Example Meta-Analysis

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REVIEW

Anorexia nervosa and perfectionism: A meta-analysis

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Step 1: Specify Research Question

The aim of this study was to synthesize published research comparing perfectionism scores in those diagnosed with AN, with perfectionism scores of a non-clinical comparison group, a non-AN ED group, and PC group. Effect sizes were calculated, representing the

For the presentation I will just focus on the AN vs Non-clinical Comparison

Step 2: Locate Studies that meet Inclusion/Exclusion Criteria

2.1 | Method design

The research was conducted according to the PRISMA guidelines (Liberati et al., 2009), and we identified research papers that compared perfectionism scores in those diagnosed with AN and either a non-clinical comparison group, people diagnosed with a non-AN ED, or people diagnosed with another psychiatric disorder (i.e., other *DSM* diagnoses). The search identified relevant studies that met the following inclusion criteria.

Step 2: Locate Studies that meet Inclusion/Exclusion Criteria

2.1.1 | Inclusion criteria

Studies that (a) included participants who were diagnosed with AN; and with either non-clinical comparison group, people diagnosed with a non-AN ED, or people diagnosed with another diagnosed psychiatric disorder, in accordance with the *DSM III, IV*, or 5 criteria; (b) were peer-reviewed articles; (c) were empirical works; (d) were published in English; and (e) provided relevant statistics for perfectionism scores to allow calculation of effect size (e.g., *M*, SD, or *t*-test), were included in the analysis.
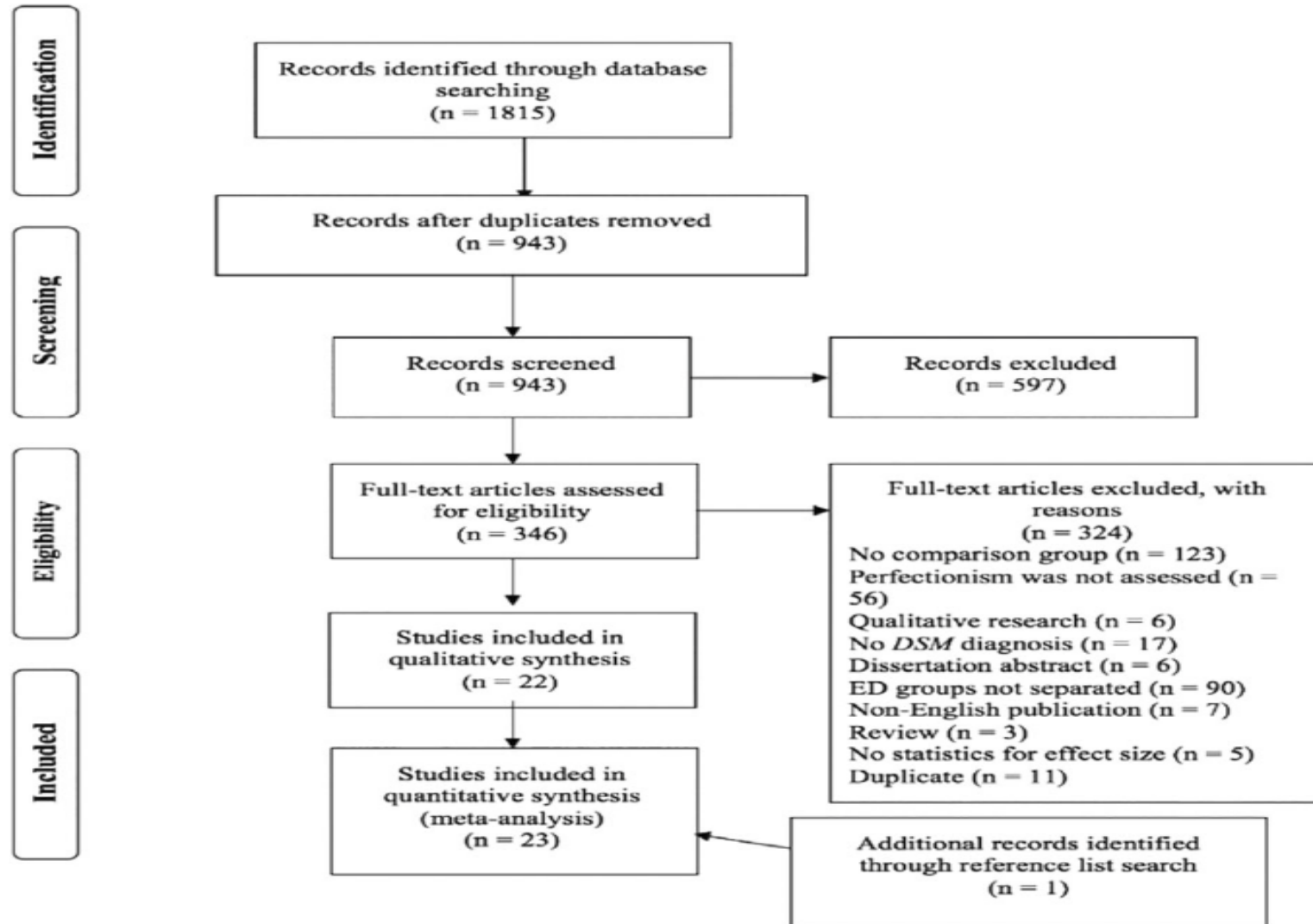
Step 2: Locate Studies that meet Inclusion/Exclusion Criteria

