



Critical Appraisal: Interpreting systematic reviews and meta analysis

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Key Learnings

- To *read and critically appraise* systematic reviews and meta analysis
- To *interpret findings and relevance* of systematic reviews and meta analysis



What is a systematic review?

A review of a **clearly formulated question** that uses **systematic and explicit methods** to identify and critically appraise all relevant research

Cochrane Collaboration, 2000



What is a meta analysis?

A **statistical analysis** that combines the results of **multiple scientific studies** to produce a single estimate of effectiveness



Levels of evidence of effectiveness

Levels	Descriptor
1	Systematic review with homogeneity (similarity of studies) of experimental studies (e.g. RCT with concealed allocation) OR 1 or more large experimental studies with narrow confidence intervals
2	One or more smaller RCTs with wider confidence intervals OR Quasi-experimental studies (eg. without randomisation)
3	3a. Cohort studies (with control group) 3b. Case-controlled 3c. Observational studies without control groups
4	Expert opinion based on physiology, bench research or consensus



Critical issue

Evidenced based practice

- Based on systematic reviews
- Use of poorly conducted systematic reviews: misleading findings → detrimental practice → ↑ costs and no benefits
- Critical appraisal is needed!



Sample review

Obesity Science & Practice

doi: 10.1002/osp4.52

REVIEW

Alternate-day versus daily energy restriction diets: which is more effective for weight loss? A systematic review and meta-analysis

B. A. Alhamedan¹, A. Garcia-Alvarez¹, A. H. Alzahrani¹, J. Karanxha², D. R. Stretchberry², K. J. Contrera⁴, A. F. Utría⁴ and L. J. Cheskin¹
John Hopkins Bloomberg School of Medical Health

Open access journal

Impact factor??

<http://onlinelibrary.wiley.com/doi/10.1002/osp4.52/epdf>



Critical appraisal of a systematic review and meta analysis



10 questions to help you make sense of a review

<http://www.casp-uk.net/>



CASP checklist on SR

Section A: Are the results of the review valid?

1. Did the review address a clearly focused question?
2. Did the authors look for the right type of papers?

Is it worth continuing?

3. Do you think the important, relevant studies were included?
4. Did the review's authors do enough to assess the quality of the included studies?
5. If the results of the review have been combined, was it reasonable to do so?

Section B: What are the results?

6. What are the overall results of the review?
7. How precise are the results?

Section C. Will the results help locally?

8. Can the results be applied to the local population?
9. Were all important outcomes considered?
10. Are the benefits worth the harms and costs?



Section A

(A) Are the results of the review valid?

Screening Questions

1. Did the review address a clearly focused question? Yes Can't tell No

HINT: An issue can be 'focused' in terms of

- The population studied
- The intervention given
- The outcome considered



Section A

2. Did the authors look for the right type of papers? Yes Can't tell No

HINT: 'The best sort of studies' would

- Address the reviews question
- Have an appropriate study design (usually RCTs for papers evaluating interventions)



Is it worth continuing?



Section A

1. Did the review address a clearly focused question?

We systematically reviewed the efficacy of ADF diets compared to VLCD (the control) in terms of weight loss, and reduction of fat mass and fat-free mass. Our objective was to explore the hypothesis that ADF could be an effective alternative to more restrictive dieting approaches, namely VLCD.

- ✓ Question or aim
- ☐ Population
- ✓ Type of interventions
- ✓ Type of outcomes
- ✓ Comparisons

Alhamdan, Obesity Science & Practice 2016



Section A

2. Did the authors look for the right type of papers?

Study selection and criteria

The following exclusion criteria were applied: case reports, letters, comments, reviews or animal studies; languages other than English; and publication date other than from 1 January 2000 to 30 September 2015. The following inclusion criteria were applied: adults aged 18–70 years, with BMI ≥ 25 kg/m², good general state of health (i.e. without a diagnosed condition), on only very-low-energy diets (<800 calories/d) for VLCD studies and interventions lasting between 3 and 12 weeks.

AND: example of literature search command

Alhamdan, Obesity Science & Practice 2016



Section A

Is it worth continuing?



- ✓ Clearly focused review question
- ✓ Selection of right type of papers
- !! Population defined in study selection criteria, not in review question
- !! Selection criteria not complete (only 1 diet specified)

Conclusion questions 1 and 2: (borderline) continue



Section A

3. Do you think all the important, relevant studies were included? Yes Can't tell No

HINT: Look for

- Which bibliographic databases were used
- Follow up from reference lists
- Personal contact with experts
- Search for unpublished as well as published studies
- Search for non-English language studies

- Other important sources (guidelines, conference proceedings)
- Hand searching
- List of search terms
- Time frame



Section A

4. Did the review's authors do enough to assess the quality of the included studies? Yes Can't tell No

HINT: The authors need to consider the rigour of the studies they have identified. Lack of rigour may affect the studies' results. ("All that glitters is not gold" Merchant of Venice – Act II Scene 7)

- Was the validity of studies assessed appropriately?
- Which checklist/tool was used?
- Was the tool attached?



Section A

5. If the results of the review have been combined, was it reasonable to do so? Yes Can't tell No

HINT: Consider whether

- The results were similar from study to study
- The results of all the included studies are clearly displayed
- The results of the different studies are similar
- The reasons for any variations in results are discussed

- Were only studies with similar (homogenous) populations, interventions and outcomes combined?
- Were reasons for differences (heterogeneity) explored?
- Were appropriate statistical methods used?



