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Research funded by WorkSafeBC and WorkSafe Saskatchewan

## The Alberta Back Pain Initiative Study: Evaluation of a Population Based Social Marketing Intervention for the Prevention of Disability Associated with Back Pain

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RS2006-OG03

**Final Report for WorkSafeBC Funded Project RS2006-OG03**

The Alberta Back Pain Initiative Study:  
Evaluation of a Population Based Social Marketing Intervention for the Prevention of  
Disability Associated with Back Pain

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**Key Messages**

- Building on previous campaigns in Australia and Scotland, a back pain mass media campaign (Don't Take it Lying Down) was implemented and evaluated in Alberta, Canada.
- The Canadian campaign appears to have had a small impact on public beliefs specifically related to campaign messaging to stay active.
- No statistically significant or clinically meaningful impact was observed on health utilization or work disability outcomes.
- Results are likely due to the modest level of awareness achieved by the campaign and future campaigns will likely require more extensive media coverage.

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## Executive Summary

*Background:* Building on previous campaigns in Australia and Scotland, a back pain mass media campaign (*Don't Take it Lying Down*) was implemented in Alberta, Canada. A variety of media formats were used with radio ads predominating due to budget constraints. This project evaluated the campaign's impact on back pain beliefs, work disability and health utilization outcomes.

*Methods:* Quasi-experimental before-and-after design with control group. Changes in back pain beliefs were studied using telephone surveys of random samples from both provinces before campaign onset and afterwards. The Back Beliefs Questionnaire (BBQ) was used along with specific questions about the importance of staying active. For evaluating behaviours, we extracted data from governmental and workers' compensation databases between January 1999 to July 2008. Outcomes included indicators of number of visits to health care providers, use of diagnostic imaging, and compensation claim incidence and duration. Analysis included time series analysis and ANOVA testing of the interaction between province and time.

*Results:* Belief surveys were conducted with a total of 8566 subjects over the four-year period. Changes on BBQ scores were not statistically significant, however the proportion of subjects agreeing with the statement, "If you have back pain you should try to stay active" increased in Alberta from 56% to 63% ( $p = 0.008$ ) with no change in the control group (consistently ~60%). No meaningful or statistically significant effects were seen on the behavioural outcomes.

*Conclusions:* A Canadian media campaign appears to have had a small impact on public beliefs specifically related to campaign messaging to stay active, but no impact was observed on health utilization or work disability outcomes. Results are likely due to the modest level of awareness achieved by the campaign. Development of future campaigns should incorporate theories regarding how mass media campaigns lead to behaviour change.

This report contains a series of papers describing study results. These papers have either been published, submitted, or will be submitted for publication.

## **Paper One**

### **Title: Implementation and Evaluation of a Social Marketing Intervention: Back Pain Media Campaign**

Published as Gross DP, Davis B, Wood S. A Social Marketing Intervention: Back Pain Media Campaign. *Vue: The Magazine of the Marketing Research and Intelligence Association*. September 2008; pages 22-25.

## **Background**

Social marketing campaigns are increasingly being used to prevent and manage health conditions including use of cancer screening tests, reducing cigarette consumption, and increasing physical activity.<sup>9</sup> Social marketing has been defined as, *“The use of commercial marketing techniques to promote the adoption of a behaviour that will improve the health or well-being of the target audience or society as a whole.”*<sup>17</sup> While such campaigns are commonly used, more can be learned about which forms of communication or media formats are most effective. We will discuss the planning, implementation and planned evaluation of a recent social marketing campaign in Alberta, Canada designed to assist people in coping with back pain, a leading cause of disability.