2.1.2 | Exclusion criteria

Studies that (a) had no clear diagnosis of AN, a non-AN ED, or another psychiatric disorder in accordance with the *DSM* criteria; (b) were not published in English; (c) provided no comparison group; (d) were meta-analyses or systematic reviews; (e) were case studies; or (f) either included insufficient results reported for calculation of effect size or results not available from authors, were not included.

Step 2: Locate Studies that meet Inclusion/Exclusion Criteria

Identification

Records identified through database searching
(n = 1815)

↓

Records after duplicates removed
(n = 943)

Screening

Records screened
(n = 943) → Records excluded
(n = 597)

↓

Eligibility

Full-text articles assessed for eligibility
(n = 346) → Full-text articles excluded, with reasons
(n = 324)
No comparison group (n = 123)
Perfectionism was not assessed (n = 56)
Qualitative research (n = 6)
No *DSM* diagnosis (n = 17)
Dissertation abstract (n = 6)
ED groups not separated (n = 90)
Non-English publication (n = 7)
Review (n = 3)
No statistics for effect size (n = 5)
Duplicate (n = 11)

↓

Studies included in qualitative synthesis
(n = 22)

↓

Included

Studies included in quantitative synthesis (meta-analysis)
(n = 23) ← Additional records identified through reference list search
(n = 1)

Step 3: Extract Study Information

2.2.2 | Data extraction

The data extracted from each study were, where applicable, year published, country, age of participants, gender, number of participants in each group, version of *DSM* used for diagnoses, *DSM* diagnosis, specifically how the *DSM* diagnosis was reached, measure used for assessing perfectionism, and any group statistics reported used to calculate the effect size.

Step 3: Study Info Results

Study	Country	Race/ethnicity	Perfectionism measure	AP, MP, or both captured	Methodological quality score	DSM version	Method of diagnosis	AN group (n)	Comparison group (n)	N
Bachner-Melman et al. (2006)	IL	Not reported	CAPS	Both	22/22	IV	SCID	AN (31)	Non-clinical (248)	279
Bachner-Melman et al. (2007)	IL	Not reported	CAPS	Both	18/22	IV	SCID	AN (17)	Non-clinical (242)	259
Casper et al. (1992)	US	Not reported	EDI-P	MP	18/22	III-R	SCID	AN-BP (19) AN-R (12)	BN (19) Non-clinical (19)	50
Castro-Fornieles et al. (2007)	ES	Not reported	CAPS	Both	22/22	IV	Clinical interview	AN (75)	BN (33) PC (86) Non-clinical (213)	407
Dalle Grave, Calugi, and Marchesini (2008)	IT	Not reported	EDI-P	MP	19/22	IV	SCID	AN-BP (30) AN-R (35)	BN (28)	93
Davis and Scott-Robertson (2000)	US	Not reported	MPS	AP	18/22	IV	Not reported	AN (46)	Non-clinical (22)	68
Davies, Liao, Campbell, and Tchanturia (2009)	UK	Not reported	F-MPS	MP	19/22	IV	SCID	AN (30)	BN (26) Non-clinical (51)	107
Fassino, Amianto, and Abbate-Daga (2009)	IT	Not reported	EDI-P	MP	22/22	III	SCID	AN-BP (30) AN-R (38)	BN (35) Non-clinical (54)	159
Fassino, Piero, Gramaglia, and Abbate-Daga (2004)	IT	Not reported	EDI-P	MP	22/22	IV	SCID	AN-BP (61) AN-R (61)	BN (104)	226
Halmi et al. (2000)	US	Not reported	F-MPS	MP	20/22	IV	Not reported	AN-BP (60) AN-R (146)	Non-clinical (44)	250
Jiménez-Murcia et al. (2007)	ES	Spanish	EDI-P	MP	20/22	IV	SCID	AN (30)	BN (30) PC (30)	90
Kim et al. (2010)	KR	Korean & British	CRF-Q	MP	18/22	IV	Semi-structured interview	AN (52)	Non-clinical (108)	202
Moor, Vartanian, Touyz, and Beumont (2004)	AU	Not reported	EDI-P	MP	19/22	IV	Not reported	AN (27)	BN (23) Non-clinical (25)	75

