

Audiovisual Educational Intervention for Children and Adolescent with Cancer: A Systematic Review

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Abstract

Background : Audiovisual materials for children have been widely used for cancer education; however, the effects of the materials remain unclear. The purpose of this study was to clarify the effects of audiovisual educational interventions for children.

Methods : We searched PubMed, EMBASE, CENTRAL, PsycINFO, and CINAHL on 3 September 2018. Randomized controlled trials and quasi-randomized controlled trials that evaluated the audiovisual materials for children with cancer were included to identify the effects of the audiovisual interventions. The results of the analysis were evaluated using the Grade of Recommendation, Assessment, Development and Evaluation to assess the certainty of evidence.

Results: From the identified 5,367 studies, we included four reports based on two trials that included 388 children under 18 years old. One trial found that audiovisual educational intervention increased knowledge and self-efficacy (very low certainty of the evidence). The other trial reported that there were no clear differences in perceived stress and health locus of control (very low certainty of the evidence). The result of the meta-analysis indicated that there was no clear difference between the intervention group and the control group for the quality of life (very low certainty of the evidence).

Conclusion: Audiovisual interventions might increase knowledge and self-efficacy, but there were no meaningful overall conclusions. Further trials are needed to assess educational interventions used in pediatric cancer treatment. Healthcare professionals should consider whether the materials they are currently using to communicate cancer-related information are sufficient and understandable for children with cancer.

Systematic review registration: We registered the protocol to the PROSPERO (Registration: CRD42018110562)

Background

Every year globally approximately, 300,000 children under the age of 19 are diagnosed with cancer, and an estimated 80,000 die (1). Children often need palliative care services because they experience life-limiting conditions that curative treatment may improve but which could also make them worse (2, 3). One of the essential concepts in palliative care is decision-making regarding care. The American Academy of Pediatrics (AAP) statements on informed consent, permission, and assent have been standard in the medical settings. Children with cancer must be involved in their medical decision-making that is commensurate with their psychological and cognitive development. Many of these children require palliative care services and guidance with shared medical decision making (4). Regardless of whether children make the decisions during the decision-making process, they must (a) provide consent or assent, (b) understand their situation, and (c) adopt actions supportive of their goals (5). The AAP also reported that the provision of information about diseases, such as the nature of the illness or condition, treatments, and potential risks, is one of the critical components to making acceptable decisions (4). By

having sufficient information and understanding, children can adequately prepare for their treatments and future (6-9).

An important question to be addressed is what educational resources are best suited to providing information to children with cancer so that they can be adequately informed. One widely used source is educational audiovisual material, which works on both the imagery and verbal processes and promotes the processing of information (10). There are three types of audiovisual materials, 1) auditory materials such as recoding, radio, and tele-lecture, 2) visual materials such as illustrated books, chart, and drawing, 3) audiovisual materials which were combined auditory and visual materials such as television, videotape, and film. The audiovisual materials have been identified as the effects of education materials (11). Audiovisual materials have been identified as the effects on education to increase knowledge and satisfaction and decrease anxiety (12). Rutten, Arora, Bakos, Aziz, & Rowland, (2005) also summarized patients' needs for information. Almost 50% of patients needed audiovisual material, including printed material and media during diagnosis (13). Because of the lack of research on the effects of using audiovisual educational materials (e.g., books, brochures, and computer games) to increase children's knowledge of diseases, the effects remain unclear (14). Therefore, this systematic review aimed to: (a) identify the effects of audiovisual educational materials on children to enhance their knowledge and understanding of cancer and (b) identify the impact of audiovisual educational materials on psychological, social and physical outcomes.

Methods

Study design

This study was a systematic review and meta-analysis. We registered the review protocol in PROSPERO (Registration: CRD42018110562).