Section A

3. Were the important, relevant studies included?

NO:

Data sources

Literature searches were conducted using PubMed, with the time frame of publication 1 January 2000 to 30 September 2015. An example of search commands is detailed as follows:

[Caloric restriction [tiab] OR VLED [tiab] OR LED [tiab] OR very low energy diet [tiab] OR low energy diet [tiab] OR LCD [tiab] OR 25% energy deficit weight loss diet

4. Did the authors do enough to assess the quality of the included studies?

YES:

Quality assessment

Two reviewers used the Downs and Black quality checklist to assess the risk of study bias (ROB) for each included study (19): (i) low ROB: when a study fulfilled all

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5. Was it reasonable to combine results?

Table 2A. Studies included in the meta-analysis

Name	Sample size (n)	Females (%)	Age* (years)	Baseline BMI*	Length (weeks)	Change in body weight* (kg)	Change in fat mass* (kg)	Change in fat-free mass* (kg)
ADF								
Versady, 2013 (23)	15	66	47 ± 3.0	26 ± 1.0	12	5.20 ± 0.9	3.60 ± 0.7	1.60 ± 0.5
Shutani, 2013 (21)	25	96	40 ± 2.0	35 ± 1.0	12	3.00 ± 1.0	2.00 ± 1.0	1.00 ± 1.0
Klemple, 2013 (HF) (8)	17	100	42 ± 3.0	35 ± 0.7	8	4.30 ± 1.0	5.40 ± 1.5	1.10 ± 1.3
Klemple, 2013 (LF) (8)	18	100	43 ± 2.0	36 ± 0.7	8	3.70 ± 0.7	4.20 ± 0.6	0.50 ± 0.7
Versady, 2009 (10)	16	75	46 ± 2.0	34 ± 1.0	8	5.60 ± 1.0	5.40 ± 0.6	0.10 ± 0.1
VLCD								
Munro, 2013 (placebo) (22)	19	79	47 ± 2.0	34 ± 0.8	4	5.79 ± 0.4	4.19 ± 0.4	1.33 ± 0.4
Munro, 2013 (fish oil) (22)	20	75	45 ± 2.0	31 ± 0.6	4	6.12 ± 0.3	4.36 ± 0.3	1.68 ± 0.3
Westertep-P, 2005* (22)	76	70		28 ± 0.3	4	5.90 ± 0.2	5.00 ± 0.2	2.50 ± 0.5
Lejeune, 2005 (24)	113		45 ± 1.0	29 ± 0.2	4	6.30 ± 0.3	4.00 ± 0.3	2.30 ± 0.2
Westertep-P, 2004 (25)	148		44 ± 0.8	30 ± 0.2	4	6.40 ± 0.1	3.90 ± 0.3	2.50 ± 0.2
Kovacs, 2004 (26)	104	75		30 ± 0.3	4	6.40 ± 0.3	4.00 ± 0.3	2.40 ± 0.3
Lejeune, 2003 (27)	91			29 ± 0.3	4	6.60 ± 0.2	4.10 ± 0.2	2.50 ± 0.2

*Mean ± SEM.

†Numbers were computed from one figure of the article.

ADF, alternate-day fasting; BMI, body mass index; HF, high fat group; LF, low fat group; VLCD, very-low-calorie-diets.

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Section A

3. Were the important, relevant studies included?

Limited to PubMed search – **NO**

4. Did the authors do enough to assess the quality of the included studies?

YES

5. Was it reasonable to combine results?

YES

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Section C

(C) Will the results help locally?

8. Can the results be applied to the local population? Yes Can't tell No

HINT: Consider whether

- The patients covered by the review could be sufficiently different to your population to cause concern
- Your local setting is likely to differ much from that of the review

9. Were all important outcomes considered? Yes Can't tell No

HINT: Consider whether

- Is there other information you would like to have seen

10. Are the benefits worth the harms and costs? Yes Can't tell No

HINT: Consider

- Even if this is not addressed by the review, what do you think?

Section C

(C) Will the results help locally?

8. Can the results be applied to the local population? Yes Can't tell No

HINT: Consider whether

- The patients covered by the review could be sufficiently different to your population to cause concern
- Your local setting is likely to differ much from that of the review

9. Were all important outcomes considered? Yes Can't tell No

HINT: Consider whether

- Is there other information you would like to have seen

10. Are the benefits worth the harms and costs? Yes Can't tell No

HINT: Consider





- Even if this is not addressed by the review, what do you think?

Section C

Conclusion

Among individuals with obesity, ADF is an efficacious dietary method, and may be superior to VLCD for some patients because of ease of compliance, greater fat-mass loss and relative preservation of fat-free mass. However, further studies comparing ADF to VLCD (ideally head-to-head randomized clinical trials) that also control for patient characteristics, are needed to confirm the efficaciousness of these two approaches for weight loss, and to determine if ADF is better suited to certain populations.

This information is of interest to health care providers and dietitians, as well as individuals with obesity seeking effective and potentially easier to follow methods to lose weight.

Conclusion

- Critical appraisal: is the review of good quality?
- Not every published review is of good quality
- Critical appraisal is time-consuming, but gets easier along the way
- Very important NOT to use systematic reviews without critical appraisal:
especially if you base **policy** or **practice** on the results



Thanks for your attention!