

INTERVENTIONS ON DIET AND PHYSICAL ACTIVITY: WHAT WORKS

METHODOLOGY



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Recognizing the heavy and growing burden of chronic noncommunicable diseases (NCDs), the *Global Strategy on Diet, Physical Activity and Health (DPAS)* was endorsed by the World Health Assembly in 2004 (1). DPAS describes the responsibilities of many stakeholders to take action to improve diet and promote physical activity. One of the responsibilities of the World Health Organization (WHO) is to "*identify and disseminate information on evidence-based interventions, policies and structures*". This priority is further underlined in the NCD Action Plan that was endorsed by the World Health Assembly in May 2008.

A review of the evidence of effective diet and physical activity interventions was undertaken, the results of which are summarized in *Interventions on diet and physical activity: what works - Summary Report*.

This publication provides policy-makers and other stakeholders with a summary of tried and tested diet and physical activity interventions aimed at reducing the risk of chronic NCDs (accessible via the DPAS website at www.who.int/dietphysicalactivity/whatworks).

As the *Summary Report* is written for policy-makers, it only contains a short overview of the methodology of the review. The purpose of the current online document is to give more detailed information on the five stages of the methodology used.

The review evaluated existing evidence on the effectiveness of diet and physical activity interventions at group, community and population levels, with a focus on disadvantaged communities and low- and middle-income countries. In addition to the peer-reviewed studies, it also made use of grey literature on policy interventions and promising initiatives that had not yet undergone rigorous evaluation. The methodology was adapted from the guidelines provided by the Centre for Reviews and Dissemination of the University of York (2), Rychnetik and Frommer (3) and Flynn et al. (4).

**Phase 1:
Search
strategy**

The search strategy was restricted to studies on diet and/or physical activity that included human participants and were published in English between January 1995 and June 2006. The interventions described in the studies, however, could have taken place before 1995.

The following databases were searched: Cochrane Library, EMBASE and PubMed. The search strategy focused on four constructs for diet and physical activity: behaviour, intervention, objectives, and outcome (Tables 1 and 2).

The final yield of this process, after duplicates were removed, was 937 diet studies and 776 physical activity studies. Annexes 1 and 2 provide details of the search strategies for diet and physical activity respectively.

Table 1. Search strategy schema for diet interventions

Behaviour	Intervention	Objective	Outcome measure
Diet*	Campaign	Health	Best practice
Diet* habit	Initiative	Health behavio(r)	(Cost-)effective
Diet* intake	Intervention	Health education	Decision-analysis
Diet* knowledge	Program(me)	Health knowledge	(Economic) evaluation
Diet* practice(s)	Project	Health practice	Environment
Nutrition intake	Strategy	Health promotion	Guideline
Food habit*			Outcome measure

Table 2. Search strategy schema for physical activity interventions

Behaviour	Intervention	Objective	Outcome measure
Exercise	Campaign	Disease prevention	Best practice
Physical activity	Initiative	Health	(Cost-)effectiveness
Physical fitness	Intervention	Health Behaviour	Decision-analysis
Sport(s)	Program(me)	Health education	(Economic) evaluation
	Project	Health knowledge	Environment
	Strategy	Health practice	Guideline
		Health praomotion	Outcome measure

Inclusion criteria

The review included studies on interventions:

- 1. aimed at reducing risk for NCDs.**
 - Interventions designed to increase levels of participation in physical activity or to improve dietary habits and/or prevent obesity;
 - Interventions targeting changes in awareness, knowledge and/or attitudes towards diet and/or physical activity, improving self-efficacy, skill or competency concerning these behaviours;
 - Interventions targeted at changes in policy and/or the physical and/or social environment;
 - Interventions that were part of larger chronic NCD prevention strategies.
- 2. aimed primarily at “apparently healthy” adults and children.**
 - High-risk groups for chronic NCDs, such as overweight persons or those with high cholesterol or a family history of chronic NCDs, were, however, included.
- 3. targeting groups or communities.**
 - Interventions aimed at individuals were not included unless the individuals were counselled as part of a population-based programme.
- 4. with a sample size greater than fifty.**
- 5. that were clearly described.**
 - Studies were not included if the intervention was not clearly described and therefore outcomes could not be attributed to either physical activity or dietary intervention strategies.
- 6. cited in primary references only.**
 - Review articles that met the criteria for inclusion were however “hand-searched” for any additional references that had not been found in the previous database searches.