Inclusion criteria

Randomized control trials (RCTs) and quasi-randomized controlled trials (quasi-RCTs), were included. The participants were children under 18 years of age who were diagnosed with cancer and undergoing treatment. Henceforth all references to children include up to and including age 17. If we could not separate the data of children with cancer from those of adults or children who completed their treatment, we evaluated the studies, which included over 80% of children who were under 18 years old and undergoing treatment. Interventions were audiovisual educational interventions that provided all cancer contents, including diseases of cancer, symptoms, treatments, and psychosocial effects such as stress and self-efficacy. The authors must have reported: (a) the content related to cancer provided through the intervention, (b) the mode/type of the intervention such as internet-based, video, or booklet, and (c) the setting (individually, as a couple, or in a group) in which the intervention was implemented. Comparisons were usual care including non-audiovisual educational intervention or control group with no intervention.

Exclusion criteria

Excluded were children who completed their treatment of cancer, studies with no distinct information or education component, and interventions featuring distraction techniques (e.g., during painful procedures) were excluded.

Outcome(s)

Primary outcomes were (a) knowledge and understanding about cancer, (b) psychological, and social outcomes such as anxiety, depression, perceptions of coping, quality of life, decision-making and well-being, and (c) physical health outcomes such as health-related quality of life, symptoms, and pain. We sought no secondary outcomes.

Search methods

We searched the following electronic bibliographic databases: PubMed, EMBASE, CENTRAL, PsycINFO, and CINAHL. The search strategy included some terms relating to participants, intervention, and study design such as cancer, child, audiovisual, and controlled trial. We followed the (a) Cochrane's Methodological Expectations of Cochrane Intervention Reviews for conducting the search (15), (b) the Cochrane Handbook of Systematic Reviews of Interventions to systematically extract studies (16), (c) the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guideline for reporting the search (17), and (d) the guideline for Peer-Reviewing the Search Strategies (PRESS) (18). Included studies must have been published in peer-reviewed journals. We set no limitations on language, geographic location or setting to limit the identified impact from poor reporting of outcomes in medical research (19-23). A medical information specialist assisted in developing the search strategies (**Additional File 1**).

Screening and data extraction

Search results were de-duplicated in EndNote X8 and imported to Rayyan, which is a web application to screen the eligible studies (24). See the PRISMA flow diagram (**Fig. 1**) for the process of study selection. Three reviewers (N.Y., D.S. or M.S.) independently screened the titles and abstracts of studies for potential of meeting the inclusion criteria. Furthermore, three reviewers (N.Y., D.S. or M.S.) independently screened the full text of these potentially eligible studies. Disagreements were discussed and resolved with each other without assistance of another reviewer. For the included studies, two reviewers independently extracted the data into a data collection Excel form developed for this study (N.Y. & D. S.).

Risk of bias (quality) assessment

Two reviewers (N.Y. and D.S.) independently assessed the risk of bias in the included studies including selection bias (random sequence generation and allocation concealment), performance bias, detection bias, attrition bias, reporting bias, and other biases following the Cochrane risk of bias tool (25).

Strategy for data synthesis

We conducted a meta-analysis of the findings from the included studies to quantify treatment effects using Review Manager 5. For continuous data, we used the standardized mean difference (*SMD*) to combine trials because the outcome was measured using the different measurements. We summarized the evidence in Table 1 Summary of findings using GRADEpro for each outcome (26).

Results

We conducted electronic searching on 3 September 2018 and identified 5,367 potentially relevant studies and removed 1,380 duplicates. Of the resulting 3,987 studies, 3,948 studies were excluded by title and abstract review. After the remaining 39 full-text studies were read; we excluded 35 full-text studies because of differing inclusion criteria. Finally, we included four studies for this review (27-30), with two of these studies included in the quantitative analysis (28, 29) (**Fig. 1**). We resolved all disagreements by discussion with each screening author during the screening process.

