Interventions designed to limit gestational weight gain: a systematic review of theory and meta-analysis of intervention components

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CRD summary
The authors concluded that studies based on theory were as effective as studies that were supposedly non-theory-based at limiting gestational weight gain. Limitations of the review process and issues surrounding the evidence, including differences between studies and inappropriate meta-analysis, precluded firm conclusions. The authors' suggestion to interpret the findings with caution should be heeded.

Authors' objectives
To evaluate the effects of theory-based behaviour change interventions to limit gestational weight gain.

Searching
Seven databases (including MEDLINE and CINAHL) were searched between 2000 and November 2012 for peer-reviewed publications in English. Search terms were reported. Eligible articles and relevant reviews were searched for additional studies.

Study selection
Eligible studies were those that aimed at limiting gestational weight gain (total gestational weight gain, rate of gestational weight gain or adherence to a specific guideline) in pregnant adult women. Studies were excluded if they were aimed at preventing gestational diabetes or focused on smoking cessation and exercise/physical activity for any purpose other than to limit gestational weight gain. Studies were assessed only to the birth of the child.

Studies were conducted in USA, Canada, Europe, Brazil, Australia and Taiwan. Studies included women with a mean pre-pregnancy body mass index in the range 21.0 to 38.22 kg/m². Eight studies were informed by a behaviour change theory. Interventions involved general education, physical activity counselling, dietary counselling, weight gain counselling or a combination of approaches. Where reported, intervention sessions were run by various professionals. The number of sessions ranged from one to 60. Gestational weight gain was calculated as last weight measured prior to delivery minus pre-pregnancy weight. Pre-pregnancy weight was self-reported in approximately half of the studies.

The authors did not state how many reviewers screened studies for inclusion.

Assessment of study quality
Studies were assessed for risk of bias using a previously published scoring system; criteria included allocation concealment, intention-to-treat analysis and attrition/loss to follow-up. Studies were assigned a score between zero and 6 (lower scores indicated a higher risk of bias).

The authors did not state how many reviewers performed the quality assessment.

Data extraction
Means and standard deviations for gestational weight gain were extracted to calculate effect sizes. Authors were contacted for further information where necessary.

The authors stated that two reviewers independently reviewed interventions and discrepancies were resolved through consensus.

Methods of synthesis
Data were combined in meta-analyses where possible and otherwise they were reported narratively. It appeared that data were combined to calculate weighted mean differences (WMD) and 95% confidence intervals (CI).

Statistical heterogeneity was assessed using the $X^2$ test and $I^2$ statistic. Separate analyses were performed by type of intervention (dietary, physical activity and mixed). Moderator analyses were performed to assess the effects of each...
behaviour change technique (classified according to the COLO-RE taxonomy) on the findings.

**Results of the review**

Twenty-one studies (3,823 participants) were included in the review; 15 were RCTs (one with historical controls). One study scored 6 on risk of bias, three scored 5, three scored 4, seven scored 3 and seven studies scored 1 or 2.

Compared to controls, women who received the interventions gained statistically significantly less weight (WMD -1.54kg, 95% CI -1.86 to -1.21; 19 studies, 22 study arms; evidence of statistical heterogeneity I²=86%). Separate analyses showed that dietary interventions were significantly more effective at limiting gestational weight gain compared to physical activity or mixed interventions (results reported in the review).

Six of the eight theory-based studies (75%) reported favourable results on gestational weight gain in the intervention group. Ten of 13 studies (77%) that were not theory-based reported positive intervention effects.

The most effective interventions included the behaviour change techniques of providing information on the consequences of behaviour to the individual, providing rewards contingent on successful behaviour, prompt self-monitoring of behaviour and motivational interviewing. None of these behaviour change techniques were present in dietary or physical activity interventions. Other findings were reported in the review.

**Authors’ conclusions**

Studies based on theory were as effective as studies that were supposedly non-theory-based at limiting gestational weight gain. Key behaviour change strategies include provision of information, motivational interviewing, self-monitoring of behaviour and providing rewards contingent on successful behaviour. Combining key behaviour change strategies with dietary interventions may be most effective.

**CRD commentary**

The review question and supporting inclusion criteria were broadly defined. Several sources were searched for relevant articles but relevant information may have been missed due to publication and language restrictions. Study risk of bias was assessed but it was unclear whether this was performed in duplicate. It was unclear whether study selection was performed in duplicate so reviewer error and bias may have been introduced.

Lots of studies were included in the review but the risk of bias across studies was generally quite high. It was unclear whether suitable models were used to combine data in meta-analysis. It was not appropriate to pool studies of different designs. The authors acknowledged the differences between studies and that some comparisons included only a few studies, suggesting that the findings should be interpreted with caution. The authors highlighted uncertainties regarding the non-theory-based studies and the limitations of the taxonomy used to classify behaviours. It was not possible to identify the most effective intervention techniques and strategies from the evidence.

Limitations of the review process and issues surrounding the evidence mean that no firm conclusions could be made in relation to the effectiveness of theory-based studies. The authors’ suggestion to interpret the findings with caution should be heeded.

**Implications of the review for practice and research**

**Practice**: The authors did not state any implications for practice.

**Research**: The authors stated that future research should identify the exact combination of behaviour change techniques and underpinning theories that were most useful for limiting gestational weight gain. This should enable health professionals to tailor care for pregnant women and optimise health outcomes for mother and baby. The authors stated that future studies should consider using intention-to-treat analysis.

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