hsuan-Yu & Klaus (2019) **no partial**	
Paper	Aßfalg & Klauer (2019) **no partial**	
Paper	Annac, Pointner, Khader et al., (2019) **no partial**	
Paper	Trippas & Pachur (2019) **no partial**	
Paper	Yang & Lupker (2019) **no partial**	
Paper	Poulisse, Wheeldon, & Segaert (2019) **no partial**	
Paper	Kumar, Balota, Scaltritti et al (2019)	
Experiments	**Experiment 1 –** 3 within-subject design	
		F test - .60
		F test - .48
		F test - .50
	Experiment 1 retrieval state declaration – 14 mixed-subject design	
		F test - .16
		F test - .19
		F test - .10
		F test - .18
		F test - .10
		F test - .12
		F test - .33
		F test - .43
		F test - .66
		F test - .04
		F test - .04
		F test - .06
		F test - .05
		F test - .04
	Experiment 1 target retrieval accuracy – 2 mixed-subject design	
		F test - .23
		F test - .31
	Experiment 1 multiple-choice – 9 mixed-subject design	
		F test - .19
		F test - .16

		F test - .88
		F test - .54
		F test - .07
		F test - .04
		F test - .11
		F test - .17
		F test - .03
	Experiment 2 retrieval state declaration – 13 within-subject design	
		F test - .16
		F test - .13
		F test - .09
		F test - .12
		F test - .09
		F test - .21
		F test - .53
		F test - .49
		F test - .67
		F test - .24
		F test - .51
		F test - .17
		F test - .39
	Experiment 2 target retrieval accuracy – 3 mixed-subject design	
		F test - .12
		F test - .16
		F test - .09
	Experiment 2 multiple-choice – 11 mixed-subject design	
		F test - .07
		F test - .19
		F test - .08
		F test - .04
		F test - .05
		F test - .03
		F test - .89 (.898)
		F test - .54
		F test - .30
		F test - .08 (.087)
		F test - .04
	Experiment 2 multiple-choice – 2 between-subject design	
		F test - .01
		F test - .007
	Experiment 3 retrieval state declaration – 2 within-subject design	
		F test - .12
		F test - .09
	Experiment 3 target retrieval accuracy – 2 within-subject design	
		F test - .07

		F test - .05
	Experiment 3 multiple-choice – 2 within-subject design	
		F test - .08
		F test - .03
	Experiment 3 multiple-choice – 6 mixed-subject design	
		F test - .92
		F test - .50
		F test - .16
		F test - .07
		F test - .12
		F test - .08
Journal	*Psychonomic Bulletin & Review*, Volume 26, Issue 6	
Paper	Ashinoff, Tsal & Mevorach (2019)	
Experiments	**Experiment 1 –** 6 within-subject analysis	
		F test - .313
		F test - .146
		F test - .174
		F test - .412
		F test - .389
		F test - .090
	Experiment 2a – 5 within-subject analyses	
		F test - .101
		F test - .092
		F test - .073
		F test - .173
		F test - .159
	Experiment 2b – 12 within-subject analyses	
		F test - .134 (.1304)
		F test - .236 (.2308)
		F test - .135 (.1315)
		F test - .131 (.128)
		F test - .324 (.318)
		F test - .101 (.098)
		F test - .257 (.252)
		F test - .272 (.266)
		F test - .171 (.167)
		F test - .258 (.253)
		F test - .165 (.161)
		F test - .089 (.087)
Paper	Scholten, Scheres, Water et al., (2019) **no partial**	
Paper	Rissman & Majid (2019) **no partial**	
Paper	Calvillo & Emami (2019)	
Experiments	**Experiment 1 –** 6 mixed-subject analysis	