Interventions had to meet all six of the above criteria. All study designs were accepted, ranging from quasi-experimental and community-controlled trials to randomized controlled trials, to process or programme evaluations.

Phase 2:
Selection of
studies for
inclusion

**Phase 2:
Selection of
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inclusion**

Inclusion results

A total of 395 peer-reviewed publications met the inclusion criteria, describing 261 different interventions. Of these 261 interventions, 64 focused on disadvantaged communities and 13 took place in a low- or middle-income country.

The 395 peer-reviewed publications were grouped into categories by setting or life-course stage (Table 3). This categorization is intended to assist the reader to find interventions of relevance and facilitate an initial analysis. This said, interventions are only truly effective when national policies are aligned, coherent and supportive (portfolio approach).

Table 3. Overview of interventions by category

Category	Total number of peer-reviewed studies	Total number of interventions	Interventions focusing on disadvantaged communities	Interventions in low- or middle-income countries
Policy and environment	30	23	3	2
Mass media	36	24	2	3
School settings	107	55	14	1
The workplace	49	38	5	1
The community	75	65	22	3
Primary health care	67	29	5	0
Older adults	18	17	3	3
Religious settings	13	10	10	0
Total	395	261	64	13

The 395 full-text articles underwent a quality assessment by a panel of internal reviewers, including four dietitians and three physical activity specialists. The purpose of the quality assessment was to judge how far any firm recommendations could be made based on the evidence. The quality of each study was assessed on the criteria used to select participants, the study design, data collection methods, intervention integrity, and withdrawals and drop-outs. Annex 3 provides details of the criteria used. This quality assessment instrument was adapted from Pomerleau et al. (5). Each peer-reviewed study received an overall rating of 1 to 3 for quality, with 1 being the highest quality. Ten peer-reviewed studies did not receive a quality score, concerning mainly process evaluations. A summary of the quality scores per category, as well as the average and median ratings within each intervention setting, are presented in Table 4.

Table 4. Quality scores by category

Category	Quality			Mean	Median
	Low (3)	Medium (2)	High (1)		
Policy and environment	7	13	8	2.0	2.0
Mass media	7	20	8	2.0	2.0
School settings	18	46	42	1.8	2.0
The workplace	9	25	13	1.9	2.0
The community	19	32	21	2.0	2.0
Primary health care	11	37	19	1.9	2.0
Older adults	3	10	5	1.9	2.0
Religious settings	0	7	5	1.6	2.0
Total	74	190	121		

The grey literature selected for inclusion comprised primarily web-based sources. Some personal communications and workshop proceedings were also included. This literature was useful in filling gaps in the evidence base, primarily in low- and middle-income countries. In addition, it was used to elaborate on specific intervention programmes evaluated in the peer-reviewed literature. The grey literature used is included in the reference list.

Phase 5: Evidence tables

The 395 peer-reviewed publications that met the inclusion criteria and the included grey literature were summarized and rated in evidence tables. Information was extracted on the components of the interventions, each of which was then rated on the following three primary outcome measures:

- i) **psychosocial changes**, including knowledge and attitudes related to diet and physical activity, self-efficacy, and stage of change;
- ii) **behavioural changes**, including behaviour towards diet, physical activity, and sedentary lifestyles;
- iii) **physical and clinical changes**, including blood pressure, body mass index, cholesterol and weight.

Each intervention was assigned three quality rankings, one for each of these outcome measures. The quality rankings are described below.

- *Effective*: These interventions were based on a formative assessment, with a generally robust experimental design or sufficient sample size, and with significant effects on specified outcome variables. They generally met all or most of the planned objectives and would probably be applicable in other settings (disadvantaged communities and low- and middle-income countries), and demonstrated feasibility and sustainability in their current category. These interventions were most often considered the “example intervention” for the category and specific outcome.
- *Moderately effective*: These interventions lacked one or more of the critical components listed above, but were sufficiently robust to warrant consideration for application in specific settings or groups and met some, if not all of the planned objectives.
- *Promising/Insufficient evidence*: These interventions demonstrated an important trend or a significant effect, but may not have been sufficiently robust in terms of experimental design or sample size, and may therefore benefit from further testing and research.
- *Minimally effective*: Interventions in this ranking had significant, but perhaps not clinically relevant effects in at least one of the outcome areas. The study designs were sufficiently robust and therefore unlikely to yield different or better results through additional testing or in other settings.
- *Insufficient evidence/not shown to be effective*: Here, the study design of the interventions was not robust, and the results sufficiently unremarkable or negative that no further testing or research application are warranted.
- *Not reported/not measured*. The outcomes of these interventions were either not measured, or measured but not reported.