The results of the risk of bias assessment are displayed in **Fig. 2** and **Fig. 3**. Both were randomized control trials. However, due to the nature of the intervention, it was not possible to blind patients, and all the outcomes were evaluated by self-assessment questionnaire. Hence we assessed both trials as a high risk for performance bias and detection bias. Fazelnia et al. (2017) did not provide enough description to evaluate bias, and we assessed as unclear for selection bias, attrition bias, and reporting bias (28). The summary of findings table (**Table 1**) shows the GRADE assessment. We included 439 participants who were undergoing treatment for cancer and were between eight and 29 years of age, of these 388 were children who met our inclusion criteria and 47 young adults (over 19 years old). Although there were four excluded participants after random assignment, we could not identify the age. The age group was different from each study. Kato et al. (2008) included between 18 years and 29 years of age and Fazelnia et al. (2017) included between eight years and 12 years of age. Settings were one hospital in Iran (28), and 34 cancer treatment centers in the United States, Canada, Australia (29). Types of interventions were different computer games, compared with standard care or an alternative non-cancer video game. We summarized the characteristics of included studies in **Table 2**. We conducted a meta-analysis about Quality of life (QOL). However, we could not conduct a meta-analysis for the outcomes of (a) knowledge, (b) perceived stress, (c) self-efficacy, and (d) health locus of control because only one trial reported on them. Thus, we synthesized the results narratively.

Primary outcomes

Knowledge, psychological, and physical outcomes were described. Psychological outcomes reported were: (a) perceived stress, (b) self-efficacy, and (c) health locus of control. QOL was included in both psychological and physical health outcomes. There were no descriptions of social outcomes.

Knowledge

Kato et al. (2008) reported on knowledge. They developed an original cancer knowledge scale for their study. The cancer knowledge scale is a questionnaire with 18 multiple-choice items; total scores ranged from 0% to 100%, and higher scores indicate adequate cancer knowledge. Cancer-related knowledge in the audiovisual intervention group had a greater increase than in the control group for cancer knowledge based on a mixed-effect linear model analyses (group × time interaction, $p = 0.035$) (very low certainty of the evidence) (29).

Quality of life

There were two RCT studies on QOL (28, 29). Fazelnia et al. (2017) measured QOL using the Pediatric Quality of Life Inventory (PedsQL) 3.0 Cancer Module child self-report, which was developed to measure health-related QOL, specifically for children aged 8-12 years old, who were diagnosed with cancer (31). Kato et al. (2008) measured QOL using the Pediatric Quality of Life self-report instrument (PQL) for children and adolescents under 18 years old (32). We conducted a meta-analysis using a random effect model and showed SMD. There was no significant difference between the audiovisual intervention group and the control group ($SMD 0.73$, 95% $[CI -0.51-1.97]$), and heterogeneity was high ($X^2 = 17.11$, $df = 1$, $I^2 = 94\%$). However, two studies showed a positive direction for the effect (**Fig. 4**) (very low certainty of the evidence). In terms of study results, Fazelnia et al. (2017) reported that the intervention increased participants' QOL (post hoc Least Significant Difference (LSD) test [after intervention: $p = 0.030$, after one month: $p < 0.001$]) (28). Kato et al. (2008) reported that the intervention did not increase participants QOL (between group × time interaction; PQL, $p = 0.112$) (29).

Perceived stress

Kato et al. (2008) reported on perceived stress. They measured perceived stress using the Perceived Stress Scale 10 with ten items and a total range from 10 to 50 (33). There was no significant difference between group × time interaction by mixed-effect linear model analyses ($p = 0.931$) (very low certainty of evidence) (29).

Self-efficacy

Kato et al. (2008) measured self-efficacy, using the self-efficacy scale developed for the trial. The intervention increased self-efficacy by mixed-effect linear model analyses (group × time interaction, $p = 0.011$) (very low certainty of the evidence) (29).

Health locus of control

Kato et al. (2008) measured health locus of control, using the Multidimensional Health Locus of Control Scale Form with 18 items including five subscales and total range from three to 36 (34). We did not show those results on the summary of findings table (**Table 1**), because they were reported as the results of five subscales and there were no descriptions of the total scores. There was no significant difference between group × time interaction by mixed-effect linear model analyses ($p = 0.608$) (29). We assessed the certainty of evidence as a very low certainty of evidence because of the high risk of bias, small sample size, and inclusion of young adults.

