

Abstract

Title: A systematic review of the effectiveness of mass media campaigns for the management of low back pain (LBP).

Purpose: To synthesize evidence on the effectiveness of mass media campaigns for the management of LBP on beliefs of the general public and health care providers, LBP-related disability, health utilization, and LBP clinical outcomes.

Materials and Methods: Five electronic databases were searched from inception to December 17, 2019. Any studies evaluating the effectiveness of mass media campaigns for LBP were eligible. Primary outcome was general public LBP beliefs, while secondary outcomes included health care provider beliefs as well as LBP-related disability, health utilization, and clinical outcomes.

Results: The search resulted in 4,164 unique records, of which 18 studies were ultimately included. These 18 studies predominantly used quasi-experimental methods to evaluate 7 LBP mass media campaigns conducted in 7 countries. All studies evaluating LBP beliefs in the general public detected positive effects. Health care provider beliefs also consistently improved. Results for behavioural outcomes (disability behaviour and health utilization) were mixed and appeared dependent on campaign characteristics and local context. A promising effect on physical activity was observed following the only campaign that evaluated this outcome, but only at 5-year follow-up.

Conclusions: Mass media campaigns for LBP appear effective for improving beliefs of the general public and health care providers. Changing public and practitioner LBP-related behaviour requires more concerted effort.

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Key Words: Disability; Low Back Pain; Public Health; Education; Mass Media; Health Promotion

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Introduction

Low back pain (LBP) is one of the most common and disabling health conditions worldwide, leading to substantial personal, social, and economic burden.[1, 2] Clinical practice guidelines have recommended a shift away from medical, surgical, and pharmacological treatment towards helping people stay active and avoid disability.[3, 4, 5, 6] Recommended first-line interventions for LBP now include education about the condition, providing reassurance (i.e., strategies aimed at changing patient behaviour, understanding, or thoughts to reduce fear, doubt and worry [7, 8]), advice to stay active, as well as exercise to reduce disability in those with persistent LBP.[9] However, surveys of the general public conducted in several parts of the world about LBP beliefs consistently indicate a mismatch between current evidence and prevailing beliefs about managing LBP.[10, 11, 12, 13] A sizeable segment of the population, especially those with LBP, still reports believing rest or protection of the back is needed, along with comprehensive medical investigation and treatment.[14, 15, 16] Pessimistic LBP beliefs are common across countries and populations, and are associated with pain and disability.[17] LBP beliefs are also associated with increased health care utilization.[18, 19]

Due to the large burden of LBP-related disability, a recent “Call for Action” was issued to address widespread misconceptions in the population and among health professionals about the causes, prognosis, and effectiveness of different treatments for LBP.[1, 9, 20] A key recommendation was to adopt the concept of positive health (i.e., “*the ability to adapt and self-manage in the face of social, physical, and emotional challenges*”) as a strategic approach to prevent long-term disability from LBP.[20, 21] Positive health

places greater emphasis on self-management and requires changed expectations among patients and the general public so they are less likely to expect complete cure for their pain. This adjustment requires initiatives to change widespread and inaccurate beliefs about LBP, and avoidance of often counterproductive behaviours such as prolonged rest, activity avoidance, or staying away from work.[20]

Many LBP population-level initiatives have taken the form of mass media campaigns aimed at changing public beliefs, overcoming misconceptions, and promoting improved self-management behaviour of people experiencing LBP.[22, 23, 24, 25] A review and workshop summary was published over a decade ago that synthesized evidence regarding the effectiveness of LBP mass media campaigns and provided recommendations for planning and evaluation of future campaigns.[26] Additional campaigns have been evaluated and a more comprehensive synthesis of LBP-related mass media campaigns and their effectiveness is needed.

This systematic review aims to describe, summarize, and synthesize the evidence from studies evaluating the effectiveness of mass media campaigns for the management of LBP.

Materials and Methods

Protocol and Registration

The protocol for this systematic review was registered with the International Prospective Register of Systematic Reviews (PROSPERO) on December 6, 2018 (CRD42018116797). The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines were followed.

Intervention Description

Mass media campaigns were defined as campaigns utilizing any channel of communication, such as television, radio, newspapers, billboards, posters, leaflets, booklets, and websites or social media intended to reach large numbers of people and that are not necessarily dependent on person-to-person contact.[27] Campaigns of interest provided information about management of LBP.[1] Downloadable computer or smartphone applications providing information about LBP were not considered mass media.

Eligibility Criteria

This systematic review included studies evaluating mass media campaigns for LBP. Relevant study groups included the general population, or subsets of the general population with or without LBP. Studies that were limited to interventions aimed at patients with cancer, rheumatic conditions, infections, fractures, surgeries, and psychiatric illnesses were excluded.