## **Back Pain**

Back pain continues to be one of the most common and costly problems facing industrialized countries including Canada.<sup>12,21</sup> Related to health-care expenditures, authors of a recent US-based study reported that in 2005 back and

neck pain alone were responsible for \$85.9 Billion (US dollars) in health care expenditures, or 9% of the estimated total US national expenditure for health care.<sup>13</sup> The authors also report that health expenditures have increased substantially since 1997, without corresponding improvement in self-rated health status in those responding to the survey. In Canada, back pain ranks first in the highest overall degree of resource use for individuals younger than 60 years and continues to be the leading cause of workers' compensation time loss claims.<sup>14</sup> Because of this, alternative strategies for managing the condition have been recommended such as public education campaigns.<sup>8</sup>

### **Social Marketing Campaigns**

In the late 1990's, a back pain social marketing campaign was undertaken in Australia by the Victoria WorkCover Authority.<sup>5</sup> The campaign aimed to disseminate information to the general public, providing practical advice for managing the condition. It included messages delineated in The Back Book, an evidence-based patient educational booklet.<sup>6</sup> Specific messages were presented through a variety of media formats including television and print and included:

“Usually back pain has a simple cause and gets better quickly of its own accord.”

“Bed rest often makes it worse, stay active and at work if you can.”

“Keep up regular activities. They will not do damage – just avoid really strenuous things.”

Researchers evaluating the campaign reported that the population exposed to the intervention showed sustained improvements in back pain beliefs (i.e. were

less likely to think back pain needed to be rested) as well as dramatic reductions in work-related disability and health care visits for the condition.<sup>2-5</sup> This was a novel experiment in social marketing for a musculoskeletal condition and engendered worldwide attention. The campaign stimulated similar back pain campaigns in Scotland and Norway.<sup>16,18,20</sup> The Scottish campaign used radio as opposed to television to reduce costs and appears to have positively altered public beliefs but had little impact on disability.<sup>16</sup> Evaluation indicated the Norwegian campaign also had little impact on disability behaviours or beliefs of health care providers.<sup>18,19</sup> Based on the initial promising results from Australia and Scotland, a related back pain campaign was launched in Alberta, Canada. Research has identified that the Canadian general public holds many of the same negative and pessimistic beliefs about back pain that were common in Australia and Scotland.<sup>10</sup>

### **Alberta Campaign**

In 2005, the Workers' Compensation Board (WCB) of Alberta began working with DDB Canada to design and execute a social marketing campaign with the primary objective of educating the Alberta public about back pain and the advantages of staying active. Starting in 2006, practical advice was provided to the targeted audience (Alberta adults between the ages of 25-54) using various communication tactics to educate them on how to manage the condition, treat the condition and modify existing beliefs that back pain requires rest. The campaign reflected a balance of paid initiatives and free initiatives to maximize exposure

with the limited budget. Tactics were chosen based on frequency, audience, and price. Over three years, the core theme of the campaign, “Back Pain: Don’t take it lying down” was used in mediums like; radio, bus ads, billboards, posters, floortalkers, promotional materials and PSA spots. All mediums included the core theme, along with other key messages such as:

- Activity is good for your back
- Even when you feel pain, you can participate in low-impact exercise without further straining your back
- The sooner you get moving the sooner you’ll feel better
- Health care professionals believe with regular activity and proper body mechanics you’ll feel better within a few weeks
- Get *your* back in motion

### **Alberta Campaign Evaluation**

A multidisciplinary team is collaborating to study the impact of the back pain campaign on back pain beliefs of the general population. This article discusses the methodology used, challenges experienced, and strategies employed to ensure success.

#### *Theoretical Model Guiding Evaluation*

The evaluation was guided by Hornick and Yanovitzky’s Model of Communication Campaign Influence (2003).<sup>11</sup> This model postulates that campaign activity has the potential to lead to improvements in behaviour through

a multi-stage process including: (1) exposure to the campaign message, (2) changing behaviour related beliefs and attitudes, and (3) improving behavioural intentions. This indicates that valid measurement of outcomes at multiple stages of the process, including beliefs and attitudes is necessary to confirm whether the campaign was effective. Isolating the marketing campaign to understand its influence as a contributing factor to changing attitudes, intentions and behaviour is a major challenge for researchers wanting to measure and evaluate advertising effectiveness.