Finally, observations were made on the process and policy implications of each intervention, as well as its intervention fidelity, sustainability, feasibility and cost-effectiveness, where data were available or evaluated. Attention was particularly drawn to programmes that could be effective in a broader context, or specifically in under-resourced settings.

Considering the above-mentioned limitations and the fact that additional evidence has been published since June 2006, the content of this document may need to be revised within the next five years.

The restrictions in the search strategy noted earlier mean that potentially valuable information may be missing from the results. Examples include interventions published before 1995, those published in languages other than English, and interventions that had not yet been analysed in the scientific literature at the time of this review (for example legislation to reduce transfatty acids).

While grey literature was used to supplement the peer-reviewed research, there is still a lack of information on effective interventions, especially from low- and middle-income countries.

Quality scores for the studies included were generally modest. Therefore, even where evidence was available, the quality of the study was not always high enough to be able to make firm recommendations.

Finally, an assumed bias towards only publishing intervention strategies that are effective may explain the relative paucity of entries in the “not shown to be effective” category.

Considering the above-mentioned limitations and the fact that additional evidence has been published since June 2006, the content of this document may need to be revised within the next five years.

The review of evidence on diet and physical activity interventions that aim to reduce the risk of chronic NCDs is published in three parts:

1. Interventions on diet and physical activity: what works (What Works), a summary of the background and the tried and tested interventions for policy-makers and other stakeholders to integrate into aligned, coherent and supportive national policies.
2. The current online background document, Methodology, providing details of the search strategies and rationale for the review.
3. Evidence Tables, an online publication providing the full results of the review behind What Works.

All the publications can be found on the WHO website at www.who.int/dietphysicalactivity/whatworks.

Phase 5: Evidence tables

Limitations of the review design

Conclusion

References

1. Resolution WHA57.17. Global Strategy on Diet, Physical Activity and Health. In: *Fifty-seventh World Health Assembly, Geneva, 17- 22 May 2004. Resolutions and decisions, annexes*. Geneva, World Health Organization, 2004.
2. *Finding studies for systematic reviews: a checklist for researchers*. York, Centre for Reviews and Dissemination, 2005 (<http://www.york.ac.uk/inst/crd/revs.htm>, accessed 25 May 2007).
3. Rychetnik L, Frommer M. *A schema for Evaluating Evidence on Public Health Interventions; Version 4*. Melbourne, National Public Health Partnership, 2002.
4. Flynn MAT et al. Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice' recommendations. *Obesity Reviews*, 2006, 7(Suppl. 1):S7- S66.
5. Pomerleau J et al. Interventions designed to increase adult fruit and vegetable intake can be effective: a systematic review of the literature. *The Journal of Nutrition*, 2005, 135:2486 - 2495.

Annex 1. Search strategies for diet

Search conducted 25 May 2006

- diet* OR diet* intake OR diet* habit OR diet* knowledge OR diet* practice OR food habit* OR nutrition intake in All Fields from 1995 to 2006 in all products - 14 118 hits (#4).
- intervention OR program OR programme OR project OR strategy OR initiative OR campaign in All Fields from 1995 to 2006 in all products - 63 968 hits (#5).
- (#4 AND #5 AND health*) from 1995 to 2006 - 3 153 hits (#6).
- (#6) in keywords, from 1995 to 2006 - 179 hits.