Subset of studies …

Step 4: Study Validity

2.3.1 | Methodological quality

We addressed the risk of bias based on methodological quality using the Standard Quality Assessment Criteria for Evaluating Primary Research Papers from a Variety of Fields checklist (Kmet, Lee, & Cook, 2004). The checklist covers criteria such as study design, outcome measures, sample size, and if the results and conclusion are congruent. Responses can be "yes", "partial", or "no" and these responses are worth either two, one, or zero points, respectively. With 11 items on the checklist used for quantitative research, each study assessed could score a maximum of 22 points, indicating strong methodological quality.

Step 4: Study Validity Results

TABLE 1 Studies included in the meta-analysis of perfectionism levels of AN and comparison groups

Study	Country	Race/ethnicity	Perfectionism measure	AP, MP, or both captured	Methodological quality score
Bachner-Melman et al. (2006)	IL	Not reported	CAPS	Both	22/22
Bachner-Melman et al. (2007)	IL	Not reported	CAPS	Both	18/22
Casper et al. (1992)	US	Not reported	EDI-P	MP	18/22
Castro-Fornieles et al. (2007)	ES	Not reported	CAPS	Both	22/22
Dalle Grave, Calugi, and Marchesini (2008)	IT	Not reported	EDI-P	MP	19/22
Davis and Scott-Robertson (2000)	US	Not reported	MPS	AP	18/22
Davies, Liao, Campbell, and Tchanturia (2009)	UK	Not reported	F-MPS	MP	19/22
Fassino, Amianto, and Abbate-Daga (2009)	IT	Not reported	EDI-P	MP	22/22
Fassino, Piero, Gramaglia, and Abbate-Daga (2004)	IT	Not reported	EDI-P	MP	22/22
Halmi et al. (2000)	US	Not reported	F-MPS	MP	20/22
Jiménez-Murcia et al. (2007)	ES	Spanish	EDI-P	MP	20/22

Subset of studies …

Step 5: Publication Bias

2.3.2 | Publication bias

The Fail-safe N is a statistical tool that addresses publication bias. The resulting calculation estimates the number of unpublished studies needed to make a statistically significant result no longer statistically significant (Rosenthal, 1979). We used the Fail-safe N to determine publication bias in the studies, as studies that produce a significant result are more likely to be published than non-significant results. Forest plots and funnel plots were generated to visually inspect heterogeneity and publication bias in the results. The forest plot visually shows the heterogeneity, or differences in results, in the included studies. For a potential indicator of publication bias, a funnel plot

Step 5: Publication Bias Results

The Fail-safe N was only acceptable for the two non-clinical group comparisons, indicating it is unlikely there are enough unpublished studies with a statistically non-significant effect to make this result statistically non-significant. The Fail-safe N for the PC group was below the minimum required value, which suggests that it is possible that there are a number of studies in existence that could overturn the significance of this result.