### *Design*

Since the back pain campaign was undertaken at the population or societal level, a strict random controlled trial design was not feasible. Therefore, belief and attitude changes were evaluated using a quasi-experimental before-and-after design with a series of four surveys conducted prior to the campaign and after each subsequent year.<sup>7</sup> Quasi-experimental designs are subject to various threats to internal validity including history, regression to the mean, and maturation biases.<sup>7</sup> However, these were accounted for through the use of a concurrent comparison group formed by surveying a non-exposed population (residents of Saskatchewan).

### *Sample and Data Collection*

To evaluate the Alberta campaign, we conducted a series of telephone surveys with a randomly selected, representative sample of the general population. The surveys were conducted from Leger Marketing's Computer Aided Telephone

Interviewing (CATI) facilities. Target respondents were residents of Alberta and Saskatchewan aged 18 years or older.

The first measurement was taken prior to the campaign launch in 2005, and post campaign surveys were conducted following each of the three campaign years. Overall there were four waves of data collection, one wave pre-campaign and three waves post-campaign always conducted in the spring. Results of the baseline survey have been published and were quite comparable to baseline characteristics of the Australian population.<sup>10</sup> For each wave, interviews were conducted with residents of Alberta where the campaign took place, and with residents of the unexposed neighboring province of Saskatchewan. The Saskatchewan sample was used as a control group to compare to Albertans. The sample sizes have been robust, consisting of 2400 interviews per year including 1200 in Alberta and 1200 in Saskatchewan.

### *Measures*

Design of the survey questions took into account the previous experiences of researchers in Australia and Scotland who evaluated campaigns with similar messaging.<sup>4,16</sup> Measures used in these countries were incorporated into the Alberta and Saskatchewan surveys. Most of the questions measured attitudes, although there was also a question to gather information on self-report behaviours of how respondents handled their last back pain episode. The survey instrument was comprised of four sections:

1. Back Beliefs Questionnaire, used to measure general beliefs about the condition<sup>15</sup>
2. “Stay Active” questions from Scotland
3. Questions related to respondents’ experience and previous management of back pain
4. Campaign awareness questions

Analysis of the Alberta campaign on public beliefs about back pain is still underway and results will not be presented here. Additional evaluation steps will be examining behavioural indicators such as workers’ compensation claims and health care use. Data is currently being extracted from the Workers’ Compensation Boards of Alberta and Saskatchewan as well as governmental agencies funding publicly available health services.

### **Discussion**

When results of studies evaluating back pain media campaigns are compared across different jurisdictions it appears that improved back pain beliefs of the general population can be achieved. Positive results have been observed in very different jurisdictions and cultures.<sup>1</sup> However, it appears that campaigns that are modest in scope produce modest results. Previous studies have not been as promising for altering associated behaviours and it remains to be seen whether campaign messaging in Alberta results in improved back pain behaviours such as reduced work disability and health utilization.

## Acknowledgements

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## Paper Two

### **Title: Evaluation of a Canadian Back Pain Mass Media Campaign**

Submitted as: Gross DP, Russell AS, Ferrari R, Battié MC, Schopflocher D, Hu R, Waddell G, Buchbinder R. Evaluation of a Canadian back pain mass media campaign. Submitted to Spine.

### **Abstract**

**STUDY DESIGN:** Quasi-experimental before-and-after design with control group.

**OBJECTIVE:** We evaluated a back pain mass media campaign's impact on population back pain beliefs, work disability and health utilization outcomes.

**SUMMARY OF BACKGROUND DATA:** Building on previous campaigns in Australia and Scotland, a back pain mass media campaign (*Don't Take it Lying Down*) was implemented in Alberta, Canada. A variety of media formats were used with radio ads predominating due to budget constraints.

**METHODS:** Changes in back pain beliefs were studied using telephone surveys of random samples from both provinces before campaign onset and afterwards. The Back Beliefs Questionnaire (BBQ) was used along with specific questions about the importance of staying active. For evaluating behaviours, we extracted data from governmental and workers' compensation databases between January 1999 to July 2008. Outcomes included indicators of number of visits to health care providers, use of diagnostic imaging, and compensation claim incidence and

duration. Analysis included time series analysis and ANOVA testing of the interaction between province and time.