Studies were considered eligible for inclusion if they were randomized controlled trials (RCTs), controlled trials (CTs), interrupted time series studies, before and after studies, or any other quasi-experimental or observational design investigating the effectiveness of mass media campaigns for LBP. Commentaries, systematic reviews, clinical practice guidelines, theses, reviews, editorials, and studies published in languages other than English were excluded. Studies of all lengths of follow-up were considered.

Information Sources and Search

An extensive literature search was conducted by a health sciences librarian (LD) and included Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily 1946 to December 16, 2019, OVID EMBASE (1974-Dec 17, 2019), Wiley Cochrane Central Register of Controlled Trials (CENTRAL) (1991-Dec 17, 2019), SCOPUS (Dec 17, 2019) and EBSCOHost CINAHL Plus with Full Text (1937-Dec 17, 2019). The search combined the 3 concepts of 1) LBP; 2) campaigns or educational interventions; and 3) media, technologies, or formats used to deliver the information. An extensive list of key words and subject headings were used for each concept in a broad search, but only articles evaluating LBP mass media campaigns were deemed relevant for this study. No date or language limits were used in the search but only studies targeting the adult population were included. The full electronic search strategy is provided in Appendix 1. Reference lists of included studies were manually searched, publications of key authors in the area were searched, and a forward citation search was performed to identify any additional potentially relevant studies.

Study Selection

Two reviewers selected from the study team screened the titles and, if available, the abstracts of publications retrieved from the electronic searches. If either reviewer believed that a published article potentially met the inclusion criteria, or if there was inadequate information to determine eligibility, a full-text copy of the article was obtained. Articles selected for full-text review were assessed for eligibility by two reviewers. If discrepancies occurred between reviewers at any stage of the screening process, the disagreements were resolved by consensus and consulting a third reviewer (SAO or DPG).

Data Collection Process and Data Items

Relevant data from the included studies were extracted and entered directly into a standardized data extraction form in Microsoft Word by one investigator (AS). A second reviewer (DPG) reviewed all data extraction forms, and disagreements were resolved by consensus. Data were extracted on study identification (i.e., author, title, year), study objectives, campaign characteristics (years of implementation, setting, components of the campaign, targeted population, and other key campaign elements useful for understanding campaign effects[26]), study design (i.e., RCT, CT, interrupted time series studies, before and after studies, other), participants, primary and secondary outcomes and instruments used to measure outcomes, data measured and data reported, key findings, and effect estimates when available (summary measures such as effect sizes, means and SD) of the outcomes of interest.

Outcomes of interest were extracted and classified based on the Hornik and Yanovitzky's Model of Communication Campaign's Influence.[28] This model indicates that public health communication campaigns act either directly or indirectly to modify public beliefs related to the health behaviour. Improved beliefs potentially leading to behaviour changes and subsequently improved health outcomes. Public beliefs about LBP were thus considered our primary outcome due to the direct effect of campaign influence. LBP-related behaviour changes and clinical outcomes were considered secondary outcomes due to the mediating effect of LBP beliefs and potential moderating effect of external constraints and incentives on behaviour. Outcome measures were classified as follows:

Primary Outcome

General Public LBP Beliefs: These were defined as concepts related to LBP that individuals find to be probable or likely to be true.[29] Specifically, evaluations of LBP-related beliefs among the general public regarding the inevitable consequences of future life with LBP as well as beliefs about how to manage and cope with LBP were investigated. This included beliefs about the prognosis or likely outcome of an episode of LBP, importance of bed rest versus staying active, how physical activity and work affect LBP, and other beliefs.[30]

Secondary Outcomes

Health Care Provider Beliefs: These were defined as the beliefs of health care providers who treat patients with LBP. This category included all self-reported responses of health care providers to belief surveys representing their beliefs, opinions, attitudes, and knowledge of LBP and its management.

Disability behaviours: These were defined as actions and habits conducted by individuals that relate to health maintenance, restoration, and/or improvement of LBP.[31] This included physical activity or its avoidance during a LBP episode as well as all measures of work disability (i.e., work and sickness absence, workers' compensation claims or time loss benefits, or insurance claims or time loss benefits for LBP).

Health utilization behaviours: These were defined as actions and habits conducted by individuals that relate to the choice of seeking care for an episode of LBP, the choice of health care provider, number of health care visits for an episode, among other behaviours. This category included type of health provider selected to treat LBP, number of visits to that provider, use of surgery for LBP, and use of or referrals to diagnostic imaging (i.e., computed tomography (CT), radiography (X-Ray), and/or magnetic resonance imaging (MRI)). This category also included the behaviours and recommendations of health care providers treating patients with LBP, including treatments provided, referrals for diagnostic imaging, surgical consultations, etc.

LBP-related clinical outcomes: These were defined as changes in the actual health or clinical status of the population under investigation.[32] This included reported LBP prevalence within the general population, reported LBP intensity, or any other indicator of LBP-related health outcomes.