Step 5: Publication Bias Results

Funnel plots for the group comparisons were visually inspected and identified no asymmetry. The AN vs. non-clinical comparison group

I added the blue line, which is not affected by the outlier, and tells a different story regarding publication bias
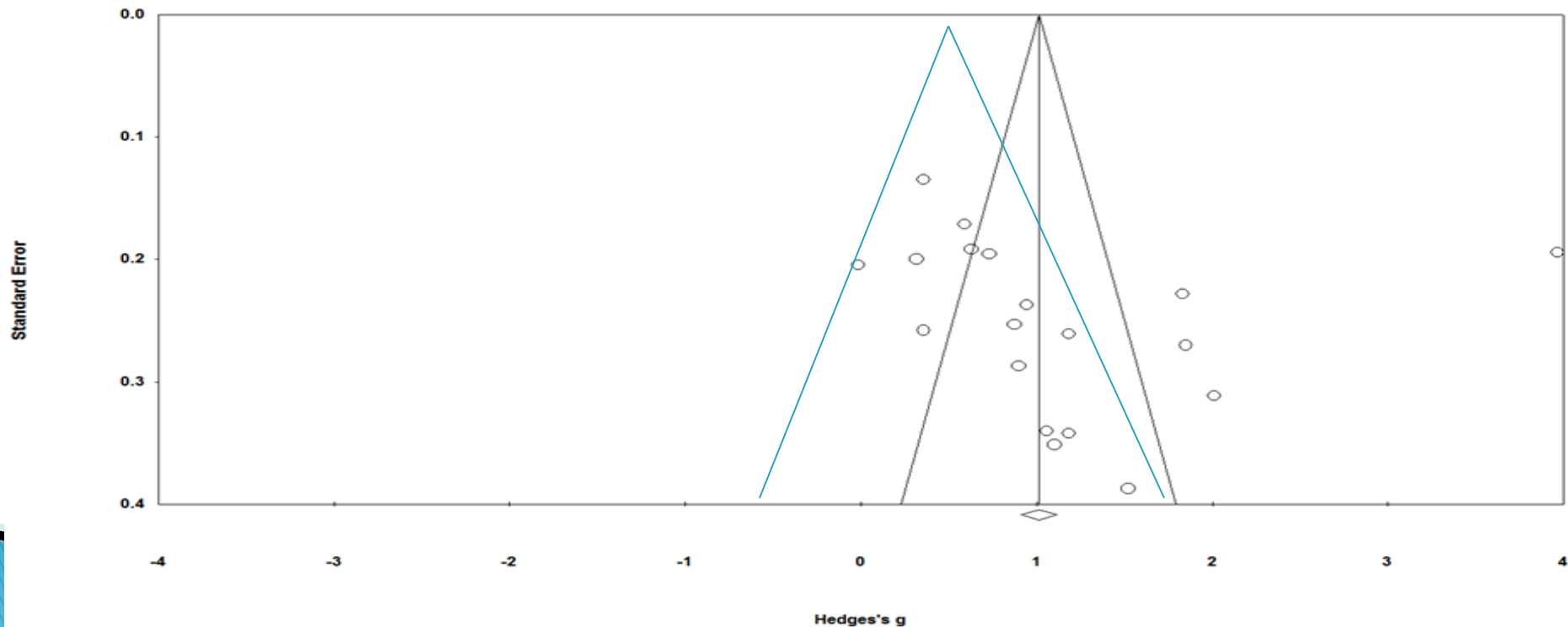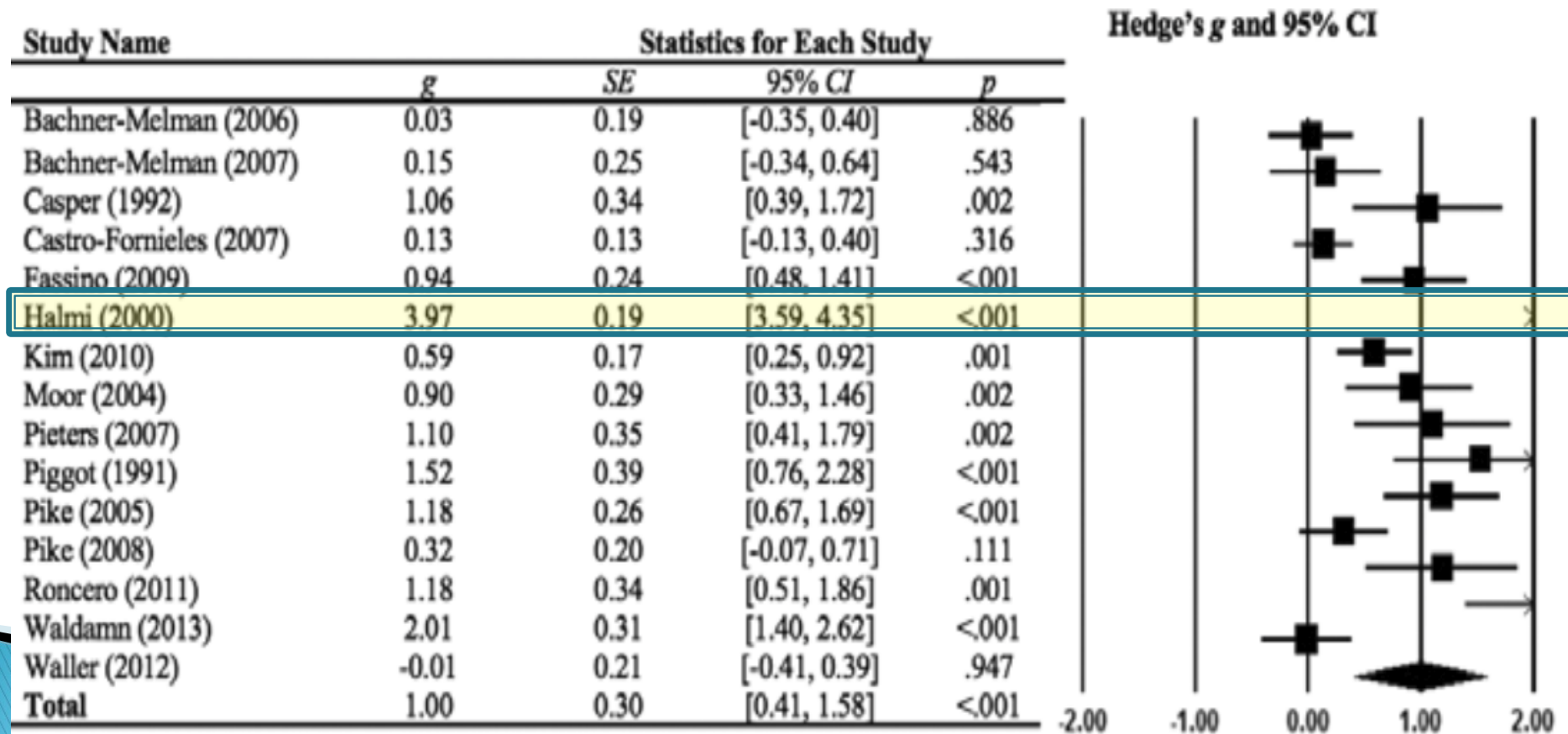
Step 6: Combine Effect Sizes