**RESULTS:** Belief surveys were conducted with a total of 8566 subjects over the four-year period. Changes on BBQ scores were not statistically significant, however the proportion of subjects agreeing with the statement, “If you have back pain you should try to stay active” increased in Alberta from 56% to 63% ( $p = 0.008$ ) with no change in the control group (consistently ~60%). No meaningful or statistically significant effects were seen on the behavioural outcomes.

**CONCLUSIONS:** A Canadian media campaign appears to have had a small impact on public beliefs specifically related to campaign messaging to stay active, but no impact was observed on health utilization or work disability outcomes. Results are likely due to the modest level of awareness achieved by the campaign and future campaigns will likely require more extensive media coverage.

## INTRODUCTION

Clinical practice guidelines advocate that back pain is most often a benign, self-limiting condition and suggest that early management should include minimal medical intervention, reassurance and advice to stay active.<sup>1-4</sup> This is a reversal of decades of medical advice and many health care providers and the general public still appear to hold contrary opinions.<sup>5-7</sup> Results of surveys in the United Kingdom and Norway indicate widely held beliefs that back pain most often results from major pathology such as a “slipped disc” or “trapped nerve”.<sup>8, 9</sup> Canadians also hold pessimistic views, believing that back pain will eventually stop one from working, becomes progressively worse with age and makes everything in life worse.<sup>10</sup>

Given the mismatch between public beliefs and current evidence-based recommendations, many back pain disability prevention strategies have aimed at changing beliefs.<sup>11, 12</sup> Mass media campaigns designed to re-educate the public have been conducted and evaluated in Australia, Scotland, and Norway.<sup>13-17</sup> In Australia, improvements in population and healthcare provider beliefs about back pain were observed following the campaign along with dramatic reductions in work-related disability and health care visits.<sup>16-19</sup> Television was the primary media for this three year campaign, with a resulting cost of approximately \$10 million CDN.<sup>20</sup> The Scottish campaign used radio as opposed to television to reduce costs and appears to have positively altered public beliefs, but had no measurable impact on sickness absence or new awards of social security

benefits.<sup>15</sup> The Norwegian campaign also had a lower budget (~\$1.3 million CDN) and appears to have modestly shifted public beliefs but again had no corresponding change in sickness behaviour.<sup>14, 20</sup>

The apparent success of previous campaigns and the fact that back pain continues to be one of the most prevalent and costly medical conditions stimulated a related intervention in Alberta, Canada. Previous research identified Alberta as a suitable location as the population holds pessimistic beliefs about back pain.<sup>10</sup> The Alberta campaign built on previous experiences, maintaining the general theme of prior campaigns (*Back Pain: Don't Take it Lying Down*), while focusing on radio to reduce costs.

We evaluated the impact of the Alberta back pain campaign on beliefs of the general population, beliefs of groups at high risk for developing back pain (students of nursing and construction trade programs), and disability behaviours including compensation and health utilization outcomes.

## **METHODS**

### *Design*

As the campaign was administered to the entire population, a strict random controlled trial design was not feasible. For this reason, quasi-experimental before-and-after (beliefs) and interrupted time series (behaviours) designs were used with control groups formed from individuals with non-back musculoskeletal

conditions and an unexposed neighboring province.<sup>21</sup> This design allowed us to account for trends in behavioural outcomes over time, and the comparison groups allowed us to account for confounding influences such as policy or legislation changes occurring within Alberta or Western Canada during the study period. The University of Alberta's Health Research Ethics Board approved this research.

### *Study population*

All residents of the province of Alberta served as the study population, and the unexposed population of the neighboring province Saskatchewan served as a control. At baseline, demographic characteristics, back pain beliefs and experience with back pain were similar between provinces (see Table I).

### *Campaign Description*

Starting in May 2005, the Workers' Compensation Board (WCB) of Alberta and partners undertook a mass media campaign with the primary objective of educating adult Albertans about back pain and the advantages of staying active (see [www.backactive.ca](http://www.backactive.ca)). Practical advice was provided using various communication tactics to educate on how best to manage or treat the condition, and focused largely on modifying existing beliefs that back pain requires rest.