		F test - .01
		F test - .08
		F test - .05
		F test - .00
		F test - .03
		F test - .00 (8.47E-05)
Paper	Fang, Ravizza, & Liu (2019) **no partial**	
Paper	Hadar, Luria, & Liberman (2019)	
Experiments	**Experiment 1 accuracy -** 4 mixed-subject analysis	
		F test - .116
		F test - .804
		F test - .040
		F test - .039 (.041)
	Experiment 1 filtering cost – 2 mixed-subject analyses	
		F test - .072
		F test - .054
	Experiment 1 filtering benefits – 2 mixed-subject analyses	
		F test - .114 (.071)
		F test - .322 (.203)
	Experiment 1 comparison to baseline condition – 2 mixed-subject analyses	
		F test - .071 (.072)
		F test - .044
	Experiment 2 accuracy – 3 mixed-subject analyses	
		F test - .745
		F test - .01
		F test - .025
	Experiment 2 filtering cost – 1 mixed-subject analyses	
		F test - .042
	Experiment 2 filtering benefit – 2 mixed-subject analyses	
		F test - .015
		F test - .239
Paper	Liepelt, Porcu, Stenzel et al., (2019) **no partial**	
Paper	Moeller & Frings (2019)	
Experiments	**Experiment 1 –** 5 within-subject	
		F test - .28
		F test - .47
		F test - .37
		F test - .35 (.344)
		F test - .42
	Experiment 2 – 9 within-subject	
		F test - .21
		F test - .43
		F test - .29
		F test - .55

		F test - .27
		F test - .60
		F test - .27
		F test - .28
		F test - .31
Paper	Myers & Watson (2019) **no partial**	
Paper	Parikh, McGovern, & LaBar (2019)	
Experiments	**Experiment 1 –** 9 between-subject design	
		F test - .16
		F test - .02
		F test - .14
		F test - <.01
		F test - <.01
		F test - .02
		F test - .05
		F test - .16
		F test - .08
Paper	Rosenbaum & Bui (2019) **no partial**	
Paper	Slattery & Parker (2019) **no partial**	
Paper	Walker, Luque, Pelley et al., (2019)	
Experiments	**Experiment 1 –** 12 mixed-subject	
		F test - .348
		F test - .187
		F test - .058
		F test - .413
		F test - .113
		F test - .530
		F test - .119
		F test - .169
		F test - .624
		F test - .363
		F test - .050
Paper	Wisniewski, Church, Mercado III, et al., (2019) **no partial**	
Journal	*Attention, Perception, & Psychophysics*, Volume 81, Issue 8	
Paper	Adamo, Cox, Kravitz et al (2019) **no partial**	
Paper	Anderson & Britton (2019)	
Experiments	**Experiment 1 –** 3 within-subject design	
		F test - .643
		F test - .288
		F test - .194
Paper	Arciniega, Kilgore-Gomez, Harris et al., (2019)	

Experiments	**Experiment 1 –** 5 mixed-subject design	
		F test - .95
		F test - .12
		F test - .1
		F test - .64 (.633)
		F test - .1
	Experiment 2 – 5 mixed-subject design	
		F test - .975 (.982)
		F test - .12
		F test - .116 (.098)
		F test - .5 (.006)
		F test - .5
	Experiment 3 – 4 mixed-subject design	
		F test - .205
		F test - .18
		F test - .08
		F test - .34
	Experiment 4 - no partial	
Paper	Banai & Lavner (2019)	
Experiments	**Experiment 1 –** 4 between-subject design	
		F test - .045
		F test - .437
		F test - .353
		F test - .533
Paper	Carrigan, Wardle, & Rich (2019)	
Experiments	**Experiment 1 –** 9 within-subject design	
		F test - .38
		F test - .046
		F test - .43
		F test - .72
		F test - .87
		F test - .18
		F test - .76
		F test - .91
		F test - .23
	Experiment 2 – 8 within-subject design	
		F test - .88
		F test - .84
		F test - .27
		F test - .63
		F test - .77
		F test - .92
		F test - .93
		F test - .36