Discussion

The results of this systematic review showed that there were few evidenced-based cancer-related educational materials targeted for children. Although it has been known that the ethical and psychosocial aspects of 'truth-telling' about cancer are essential for children (35, 36), we found a lack of references for how to specifically involve children in these multifaceted medical communications as have other researchers (37). Only two studies meeting our inclusion criteria were identified (28, 29). Audiovisual interventions providing cancer-related information might increase the knowledge and self-efficacy of children with cancer compared with non-cancer related audiovisual interventions.

We performed a meta-analysis for QOL. Both measures were scored on a Likert scale of 0-4, which may explain why we found high heterogeneity and continuous outcomes have higher heterogeneity when compared with dichotomous outcomes (38). There was no clear difference between the intervention group and the control group of QOL; while two trials showed a positive direction of effect. Also, there was no clear difference between the intervention group and the control group of perceived stress and health locus of control. Although we continue to think that audiovisual interventions afford some evidence of beneficial outcomes for patients, our results should be interpreted with caution due to clear concerns for the risk of bias, indirectness, and imprecision (**Table 1**). Moreover, the results might change in the future by adding the trials, which are conducted using a suitable research methodology to decrease a potential bias. Further trials are needed to assess the effect of audiovisual educational interventions.

Included studies used validated scales for measuring QOL, perceived stress, and health locus of control. However, they used an original scales for measuring knowledge and self-efficacy for their study because there were no validated scales available for children with cancer. To be able to conduct a meta-analysis, future research needs to use the commonly accepted and validated scales when possible. It is necessary to develop and assess the psychometric properties of new scales that would capture the complexities of palliative care for children.

The main strength of our review was that we undertook a comprehensive search and review strategy. Although in a previous review, researchers reported that there were three types of educational aids: printed, visual and audiovisual (39), we found only computer games, as an audiovisual intervention, for sharing information about cancer with children. Stein et al. (2019) suggested that communication about cancer with children is one of the difficult challenges for healthcare professionals and families, while

there are no specific guidelines for talking with children about illnesses (40). We identified the lack of research of other educational methods as a gap in knowledge and an area where additional research should be conducted.

There were several limitations to our study. First, the paucity of full range of trials taking place in this field significantly reduced combining evidence. There were also a small number of countries as research sites; thus, the outcomes mainly reflect Western countries. This systematic review could not identify meaningful overall conclusions of the effects of the audiovisual interventions to share information with children with cancer. Some research in other fields concluded that the value of interventions to share information remains mostly unclear (14, 41, 42). In this area, it is challenging to clarify the conclusions of interventions because the interventions are impossible to blind to participants, and collecting the data is difficult from a sufficient sample size. Besides, when targeting children, there are few validated scales according to the child's cognitive and psychological developmental stages, and the validation of outcome evaluation is a problem. It must be noted that research with children is inherently difficult because of ethical issues and children's limited understanding. Traditionally, children were excluded from research, which denied their rights to participate, and thus, their voices were not reflected in the research (43, 44). Researchers would do well to include children as participants, not as objects, and make use of their insights and preferences for clinical practice. More research is needed to investigate the effects of these and other related interventions.

Conclusion

Although audiovisual educational interventions might increase children's knowledge and self-efficacy, only two individual randomized control trials met our inclusion criteria and could not provide meaningful overall conclusions. We need further trials to assess children's educational materials on cancer and should include broader samples and settings such as younger children and children in low- and middle-income countries. The use of validated scales, when possible, would facilitate future meta-analyses.

Practice implications

Healthcare professionals should consider whether the materials they are currently using to communicate cancer-related information are sufficient and understandable for children with cancer. Practical materials still need to be developed and assessed to inform children of various ages about cancer.