Key messages included:

- Activity is good for your back
- Even when you feel pain, you can participate in low-impact exercise

without further straining your back

- The sooner you get moving the sooner you'll feel better
- Health care professionals believe with regular activity and proper body mechanics you'll feel better within a few weeks
- Get *your* back in motion

Over three years, the core theme of the campaign was used in a variety of media formats including; radio, bus ads, billboards, posters, promotional materials and public service announcement television spots. To maximize reach, radio ads ran in major frequencies in eleven regions throughout the province and on a variety of station formats. Ads were aired in bursts during high listening months. Medical and health care associations endorsed the advertisements to increase credibility (College of Physicians and Surgeons of Alberta, Alberta College of Family Physicians, College of Chiropractors of Alberta, and the Alberta Physiotherapy Association). The campaign reflected a balance of paid and free initiatives to maximize exposure within a limited budget. The total budget over the three years of the campaign was \$934,500 CDN, with the majority of funds (~72%) spent on radio advertisements.

### *Evaluating Changes in Beliefs*

Based on Hornik and Yanovitzky's theoretical model of the potential mechanism of a communication campaign's influence, our main outcomes included indicators of back pain beliefs and associated behaviours.<sup>22</sup> Changes in beliefs were

studied using Computer-Assisted Telephone Interviews (CATI) of random samples of the general population of both provinces before the campaign onset in May 2005 and afterwards in 2006, 2007 and 2008. An experienced polling company, Leger-Criterion Research Ltd., was contracted to conduct the surveys, targeting household members 18 years of age and older. A random sampling strategy was used in an attempt to obtain representative groups from each province. Sample size (~1100 per province per year) was calculated based on detecting a change of 3 points on the Back Beliefs Questionnaire, as was seen in Australia.

During the CATI surveys all subjects completed the Back Beliefs Questionnaire, which was designed to measure beliefs regarding the inevitable consequences of future life with back pain.<sup>23</sup> Higher scores are indicative of more positive beliefs, suggesting better ability to cope. Scores range between 9 (worst possible) and 45 (best possible). In addition to the Back Beliefs Questionnaire, we asked subjects to rate their level of agreement on four statements related to management of back pain used in evaluating the 'Working Backs Scotland' campaign (see Table II for specific items). We also asked about awareness of media information about back pain and whether this awareness influenced respondents' attitudes and beliefs.

The Back Beliefs Questionnaire was also administered to two groups of students enrolled in programs with high risk of filing back injury claims upon entry into the

workforce. This included students in the University of Alberta nursing program and students in the Northern Alberta Institute of Technology construction trades programs. Surveys were conducted once prior to the campaign, and in the two subsequent years after the campaign started. Different cohorts were evaluated each year, thus we were not evaluating changes in individual students' beliefs over time but changes in all student beliefs.

### *Evaluating Changes in Health Utilization*

To examine the campaign's impact on health care, data was obtained from the public health care funding agency in Alberta as well as the WCB-Alberta. Each of the databases has previously been used for research purposes.<sup>24-26</sup> We created time series of key outcomes through sequential monthly measurement of variables from January 1999 to July 2008, with the beginning of the media campaign hypothesized as an "interruption" in the time series.

Specific measures extracted from the public funding agency on a monthly basis included:

- Number of visits to family physicians
- Number of visits to chiropractors
- Number of visits to medical specialists.

Measures extracted from the workers' compensation databases for claims filed each month included:

- Average number of visits to family physicians
- Average number of visits to physical therapists
- Average number of visits to chiropractors
- Proportion of claimants visiting acupuncturists
- Proportion of claimants visiting medical specialists
- Proportion of claimants undergoing diagnostic imaging studies (x-ray, CT and MRI)
- Proportion of claimants visiting independent medical examiners, work assessment centers and multidisciplinary rehabilitation programs

### *Evaluating Changes in Work-Related Disability*

To evaluate the campaign's impact on work disability, we obtained data from administrative databases of the WCB of Alberta and Saskatchewan. Again variables were gathered on a monthly basis from January 1999 (WCB-Saskatchewan was available from January 2001) and time trends examined.