COCHRANE
LIBRARY

Search conducted 15 June 2006

- intervention OR program OR programme OR project OR strategy OR initiative OR campaign - 718 096 hits (#7).
- ('health behaviour'/de OR 'health behaviour') OR ('health behavior'/de OR 'health behavior') OR ('health knowledge'/de OR 'health knowledge') OR ('health practice'/de OR 'health practice') OR ('health education'/de OR 'health education') OR ('health promotion'/de OR 'health promotion') - 226 379 hits (#8).
- 'diet intake' OR ('dietary intake'/de OR 'dietary intake') OR 'diet habit' OR 'dietary habit' OR 'diet knowledge' OR 'dietary knowledge' OR 'diet practice' OR 'dietary practice' OR 'diet practices' OR 'dietary practices' OR ('food habit'/de OR 'food habit') OR ('food habits'/de OR 'food habits') - 66 263 hits (#9).
- 'diet'/exp OR 'diet' - 270 110 hits (#10).
- #7 AND #8 AND #9 AND #10 - 593 hits (#11).
- #7 AND #8 AND #9 AND #10 AND [english]/lim AND [humans]/lim AND [1995-2006]/py - 429 hits.

EMBASE

Search conducted 2 June 2006

- diet* OR diet* intake OR diet* habit OR diet* knowledge OR diet* practice OR food habit* OR nutrition intake; limits: English, publication date from 1995 to 2006, humans - 22 730 hits (#1).
- intervention OR program OR programme OR project OR strategy OR initiative OR campaign; limits: English, publication date from 1995 to 2006, humans - 270 351 hits (#2).
- health* behaviour OR health* behavior OR health* knowledge OR health* practice OR health* education OR health* promotion; limits: English, publication date from 1995 to 2006, humans - 20 913 hits (#3).
- #1 AND #2 AND #3; limits: English, publication date from 1995 to 2006, humans - 445 hits.

PUBMED

Annex 2. Search strategies for physical activity

COCHRANE
LIBRARY

Search conducted 21 May 2006

Restricted to: 1995 to 2006.

- physical activity OR exercise OR physical fitness OR sport* - 1 792 hits (#12).
- intervention OR program* OR project OR campaign OR initiative OR strategy - 58 520 hits (#13).
- health OR health behaviour OR health promotion OR health practice OR health knowledge - 58 520 hits (#14).
- outcome measure OR best practice OR effectiveness OR environment OR evaluation - 79 416 hits (#15).
- #12 AND #13 AND #14 AND #15 - 4 299 hits.
- physical activity AND program* AND health* AND effectiveness - 690 hits.
- physical activity OR exercise AND intervention* AND health* AND effectiveness* - 6 188 hits.
- physical activity AND intervention AND health AND effectiveness - 1 033 hits.

Search conducted 21 May 2006

- physical activity AND program* AND health* AND effectiveness, 1995 to 2006 - 690 hits.
- physical activity OR exercise AND intervention* OR initiative AND effectiveness - 9 721 hits (#16).
- #16 AND health* AND 1995 to 2006 - 5 696 hits (#17).
- #17 in keywords - 173 hits.
- physical activity OR exercise - 4 320 hits (#18).
- #18 AND health AND intervention OR initiative AND effectiveness, 1995 to 2006, in keywords - 60 hits.
- intervention or initiative - 49 942 hits (#19).
- #18 AND #19 in keywords AND health, 1995 to 2006 - 60 hits.
- intervention OR initiative OR program - 66 612 hits (#20).
- #18 AND #20 AND health*, keywords, 1995 to 2006 - 181 hits.

PUBMED

Search conducted 12 April 2006

Restricted to: English and humans.

- physical activity AND intervention AND health AND best practice - 9 hits.
- physical activity AND intervention - 2 279 hits.
- physical activity AND program* - 2 634 hits.
- physical activity AND intervention AND health - 1 266 hits.
- physical activity AND program AND best practice - 7 hits.
- physical activity AND program AND effectiveness - 198 hits.
- physical activity AND program AND environment - 141 hits.

Search conducted 19 May 2006

Restricted to: English, humans, 1995 to 2006.

- physical activity OR exercise OR physical fitness OR sports AND intervention OR program* OR project OR campaign OR initiative OR strategy AND health OR health behaviour OR health promotion OR health practice OR health knowledge OR health education OR disease prevention AND best practice OR effectiveness OR environment OR evaluation OR economic evaluation OR cost-effectiveness OR decision-analysis OR guideline – 133 288 hits.
- physical activity AND program* AND health* AND effectiveness – 200 hits.
- physical activity AND intervention* AND health* AND effectiveness – 261 hits.
- physical activity AND intervention* AND health* AND best practice – 19 hits.
- physical activity OR exercise AND intervention* AND effectiveness – 610 hits.