Abbreviations

AAP: American Academy of Pediatrics

PQL: Pediatric Quality of Life self-report instrument

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-analyses

QOL: Quality of life

RCTs: Randomized control trials

Declarations

Ethical Approval and Consent to participate

Not applicable.

Consent for publication

Not applicable.

Availability of supporting data

Not applicable.

Competing interests

Not applicable.

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Authors' contributions

NY contributed to creating the research idea and study design. NY, DS, and MS contributed to the screening. NY and DS contributed to extract the data and assess the risk of bias. The discussion with EO resolved conflicts. EO supervised through the review. NY wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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Tables

Table 1 Summary of findings table

Audiovisual intervention to share information about cancer compared to usual care or no care for children with cancer

Patient or population: Children with cancer

Setting: United State, Canada, Australia, and Iran

Intervention: Audiovisual intervention to share information about cancer

Comparison: Usual care or no care

| Outcomes | Anticipated absolute effects* (95% CI) | | № of participants (studies) | Certainty of the evidence (GRADE) |
|----------------------------------|--|---|-----------------------------|-----------------------------------|
| | Risk with Usual care or no care | Risk with Audiovisual intervention to share information about cancer | | |
| Knowledge after one month | The mean knowledge was 0.63 | The mean difference in the intervention group was 0.02 higher (0.02 lower to 0.06 higher) | 320 (1 RCT) | ⊕●●● VERY LOW a, b, c |
| Quality of life after one month | - | The standardized mean difference quality of life in the intervention group was 0.73 higher (-0.51 lower to 1.97 higher) | 326 (2RCT) | ⊕●●● VERY LOW a, b, c, d |
| Perceived stress after one month | The mean perceived stress was 35.2 | The mean difference in the intervention group was 1.3 higher (0.18 lower to 2.78 higher) | 316 (1 RCT) | ⊕●●● VERY LOW a, b, c |
| Self-efficacy after one month | The mean self-efficacy was 157.9 | The mean difference in the intervention group was 0.1 higher (5.01 lower to 5.21 higher) | 320 (1 RCT) | ⊕●●● VERY LOW a, b, c |

*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group.

GRADE Working Group Grades of Evidence

High certainty: We are very confident that the true effect lies close to that of the estimate of the effect

Moderate certainty: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

Low certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect

Very low certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

Explanations

a. Participants were not blinded to received audiovisual intervention and measurement were self-reports, thus, all trials were assessed at high risk of bias about performance bias and detection bias.

b. Young adults were included.

c. Sample size was small.

d. Heterogeneity was high (i^2 was 94%).