Quality Assessment of Individual Studies

Quality assessment of the individual studies was completed by two reviewers working independently (AS and DPG) and overseen by a third reviewer (SAO) to help resolve disagreements and avoid conflict of interest. All included studies were appraised using

the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies.[33] The EPHPP tool is a generic tool developed to evaluate different public health intervention study designs such as RCTs and CTs, interrupted time series studies, before-and-after designs, and case-control studies. The tool assesses six domains: 1) selection bias, 2) study design, 3) confounders, 4) blinding, 5) data collection method, and 6) withdrawals/dropouts. Each domain is rated as strong, moderate, or weak using set guidelines. The tool does not evaluate the quality of the mass media campaign, only the quality of the campaign evaluation reported in each manuscript. EPHPP scoring guidelines indicate that a study is judged to be of strong quality if there are no weak ratings, of moderate quality if there are no more than two weak ratings, and of weak quality if more than two weak ratings.

The validity of the EPHPP has not been formally evaluated, but it has been recommended by the Canadian National Collaborating Centre for Methods and Trials Cochrane Collaboration for use in systematic reviews of public health interventions.[34] The EPHPP has been found to have *fair* inter-rater agreement for individual domains and *excellent* agreement for the final grade.[35] Our inter-rater reliability for quality assessment of individual studies using the EPHPP tool was determined to be poor (Kappa <0.6) before consensus was achieved. Therefore, all articles were reviewed by both reviewers and final decisions were reached through consensus.

Synthesis of Results

A quantitative meta-analysis was planned; however, the included studies were very heterogeneous in terms of campaign characteristics, study designs, outcomes measured, and the way they were reported which did not allow for meaningful data pooling. A meta-analysis was therefore not deemed appropriate. Additionally, in most cases the same mass media campaign was evaluated in multiple published studies (i.e., evaluating different outcomes or different follow-up times). We therefore limited our synthesis to narrative descriptions and summaries of the campaigns and their associated evaluations using decision rules for strength of evidence as defined below. We developed a table describing the various mass media campaign's characteristics based on elements that have previously been deemed important for understanding the effect of mass media campaigns.[26] We also developed descriptive tables for each individual study, study quality appraisals, and strength of evidence for each outcome evaluated.

In order to make decisions regarding the strength of evidence and direction of effects of the LBP mass media campaigns, decision rules for outcomes were created as outlined below. The following decision rules were used:

1. **Positive effect:** The result for the outcome is deemed a relevant improvement (i.e., detectable improvement compared to baseline values or to a control group) and is consistent across multiple campaigns or studies;
2. **Promising effect:** The result for the outcome is deemed a relevant improvement (i.e., detectable improvement compared to baseline values or to a control group) in at least one campaign or study;

3. **Negative effect:** The result for the outcome is deemed a relevant deterioration and is consistent across multiple campaigns or studies;

4. **No effect:** The result for that outcome is deemed irrelevant (i.e., no detectable improvement compared to baseline values or to a control group) across campaigns or studies. The campaign did not significantly improve or deteriorate the outcome of interest;

5. **Mixed or Unclear Findings:** There is no clear pattern of positive, negative, or neutral results and/or the outcome has conflicting results across campaigns or studies.

Results

Study Selection

The electronic search identified 6,670 records. After removal of duplicates, the titles and abstracts of 4,164 individual studies were screened for eligibility. For 227 records the full-text article was obtained and reviewed for eligibility. Sixteen studies from the electronic search were included in this review.[22, 23, 24, 25, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47] Review of the reference lists of the included studies resulted in inclusion of 2 more studies.[48, 49] Thus, the total number of studies included was 18.[22, 23, 24, 25, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49] Figure 1 shows the PRISMA flow diagram for the selection of studies.

Campaign Characteristics

Table 1 provides a detailed description of the characteristics of the campaigns evaluated in the 18 studies. Overall, 7 LBP mass media campaigns have been conducted in 7 countries, and these have been evaluated by 18 published studies. The mass media campaigns took place in Australia [22, 36, 37, 38, 39] (*Back Pain – Don't Take it Lying Down* campaign); Japan [47, 48, 49] (COMMUNItY-wide Campaign To promote Exercise campaign - *COMMUNICATE*); Canada [25, 40] (*Back Pain – Don't Take it Lying Down* campaign); Scotland [23] (*Working Backs Scotland* campaign); Norway[24, 42, 43] (*Active Back* campaign); Ireland [41] (*St Vincent's Working Backs* campaign); and the United States of America (USA) [44, 45, 46] (*Choosing Wisely* campaign).