Paper	Curby & Moerel (2019)	
Experiments	**Experiment 1 –** 10 within-subject design	
		F test - .54
		F test - .18
		F test - .58
		F test - .26
		F test - .08
		F test - .37
		F test - .63
		F test - .46
		F test - .12
		F test - .06
	Experiment 2 – 16 within-subject design	
		F test - .48
		F test - .07
		F test - .02
		F test - .34
		F test - .17
		F test - .07
		F test - .20
		F test - .18
		F test - .16
		F test - .14
		F test - .17
		F test - .06
		F test - .10
		F test - .24
		F test - .21
		F test - .21
Paper	Czoschke, Henschke, & Lange (2019)	
Experiments	**Experiment 1 –** 18 within-subject design	
		F test - .59
		F test - .59
		F test - .38
		F test - .18
		F test - .08
		F test - .21 (.204)
		F test - .74
		F test - .87
		F test - .41
		F test - .18
		F test - .52
		F test - .59
		F test - .35

		F test - .04
		F test - .06
		F test - .43
		F test - .50
		F test - .09
	Experiment 2 – 16 within-subject design	
		F test - .59
		F test - .05
		F test - .03
		F test - .75
		F test - .19
		F test - .13
		F test - .19
		F test - .42
		F test - .21
		F test - .05
		F test - .01
		F test - .08
		F test - .18
		F test - .05
		F test - .39
		F test - .54
Paper	Edwards & Bayliss (2019)	
Experiments	**Experiment 1 –** 9 within-subject design	
		F test - .403
		F test - .453
		F test - .460
		F test - .394
		F test - .038
		F test - .294
		F test - .223
		F test - .912
		F test - .038
	Experiment 2 – 7 within-subject design	
		F test - .363
		F test - .654
		F test - .562
		F test - .254
		F test - .087
		F test - .884
		F test - .004
	Comparisons between experiments – 1 between-subject design	
		F test - .143
Paper	Frătescu, Van Moorselaar, & Mathôt (2019) **no partial**	

Paper	Hansen, Irons, & Leber (2019)	
Experiments	**Experiment 1 –** 4 between-subject design	
		F test - .014
		F test - .185
		F test - .227
		F test - .149
	Experiment 2 – 4 between-subject design	
		F test - .010
		F test - .274
		F test - .314
		F test - .123
	Cross-experiment analyses – 5 mixed-subject design	
		F test - .036
		F test - .016
		F test - .115
		F test - .123
		F test - .245
Paper	Karşılar & Balcı (2019)	
Experiments	**Experiment 1 –** 3 within-subject design	
		F test - .167 (.171)
		F test - .043 (.013)
		F test - .022 (.035)
	Experiment 2 – 2 within-subject design	
		F test - .13
		F test - .031
	Experiment 3 – 3 within-subject design	
		F test - .028 (.029)
		F test - .02
		F test - .032
	Experiment 2 – 2 within-subject design	
		F test - .076
		F test - .008
Paper	Khayat & Hochstein (2019) **no partial**	
Paper	Kirsch & Kunde (2019)	
Experiments	**Experiment 1 –** 5 within-subject design	
		F test - .164
		F test - .147
		F test - .130
		F test - .167
		F test - .250
Paper	Kwon & Oh (2019)	
Experiments	**Experiment 1 –** 6 within-subject design	
		F test - .61

		F test - .37
		F test - .59
		F test - .59
		F test - .15
		F test - .59
Paper	Lee & Mather (2019) **no partial**	
Paper	Legge, Granquist, Lubet et al., (2019) **no partial**	
Paper	Li, Li, Xie et al., (2019) **no partial**	
Paper	Lo & Wang (2019)	
Experiments	**Experiment 1 –** 3 within-subject design	
		F test - .77
		F test - .55
		F test - .65
	Experiment 2 – 4 within-subject design	
		F test - .84
		F test - .31
		F test - .16
		F test - .25
	Experiment 3 – 5 within-subject design	
		F test - .82
		F test - .36
		F test - .32
		F test - .26
		F test - .20
Paper	Menceloglu, Grabowecky, & Suzuki (2019)	
Experiments	**Across-domain expectation effects –** 2 mixed-subject design	
		F test - .31
		F test - .66
	Across-domain priming effects – 3 mixed-subject design	
		F test - .52
		F test - .77
		F test - .31
	Within-domain expectation and priming effects – 1 within-subject design	
		F test - .15
	Within-domain expectation and priming effects – 4 mixed-subject design	
		F test - .40
		F test - .64
		F test - .25
		F test - .20
Paper	Nightingale, Wade, Farid et al., (2019) **no partial**	
Paper	Pan, Han, & Zuo (2019)	
Experiments	**Experiment 1 –** 4 within-subject design	