Table 2 Characteristics of included studies

Figures

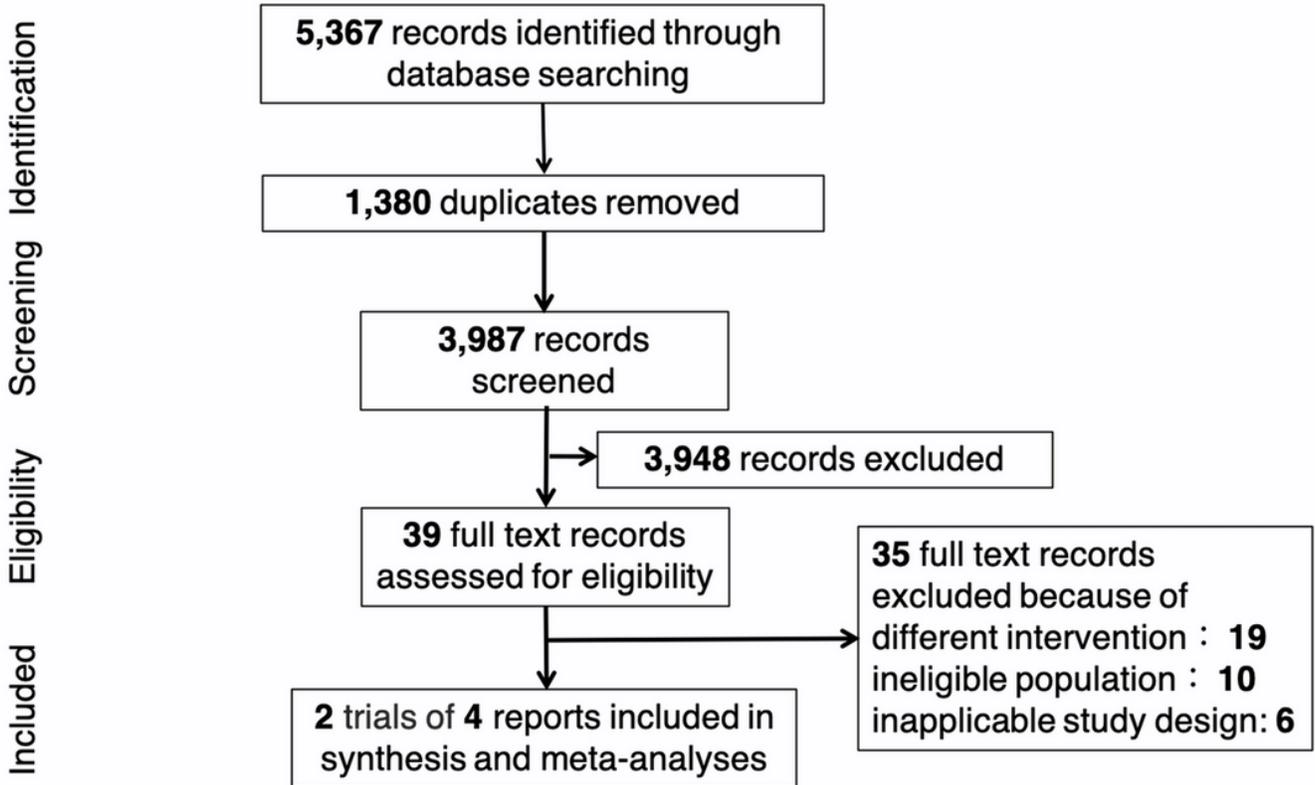


Figure 1

PRISMA flow diagram

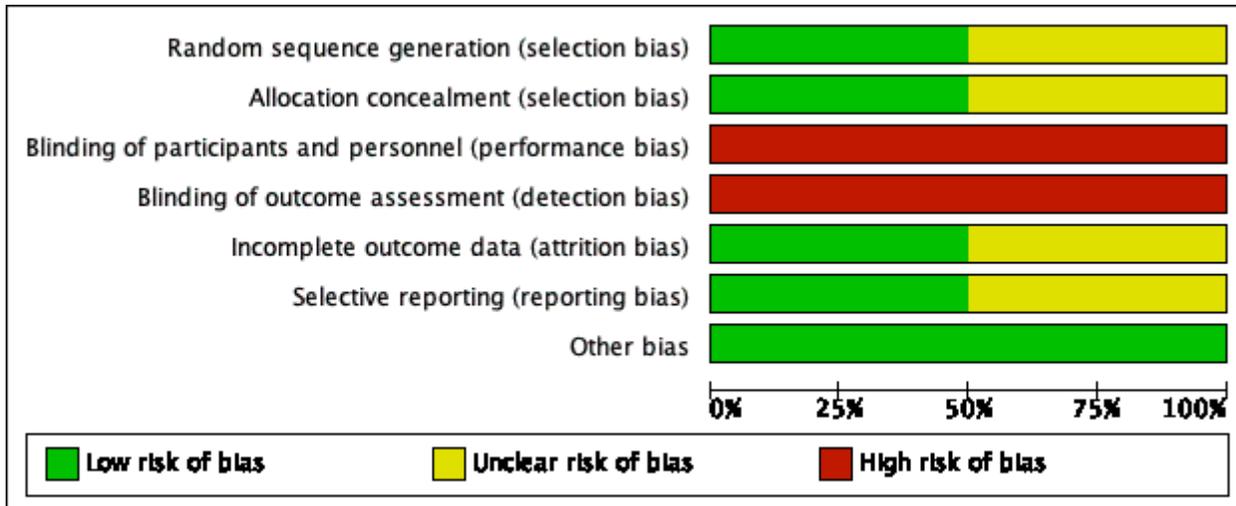


Figure 2

Risk of bias graph for systematic reviews

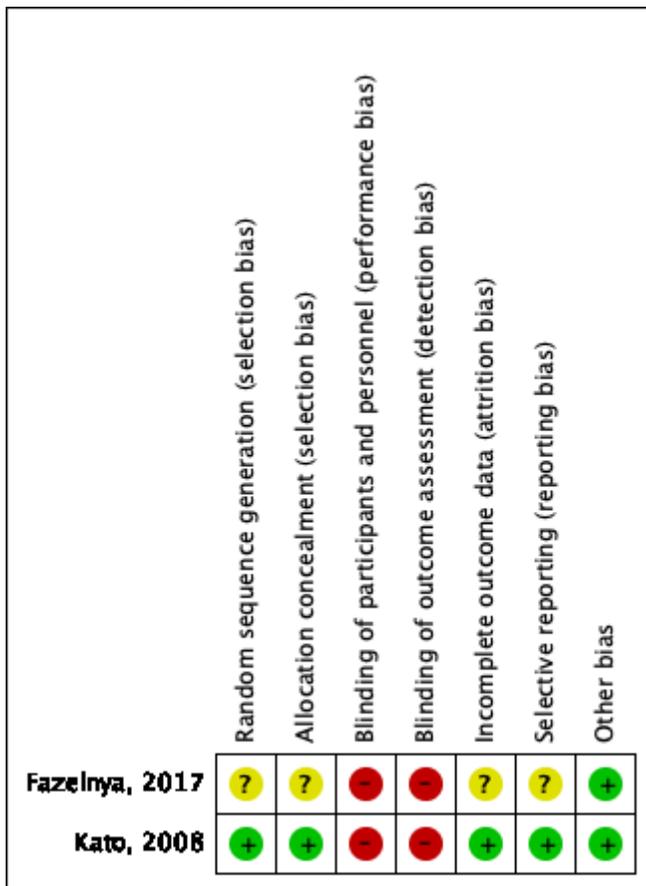
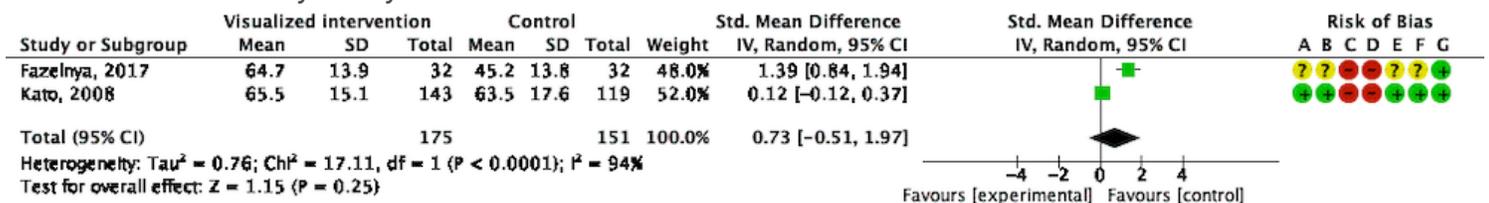


Figure 3

Risk of bias summary for systematic reviews



Risk of bias legend

- (A) Random sequence generation (selection bias)
- (B) Allocation concealment (selection bias)
- (C) Blinding of participants and personnel (performance bias)
- (D) Blinding of outcome assessment (detection bias)
- (E) Incomplete outcome data (attrition bias)
- (F) Selective reporting (reporting bias)
- (G) Other bias

Figure 4

Forest plot on quality of life

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [AdditionalFile1.docx](#)