Search conducted 21 May 2006

Restricted to: English, humans, 1995 to 2006.

- physical activity OR exercise AND intervention* AND effectiveness – 610 hits.
- physical activity OR exercise AND intervention* OR program* AND health* AND effectiveness – 8 075 hits.
- physical activity OR exercise AND intervention* OR initiative AND health* AND effectiveness* - 871 hits.

Annex 3.

Quality assessment tool

Reference Manager Number: -----

1ST AUTHOR: -----

QUESTIONNAIRE

A. SELECTION OF PARTICIPANTS

1. Were the selection methods shown to be valid?
 1. Low risk of bias
 2. Moderate risk of bias
 3. High risk of bias
 4. Cannot tell

2. Are the individuals selected to participate in the study likely to be representative of the target population?
 1. Very likely
 2. Somewhat likely
 3. Not likely
 4. Cannot tell

3. What percentage of selected individuals agreed to participate?
 1. 80–100%
 2. 60–79%
 3. < 60%
 4. Not applicable
 5. Cannot tell

4. Was the required sample size estimated and appropriate?
 1. Yes, based on described sample size calculations
 2. Required sample size not calculated but sample size > 50 per group at follow-up
 3. Required sample size not calculated and sample size < 50 per group at follow-up
 4. Cannot tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
	1	2	3

B. STUDY DESIGN

1. Indicate the study design:
 1. Randomized controlled trial
 2. Case-control
 3. Cohort
 4. Quasi-experimental
 5. Process/programme evaluation
 6. Cannot tell

2. Were there important differences between groups prior to the intervention?

1. Yes
2. No
3. Can't tell

3. Were relevant confounders controlled (either in the design or analysis)?

1. Yes
2. No
3. Cannot tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
	1	2	3

C. DATA COLLECTION METHODS FOR OUTCOMES

OUTCOME 1 (specify) -----

1. Were data collection tools shown to be valid?

1. Yes
2. No
3. Cannot tell

2. Were data collection tools shown to be reliable?

1. Yes
2. No
3. Cannot tell

OUTCOME 2 (specify) -----

3. Were data collection tools shown to be valid?

1. Yes
2. No
3. Cannot tell

4. Were data collection tools shown to be reliable?

1. Yes
2. No
3. Cannot tell

OUTCOME 3 (specify) -----

5. Were data collection tools shown to be valid?

1. Yes
2. No
3. Cannot tell

6. Were data collection tools shown to be reliable?

1. Yes
2. No
3. Cannot tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
	1	2	3

D. INTERVENTION INTEGRITY

1. Was the intervention clearly described?

1. Well described
2. Moderately well described
3. Poorly described
4. Cannot tell

2. Was the consistency of the intervention assessed?

1. Yes
2. No
3. Cannot tell

3. Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?

1. Yes
2. No
3. Cannot tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
	1	2	3

E. WITHDRAWALS AND DROP-OUTS

1. Were withdrawals and drop-outs reported in terms of numbers and reasons per group?

1. Yes
2. No
3. Cannot tell

2. Indicate the percentage of participants completing the study (if the percentage differs by group, record the lowest)

1. 80–100%
2. 60–79%
3. < 60%
4. Cannot tell

3. Are the statistical methods appropriate for the study design

1. Yes
2. No
3. Cannot tell

4. Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than to actual intervention received?

1. Yes
2. No
3. Cannot tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
	1	2	3

SUMMARY GLOBAL RATING

A. SELECTION OF PARTICIPANTS RATING

STRONG	MODERATE	WEAK
1	2	3

B. STUDY DESIGN RATING

STRONG	MODERATE	WEAK
1	2	3

C. DATA COLLECTION METHODS FOR OUTCOMES

STRONG	MODERATE	WEAK
1	2	3

D. INTERVENTION INTEGRITY

STRONG	MODERATE	WEAK
1	2	3

E. WITHDRAWALS AND DROPOUTS

STRONG	MODERATE	WEAK
1	2	3

GLOBAL RATING FOR THIS STUDY (circle one)

- 1 STRONG (5 STRONG ratings)
- 2 MODERATE (< 5 STRONG ratings and 1 WEAK rating)
- 3 WEAK (> 2 WEAK ratings)

Annex 4.

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