The campaigns varied substantially in terms of the nature of the mass media components used, communication strategies and messaging provided, and overall intensity. However, the campaigns consistently aimed to overcome prevailing myths about LBP, and promote self-management and activity behaviours during LBP episodes. The primary message provided was about the importance of staying active in 4 campaigns (Scotland, Canada, Ireland, Japan), avoiding diagnostic imaging in the absence of red flags in one campaign (USA), while two campaigns had a variety of messages including the importance of staying active, avoiding diagnostic imaging in the absence of red flags, and that surgery may not always be indicated (Australia and Norway). The Australian and Norwegian campaigns provided explicit messaging about the importance of staying at work despite LBP. Several campaigns also included supplemental activities aimed at educating health care providers, such as dissemination of clinical practice guidelines or distribution of booklets through the providers.

The primary campaign medium varied across the campaigns with prime-time television commercials used in the Australian campaign, radio advertisements in Scotland and Canada, a combination of radio and print in Norway and Japan, and an online website in the USA. The Irish campaign did not report many details of the media used, describing it only as a health promotion campaign with distribution of a booklet. Television advertisements were also used in Canada, Scotland, and Norway, although this was mainly limited to complimentary Public Service Announcements (in Australia paid television advertisements formed the bulk of the media budget). All campaigns used some form of print medium. The Japanese campaign described using a social marketing

process when planning and implementing campaign activities (see table 1 for more details on the planning process used).

Intensity varied across the campaigns, with the highest reported awareness of campaign messaging reported in Australia (86% awareness in Australia as compared to 39-62% elsewhere, see table 1). Among those campaigns where budgets were detailed, the budget for the Australian campaign was the largest at USD \$7.6 million over 3 years with the bulk of the budget spent on television advertisements, while all other published budgets were more modest. The Canadian campaign has had a budget of ~USD \$1.8 million over 12 years while the Norwegian campaign had an overall budget of USD \$1.1 million over 3 years.[26] Budgets for the Scottish and Japanese campaigns were not reported, yet described as low cost. The budget of the *Choosing Wisely* campaign in the USA was not exactly known or published but is considered low cost as it relied heavily on in-kind contributions from professional associations and mainly used low cost, inexpensive social media (i.e., websites and Twitter feed). The budget for the Irish campaign was not described.

Description of Individual Studies

Table 2 provides a detailed description of the 18 studies evaluating the 7 LBP mass media campaigns. The majority of campaigns were evaluated using quasi-experimental before-and-after or time series designs (Australia 5 studies, Norway 3 studies, Canada 2 studies, Scotland 1 study, Ireland 1 study). The Japanese campaign was evaluated using a cluster RCT with 3 separate follow-up times (1, 3, and 5 years). The Japanese studies did

not evaluate general public beliefs about LBP, but evaluated physical activity levels and LBP-related clinical outcomes (prevalence and intensity of chronic LBP). The studies from the USA used quasi-experimental methods to evaluate use of and referrals for diagnostic imaging for LBP.

Quality Assessment of Individual Studies

Table 3 shows the quality assessment of the included studies. Only three papers[47, 48, 49] (16.7%) were rated as strong quality based on the overall rating from the EPHPP tool. These evaluated the Japanese campaign using cluster RCT methodology. The majority of studies (n=11[22, 24, 25, 36, 37, 38, 39, 40, 43, 45, 46], 61.1%) were rated as moderate quality, followed by four papers[23, 41, 42, 44] (22.2%) that were rated as weak. The EPHPP tool item related to selection bias was the domain most commonly rated as weak (n=9, 50%). The domains related to study design and blinding were rated as moderate in the majority of the studies (n=14, 77.8% and n=10, 55.6% respectively). Most studies were rated as strong quality on the domain confounding (n=13 studies, 72.2%). Due to the nature of the population-based campaigns, the domain related to “withdrawals and drop-outs” was not applicable for most studies, except for the studies reporting on a cluster RCT.

Synthesis of Results

A detailed synthesis for each evaluated primary and secondary outcome is provided in table 4 and discussed in detail below.

Primary Outcome - General Public Beliefs

General public LBP beliefs were evaluated through two broader categories: general “LBP beliefs” and “fear avoidance beliefs” about physical activity and work. To evaluate general “LBP beliefs”, researchers used either the Back Beliefs Questionnaire (BBQ) or level of agreement with individual belief statements that were relevant to each campaign (29 different statements). Fear avoidance beliefs were evaluated among those with a self-reported history of low back pain in the preceding year using the Fear-Avoidance Beliefs Questionnaire (FABQ) physical activity and work subscales.

Back Beliefs Questionnaire: LBP beliefs were measured by the BBQ in six studies,[22, 25, 36, 37, 38, 41] evaluating the Australian, Canadian, and Irish campaigns. Five studies [22, 36, 37, 38, 41] reported positive effects of the campaigns, with no accompanying effect in a control population. The positive effect observed in Australia was also evaluated in a longer-term follow-up 3 years after the cessation of the campaign, with beliefs remaining significantly more positive overall and on individual belief statements.[37, 38] The Canadian campaign[25] reported neutral effects (mean change of 0), however, its messaging was limited to stay active while the BBQ addresses LBP beliefs more broadly.