We conducted a random-effect analysis due to the assumed heterogeneity between the studies (there were varying types of perfectionism measures used, and the methodology of the studies varied; Borenstein et al., 2009).

AN vs Control

Hedge's *g* and 95% CI

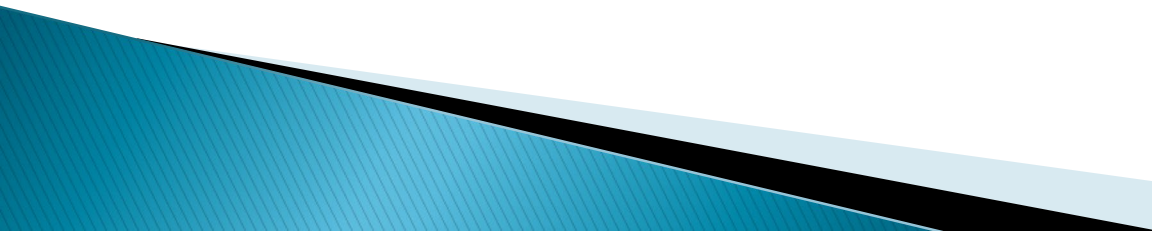| Study Name	*g*	SE	95% CI	*p*
Bachner-Melman (2006)	0.03	0.19	[-0.35, 0.40]	.886
Bachner-Melman (2007)	0.15	0.25	[-0.34, 0.64]	.543
Casper (1992)	1.06	0.34	[0.39, 1.72]	.002
Castro-Fornieles (2007)	0.13	0.13	[-0.13, 0.40]	.316
Fassino (2009)	0.94	0.24	[0.48, 1.41]	<.001
Halmi (2000)	3.97	0.19	[3.59, 4.35]	<.001
Kim (2010)	0.59	0.17	[0.25, 0.92]	.001
Moor (2004)	0.90	0.29	[0.33, 1.46]	.002
Pieters (2007)	1.10	0.35	[0.41, 1.79]	.002
Piggot (1991)	1.52	0.39	[0.76, 2.28]	<.001
Pike (2005)	1.18	0.26	[0.67, 1.69]	<.001
Pike (2008)	0.32	0.20	[-0.07, 0.71]	.111
Roncero (2011)	1.18	0.34	[0.51, 1.86]	.001
Waldamn (2013)	2.01	0.31	[1.40, 2.62]	<.001
Waller (2012)	-0.01	0.21	[-0.41, 0.39]	.947
Total	1.00	0.30	[0.41, 1.58]	<.001

Step 7: Moderators

Furthermore, too few of the studies reported ethnicity data so we were unable to include the variable as a moderator.
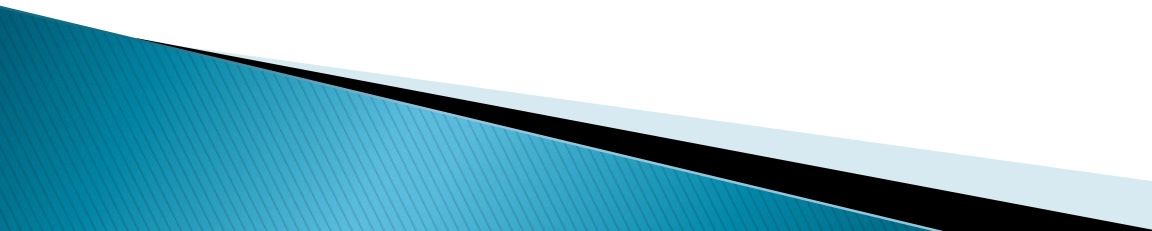
Step 8: Conclusions

There were no statistically significant differences in maladaptive perfectionism between individuals diagnosed with AN and BN. The results from the meta-analysis also supported the hypothesis that the AN group was more perfectionistic compared to the non-clinical group, and the effect size was large. This result was the same for both maladaptive and adaptive perfectionism.

Summary: Steps of a Systematic Review/Meta-Analysis

- Specify your research question/effect of interest
- Find studies that investigate the effect of interest using inclusion/exclusion criteria
- Extract all necessary information from the studies
- Assess the validity of the studies
- Assess risk of publication bias
- Estimate the weighted combined effect size and CI for the effect size
- Explore moderators of the variability in effect sizes
- Interpret the findings

Strengths of Meta-Analysis

▸ Imposes strict procedures on the process of summing up research findings

▸ Represents findings in a more sophisticated manner than conventional reviews

▸ Capable of finding relationships across studies that are obscured in other approaches or without amalgamation

▸ Capable of detecting moderators of effects

▸ Can handle a large numbers of studies, which would be difficult in a qualitative review

Weaknesses of Meta-Analysis

- Requires a lot of effort!

- Mechanical aspects don't lend themselves to capturing more qualitative distinctions between studies

- "Apples and oranges"
  ◦ Comparability of studies is often in the "eye of the beholder"

- Most meta-analyses include "blemished" studies

- Selection bias possesses continual threat
  ◦ E.g., Null finding studies are hard to find

General Conclusions

▶ Meta-analysis is a valuable tool for combining results (effect sizes) from multiple studies and providing a sense of the overall magnitude of the effect

▶ Researchers in Psychology are slowly warming up to the value of meta-analyses, and it is important that we are now familiar with meta-analyses in our fields
  ◦ And conduct them when they are missing!