		F test - .595
		F test - .129
		F test - .581
		F test - .403
	Experiment 2 – 3 within-subject design	
		F test - .444
		F test - .075
		F test - .118
	Experiment 3 – 2 within-subject design	
		F test - .294
		F test - .119
	Experiment 4 – 4 within-subject design	
		F test - .480
		F test - .210
		F test - .486
		F test - .413
	Experiment 5 – 5 within-subject design	
		F test - .584
		F test - .259
		F test - .057
		F test - .515 (.680)
		F test - .211 (.348)
Paper	Papesh & Guevara Pinto (2019)	
Experiments	**Experiment 1 –** 6 within-subject design	
		F test - .33
		F test - .04
		F test - .02
		F test - .15
		F test - .29
		F test - .03
	Experiment 2 – 7 within-subject design	
		F test - .25
		F test - .03(.012)
		F test - .23
		F test - .08
		F test - .02
		F test - .01
		F test - .04
Paper	Pickel, Pratt, & Weidler (2019)	
Experiments	**Experiment 1 –** 3 within-subject design	
		F test - .67
		F test - .16
		F test - .24
	Experiment 2 – 3 within-subject design	

		F test - .43
		F test - .18
		F test - .18
	Experiment 3 – 8 within-subject design	
		F test - .74
		F test - .68
		F test - .21
		F test - .23
		F test - .33
		F test - .35
		F test - .32
		F test - .13
	Between-experiment analyses – 6 mixed-subject design	
		F test - .19
		F test - .08
		F test - .06
		F test - .26
		F test - .19
		F test - .15
	Biased items in training versus transfer – 7 within-subject design	
		F test - .26
		F test - .11
		F test - .56
		F test - .10
		F test - .07
		F test - .34
		F test - .18
	Compatibility effects in center location – 3 within-subject design	
		F test - .64
		F test - .37
		F test - .45
Paper	Pomè, Anobile, Cicchini et al., (2019) **no partial**	
Paper	Servant & Logan (2019)	
Experiments	**Experiment 1 –** 4 within-subject design	
		F test - .94
		F test - .43
		F test - .14
		F test - .06
	Experiment 2 – 10 within-subject design	
		F test - .89
		F test - .53
		F test - .38
		F test - .06
		F test - .28

		F test - .21
		F test - .03
		F test - .12
		F test - .02
		F test - .06
	Experiment 2 – 1 mixed-subject design	
		F test - .11
	Experiment 3 – 6 within-subject design	
		F test - .92
		F test - .35
		F test - .001
		F test - .71
		F test - .07
		F test - .1
		F test - .28
		F test - .13
		F test - .005
Paper	Stothart & Brockmole (2019) **no partial**	
Paper	Tohidi-Moghaddam, Zabbah, Olianezhad et al., (2019) **no partial**	
Paper	Van Leeuwen, Smeets, & Belopolsky (2019) **no partial**	
Paper	Wallis, Tobias, Bethge et al., (2019) **no partial**	
Paper	Wolfe, Sawyer, Kosovicheva et al., (2019)	
Experiments	**Experiment 1 –** 11 within-subject design	
		F test - .198
		F test - .027
		F test - .027
		F test - .432
		F test - .003
		F test - .038
		F test - .317
		F test - .054
		F test - .017 (.010)
		F test - .53
		F test - .06
		F test - .014
	Experiment 2 – 12 within-subject design	
		F test - .329
		F test - .115
		F test - .06
		F test - .668
		F test - .09
		F test - .157
		F test - .467

		F test - .195
		F test – 107
		F test - .60
		F test - .04
		F test - .07
Paper	Wright & Chouinard (2019) **no partial**	
Paper	Zheng & Pollmann (2019)	
Experiments	**Experiment 1 –** 4 within-subject design	
		F test - .05
		F test - .03
		F test - .13
		F test - .07