Individual Belief Statements: Four individual LBP belief statements were used across multiple studies. Three studies[23, 25, 40] evaluating the Canadian and Scottish campaigns examined respondent agreement with the statement: “*If you have back pain you should try to stay active*”. Consistent positive effects of the Canadian and Scottish campaigns were observed on this belief statement (16.5% and 23.0% improvement

respectively). Similar results were reported by two [23, 25] studies evaluating agreement with the statement: “*If you have back pain, you should rest until it gets better*” (Canada 4.5% improvement, and Scotland 24.0% improvement). Each statement was directly and explicitly related to campaign messaging. The Canadian campaign has continued and a long-term follow-up indicates that the improved beliefs have been sustained for 10 years, especially among respondents reporting exposure to campaign messaging.[40]

Agreement with individual statements related to going to work and use of “simple painkillers” did not significantly change in either campaign (but were also not key messages of the campaigns).

Other beliefs statements were investigated within individual studies of general public beliefs. Evaluation of the Norwegian campaign used 7 individual LBP belief statements based on the main messages of the campaign and addressing common myths about LBP.[24] Evaluation detected a statistically significant improvement in general public LBP beliefs over time compared to a control population (mean sum-score change of 1.5 out of 35 versus 0.3 in the control group, $P < 0.001$).

A separate study of the Norwegian campaign reported on 2 additional belief statements about the usefulness of diagnostic imaging for LBP.[43] Increased skepticism about X-rays was observed in the intervention group but not the control county (mean difference between groups of 5.5%, $P < 0.001$).[24] The Irish campaign was evaluated through nine belief statements about the choice of management for acute LBP.[41] More respondents agreed they should stay active (14% improvement, $P = 0.001$), more disagreed they should

seek treatment (13% improvement, $P=0.006$) or avoid strenuous activity (14% improvement, $P=0.004$). The other six belief statements related to bed rest, medications, taking time off work, modify work activities, exercise, or using heat/cold were not significantly improved.

Fear-Avoidance Belief Questionnaire: Fear avoidance beliefs among those who reported low back pain in the preceding year were evaluated in two studies using the physical activity subscale and a work subscale of the FABQ modified to remove questions that might potentially unblind participants to the purpose of the survey.[36, 38] In these studies, positive effects of the Australian campaign were found on the FABQ physical activity subscale (mean change of 2.4 out of 24, $P<0.001$), with no corresponding improvement in the control population. No significant change was found on the FABQ work subscale.

Overall, consistent statistically significant positive effects in general public LBP beliefs were observed in all studies evaluating general public beliefs. The size of the effect varied from modest to large, depending on the setting and belief measured. The positive effects appeared related to explicit campaign messaging and may persist long term (i.e., up to 10 years in the case of the ongoing Canadian campaign).

Secondary Outcomes

Health Care Provider Beliefs

Health care provider beliefs about LBP were investigated by two studies of the Australian campaign.[22, 39] These studies measured the effects of the campaign on health care providers' agreement with 8 individual statements about management of LBP and their intended behaviour regarding what they would do when seeing patients with LBP.

General practitioner beliefs about LBP improved significantly on the majority of belief statements in the intervention group, with no corresponding improvement in the control population. At a 4.5-year follow-up, the odds ratio for general practitioners in the intervention group was 2.0 (95% confidence interval [CI], 1.3–3.0) when compared to the control population for believing that patients with LBP need not wait to be almost pain free to return to work; 1.78 (95% CI, 1.27–2.49) times as likely not to order imaging for acute LBP, and 0.47 (95% CI, 0.33–0.69) times as likely to order lumbosacral radiographs.[39] They were also 0.49 (95% CI, 0.34–0.73) times as likely to prescribe bed rest and 1.62 (95% CI, 1.19–2.22) times as likely to advise work modification.

A study evaluating the Norwegian campaign detected statistically significant improvements in health care provider beliefs about the usefulness of imaging examinations.[43] The proportion of health care providers disagreeing with the statement “*X-rays and newer imaging tests can always find the cause of pain*” was higher in the intervention as compared with the control counties (30% versus 12% disagreement respectively, $P < 0.001$). A second study evaluating the Norwegian campaign investigated seven statements related to main messages of the campaign and common LBP myths.[42] Small statistically non-significant differences were observed between health care providers exposed and unexposed to campaign messaging. However, providers in both

the control and experimental groups held beliefs that were more in line with evidence-based guidelines after the campaign.

The study evaluating the Scottish campaign[23] examined LBP-related advice that would be given by health care providers. The study explored this outcome through reported agreement with 3 statements about advice given to patients regarding the importance of staying active, resting or avoid activity, and staying off work. Statistically significant improvements were observed on the statements related to staying active (14.0% improvement) and resting/avoid activity (10.0% improvement), while the statement related to staying at work did not change significantly after the campaign.

Overall, consistent statistically significant positive effects in health care provider LBP beliefs were observed in all of the campaigns evaluating this outcome. The size of the effect varied from modest to large, depending on the setting and belief measured. The positive effect appears to be related to explicit campaign messaging and may persist long term (i.e., up to 4.5 years after cessation of the Australian campaign).

Disability Behaviours

Physical Activity: Three high quality studies of the Japanese campaign [47, 48, 49] investigated the effects on reported “*regular physical activity*” as measured by reports of engaging in 150 minutes/week or more of walking, daily flexibility activities, or muscle strengthening activities two or more days per week. No statistically significant improvement in physical activity was observed in the first two follow-up periods (1- and

3-year).[48, 49] However, at 5-year follow-up, a statistically significant positive effect was observed in the proportion of residents meeting the physical activity recommendation of walking 150 minutes/week.[47] The treatment communities saw a 4.6% improvement (95% CI 0.4%, 8.8%) compared with control communities. A linear dose–response relationship between campaign awareness and changes in physical activity was also reported. This was the only campaign in which reported physical activity was evaluated.

Work Disability (i.e., Workers' Compensation Claims/Social Security Claims/ Sickness Absence): Five studies[22, 23, 24, 25, 41] evaluating the Australian, Canadian, Norwegian, Scottish, and Irish campaigns investigated administrative data to determine whether the campaigns reduced work disability due to LBP. One study[22] from the Australian campaign (with explicit messaging regarding the importance of staying at work) reported a decline in number of claims for back problems of 15% over the duration of the campaign, as well as back claims as a proportion of all claims, and the duration of claims measured by rate of days compensated. Work-related disability (back claims as a proportion of all claims, proportion of first time back claims, duration of time loss wage replacement benefits for LBP, and recurrence of benefits)[25] and Social Security Incapacity Benefits[23] were investigated by individual studies evaluating the Canadian[25] and Scottish[23] campaigns respectively. Neither study detected relevant changes due to the campaigns.

Waddell et al.[23] investigated whether the Scottish campaign improved sickness absence using administrative data from the United Kingdom Royal Mail. Werner et al.[24] investigated whether the Norwegian campaign improved total sick leave and LBP-related sick leave days. Cunningham et al.,[41] investigated whether the Irish campaign improved LPB-related sick leave and associated number of sick leave days in the previous year. Consistently, no statistically significant or relevant effects were detected in sickness absence outcomes as a result of the Irish[41], Scottish[23], or Norwegian[24] campaigns.

Overall, mixed findings were observed of the effect of mass media campaigns on work disability behaviours. Sizeable improvements in work disability measures were detected in the Australian study, which was also the only campaign with explicit messaging regarding the importance of staying at work. Promising effects were observed on general physical activity in the Japanese campaign at 5-year follow-up.

Health Utilization Behaviours

Visits to Health Care Providers: One study evaluating the Australian campaign used administrative claims data from a workers' compensation database to evaluate health utilization behaviours as measured by medical payments for all continuing claims.[22] A statistically significant reduction in medical costs of 20% per claim was observed.

Another study evaluating the Canadian campaign, which did not contain messaging specific to use of health care, did not detect statistically significant effects on any publicly funded or workers' compensation health utilization outcome.[25]

Choice of Health Care Provider: The study of the Irish campaign[41] investigated the choice of health care provider for treating LBP through agreement with nine individual preference statements. Only one statement significantly changed after the campaign, with respondents more likely to state they intended to visit an occupational health provider when they experienced LBP (15% more likely, $P=0.001$). The other 8 health utilization preference statements related to general practitioner, physiotherapist, hospital consultant, non-consultant hospital doctor, emergency, osteopath, and chiropractor were not significantly changed after the campaign.

Imaging for LBP: Evaluations of the Norwegian, Canadian, and USA campaigns did not detect statistically significant changes in use of diagnostic imaging for LBP (i.e., CT, X-Ray, and/or MRI).[24, 25, 43, 44, 45, 46] In Norway, reductions in both the intervention and control groups were observed for CT and X-Ray, however, substantial increases were observed in capacity and use of MRI (152% in the intervention group and 596% in the control).[24] Two evaluations of the USA campaign report no change in the use of low value imaging.[44, 46] While another study detected a small, statistically significant reduction (4% relative reduction) in a dataset with very large sample size ($n=1,547,870$).[45] Evaluation of the Canadian campaign detected non-significant changes in proportion of claimants undergoing diagnostic imaging for LBP (radiograph, CT, and MRI).[25]

Overall, a mixed effect was observed of mass media campaigns on health utilization behaviours. The Australian campaign, which included explicit messaging regarding

health utilization, led to a sizeable reduction (20%) in medical costs from visits to health care providers. Additionally, changes in advice provided by health care providers in Scotland were only related to specific campaign messaging related to staying active (advice regarding staying at work was unchanged and not mentioned in the campaign). A promising effect was also observed from the Irish campaign, which increased respondents' choices regarding seeing occupational physicians who were highlighted in the campaign. However, no relevant effect on use of diagnostic imaging was detected from any of the campaigns.

LBP-Related Clinical Outcomes

LBP-related clinical outcomes were investigated by three studies evaluating the Japanese campaign at three follow-up times (1-, 3-, and 5-year follow up).[47, 48, 49] These studies examined the prevalence of chronic LBP measured by a questionnaire and LBP intensity measured through a 100 millimetre (mm) Visual Analogue Scale (VAS) from 0 mm (no pain) to 100 mm (most intense pain). The studies consistently found that neither the prevalence of reported chronic low LBP (~0.5% higher prevalence of chronic LBP in the intervention group after 5 years) or LBP intensity (mean change of ~4mm out of 100mm after 5 years with small, non-significant differences between the intervention and control groups) changed significantly after the campaign. Disability due to chronic LBP was not measured in the Japanese evaluation. Overall, no relevant effect was seen in LBP-related health outcomes following the Japanese campaign.

Discussion

Mass media campaigns have been recommended to help overcome widely held misconceptions and erroneous beliefs about LBP among the general public and reduce the burden of disability from the condition.[9, 50] However, such campaigns can be costly and no systematic review of previous research in this area has been conducted. The results of the current systematic review indicate that while evidence is moderate due to the challenges inherent to evaluating population-level interventions, mass media campaigns appear to positively shift general public beliefs about LBP. The size of the effects varied from modest to large, but were largest in the case of beliefs most closely related to campaign messaging. Accurate knowledge and beliefs that are supported by current evidence are a fundamental component of positive health, which promotes the ability to adapt and self-manage in the face of social, physical, and emotional challenges, such as LBP.[20] Consistently, mass media campaigns led to a higher proportion of the general public agreeing with the importance of self-management strategies, including staying active despite LBP.

Improvements in public LBP beliefs appear to persist for a long duration.[38, 39, 40] Evaluation of a Canadian campaign ongoing for over a decade has detected slow, sustained improvements over the course of 11 years.[40] Effects of the Australian campaign persisted for up to 4.5 years after its cessation, although with some decay likely due to absence of reminders.[37, 39] A recent Danish campaign to improve beliefs about musculoskeletal pain and work also showed significant improvements in these beliefs in the long term (three years after the campaign).[51] These observations are consistent with the slow, steady improvements from ongoing mass media campaigns related to cigarette

smoking and tobacco use, sedentary behaviour, and sexual health-related behaviours.[52] Each of these topics has required sustained and intensive public education efforts involving the mass media along with other supplemental activities such as regulatory changes before substantial improvements in beliefs and behaviours were seen. LBP appears similar, and ongoing, long-term, and intensive efforts to change LBP beliefs of the general public are recommended. Our results also indicated consistently improved LBP-related beliefs of health care providers, indicating the beliefs of providers treating patients with LBP such as physicians, physical therapists, and chiropractors may also be amenable to change. Interestingly, evaluators of the Australian campaign compared beliefs of physicians with and without a special interest in LBP and found that physicians with a special interest were significantly more likely to believe that complete bed rest and avoidance of work is appropriate for acute LBP and lumbar spine radiographs are useful.[53] This has important implications for any future mass media campaigns or knowledge translation initiatives to health care providers, particularly relating to the influence of those that may have vested interests.

It is less clear whether changes in LBP beliefs are accompanied by changes in long-term disability behaviour, health utilization, or actual LBP clinical outcomes. Promising results were observed in reported physical activity only 5-years after the Japanese campaign, which took an intensive social marketing approach to planning and implementation. However, increased physical activity did not improve at short term follow-ups and was not accompanied by improvements in the prevalence or intensity of chronic LBP. Disability due to chronic LBP (or physical activity levels despite LBP) was

not evaluated and may be more likely to improve due to this type of intervention.

Reduced work disability was seen following the Australian campaign where explicit messages were presented about the importance of staying at work. However, at the time of the campaign, Victoria also had supportive policy and legislation in place to support workers' and employers' efforts to stay at work despite LBP.[54] Several other key differences existed between the Australian and subsequent campaigns including intensity and penetration of campaign messaging (86% awareness of messaging in Australia), primary medium used, as well as overall budget. Since the Australian campaign also had the largest effect on health behaviours, replication would be worthwhile, although challenging given the changes that have occurred in the media landscape. In most countries there is now much more online, video-on-demand, and social media content rather than traditional television advertising. Additionally, conflicting messages are often presented through the media and via direct-to-consumer advertising by those with vested interests in LBP. Messaging in future campaigns should build on current results related to staying active and avoiding rest, but also emphasize more specific, targeted messages about behaviours such as the importance of staying at work, avoiding ineffective, low value, and potentially harmful treatments, and avoiding unnecessary diagnostic imaging. Creative social marketing and a large up-front budget would likely be required to run a campaign that presents these messages and overcomes obstacles. Given the enormous economic and social burden of LBP, such an investment may be worthwhile, but should be accompanied by a rigorous evaluation of effectiveness and economic benefit.

Changing LBP-related health behaviours and actual clinical outcomes is unlikely to be done merely through educational interventions alone.[54] Models of the influence of communication campaigns[28] as well as behavioural change more generally [55, 56] indicate that external constraints or incentives often facilitate or impede uptake of the desired behaviour. The Behaviour Change Wheel and Theoretical Domains Framework are useful behavioural change theories that could inform future campaign development.[55, 56] Both theories highlight the importance of foundational beliefs about health conditions and their associated behaviours, but also indicate that intrinsic and extrinsic factors such as motivation, capability, and opportunity are critical elements in behavioural change.[57] Changing behaviour of the general public and health care providers is difficult and will require complex interventions designed using a systems approach to overcome identified obstacles.[58] Designers of future campaigns will need to carefully consider how such external factors may influence the success of their campaign. Campaigns' developers ideally should work collaboratively with policy makers and other stakeholders to implement specific intervention components such as supportive regulatory and policy changes aimed at changing behaviours of the population. For example, the Norwegian campaign was supplemented with a separate peer-support intervention in six workplaces in the area exposed to the campaign.[59] This initiative led to a 27% reduction in total work absence and a 49% reduction in LBP-related work absence.

A wide variety of tools have been developed to critically appraise studies evaluating clinical interventions in different health areas.[60, 61] However, there is no agreement

regarding the optimal tool to critically appraise quality of studies evaluating population-based interventions using quasi-experimental or observational designs. Many quality appraisal tools have not been developed using scientifically rigorous methods and have not been validated.[60] For this systematic review, the EPHP tool was used to evaluate study quality. This tool has been judged suitable for use in systematic reviews of effectiveness, has been reported to have adequate content and construct validity, and has been used in other reviews evaluating the effectiveness of mass media campaigns.[62, 63, 64] However, the reliability was low and this tool showed difficulties when assessing the quality of non-RCT based studies, resulting in the majority of included studies in this systematic review to be rated weak to moderate. While well-done randomized controlled trials evaluating mass media campaigns would be beneficial, these types of studies may be challenging to conduct due to the nature of these interventions. Population-level interventions such as mass media campaigns are inherently difficult to evaluate due to their large-scale nature, challenges with regard to blinding, low response rates to population surveys, and difficulty in implementing randomization. Research is needed to develop reliable and valid quality appraisal tools for population-based trials that often rely on quasi-experimental designs with low response rates to population-based surveys. Additionally, the tool does not necessarily reflect the quality or content of the actual mass media campaign, as the assessment is based on the reporting in corresponding publications. Potentially the framework outlined here (see table 1) could inform development of a tool to evaluate the quality of mass media campaigns.

Strengths and Weaknesses

This is the first systematic review assessing the effectiveness of mass media campaigns for LBP, providing an evidence base for informed decision-making regarding the development and implementation of future mass media and population-based interventions for LBP. We conducted a very broad search due to the complex nature of these interventions. We initially searched for any type of educational intervention, then excluded any that did not involve a mass media component. This led to a large number of records being excluded with the main reasons being: 1) study was not related to back pain; 2) no mass media campaign was evaluated; and 3) no quantitative evaluation or protocol only. A detailed description and synthesis of the mass media campaigns, and their evaluations has been provided. Due to the large heterogeneity between the studies in terms of study design, outcome measures and measurement tools used, a meta-analysis of the results was not deemed appropriate and the conclusions are drawn based on a narrative synthesis using decision rules. The inclusion of studies published only in English and indexed in electronic databases may have introduced language and publication bias; although we believe the included studies are representative of the available evidence. Lastly, most campaigns were conducted in a different media landscape than the current digital and social media environment, potentially limiting the generalizability of results to the current context.

Conclusion

Mass media campaigns for LBP appear effective for improving beliefs of the general public and health care providers, making beliefs more in line with current evidence and self-management principles. Converting beliefs into behaviours is, however, more complex. As highlighted by the preparation undertaken for the successful Australian

campaign, developers of future campaigns will need to carefully consider complex cultural and regulatory contexts and design interventions that overcome identified barriers to behavioural change.

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Declaration of Interest

The authors report no conflicts of interest.

Data Sharing

Relevant data are available from the corresponding author upon reasonable request.

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