Measures obtained included:

- Back claims as a proportion of all claims
- Proportion of first time back pain claims
- Duration of time loss wage replacement benefits
- Recurrence rates of time loss wage replacement benefits

Data on potentially modifying or confounding variables were also obtained, including age, gender, diagnostic category (sprain or other), number of previous

claims, occupation category, and geographic region of residence (urban versus rural).

### *Analysis*

Descriptive statistics were calculated for belief survey respondents. To determine whether changes occurring on belief measures between survey waves and across provinces were statistically significant, we used multivariable linear and logistic regression with an interaction term between Province and Time as the principle test of effect. Changes in student beliefs before and after the campaign started were evaluated with the chi square statistic. To evaluate trends in the health utilization and work disability outcomes, time series analysis was used including sequence graphs and scatterplots with loess smoothing to perform visual estimation of trends or interruptions in the time series. Statistical testing was performed using linear regression and ARIMA statistics to control for inherent auto-correlation. All analyses were conducted using SPSS. A 0.05 alpha level was used to judge statistical significance.

## **RESULTS**

### *Belief Surveys*

Belief surveys were completed with a total of 8,566 subjects over the four-year period. Response rates in the four survey waves were: 2005 28.0%; 2006 29.0%; 2007 25.5%; 2008 22.2%. Characteristics of subjects interviewed each year are shown in Table I. Subjects from both provinces were quite comparable but some

differences were observed across annual survey waves. As compared to 2005, later samples contained a higher proportion of females, were older, and were more likely to live in rural areas. The proportion of subjects reporting back pain did not change meaningfully over the survey waves. In terms of exposure to campaign messaging, the proportion of subjects reporting exposure increased consistently in Alberta after the campaign started (to a high of 49.2% in Alberta in 2008) whereas reported awareness was not as great in the control province (high of 38.8% in 2008).

Overall Back Beliefs Questionnaire scores were consistent across years in Alberta and between provinces (see Table II). Using multivariable linear regression, the interaction between province and time was found not to be statistically significant ( $p = 0.13$ ), suggesting no effect of the campaign on questionnaire scores. However, the proportion of subjects agreeing with the statement, “If you have back pain you should try to stay active” did increase in Alberta from 56% in 2005 to 63% in 2008 ( $p = 0.008$ ) with no change observed in Saskatchewan (consistently ~60%). Using multivariable logistic regression, a statistically significant interaction was observed between province and year for the items related to staying active and rest. This interaction remained statistically significant after controlling for age, sex, urban residence, previous back pain experience, and awareness of media messaging. No statistically significant effect was seen for the items related to simple painkillers being enough to control back pain or back pain settling quickly.

No meaningful or statistically significant changes were observed in Back Belief Questionnaire scores of construction trades students (26.5 before versus 26.4 after) or nursing students (28.6 versus 29.0, see Table III). Additionally, no statistically significant changes were observed in responses to specific items in the BBQ related to rest or exercise for back pain suggesting no effect of the campaign in these at-risk subgroups.

### *Health Utilization Outcomes*

No meaningful or statistically significant effects of the campaign were seen on any of the publicly funded health utilization outcomes in Alberta or on any of the workers' compensation health utilization outcomes. As seen in Figure I, a trend toward fewer mean visits to all health care providers in the first year of a workers' compensation back claim has occurred since 1999. However, this downward trend preceded the media campaign. Average number of visits to any health providers in the first year of a back claim has declined from a mean of 15.8 visits in 1999 to 14.3 in 2007. Average number of visits for non-back claimants increased from 13.5 to 17.2 over the same time period.

### *Work Disability Outcomes*

No meaningful or statistically significant effects of the campaign were seen on any of the workers' compensation claims outcomes, including first time back claims. A general downwards trend was observed in both the proportion of back

claims and duration of claims in Alberta (see Figures II and III). However, these trends preceded the media campaign and also were observed in the control province of Saskatchewan (Figures II and III).

### **DISCUSSION**

A back pain mass media campaign in Alberta, Canada focused largely on the message to stay active appears to have had a small impact on general public beliefs specific to campaign messaging. In the final year, 63% of respondents agreed with the statement, “If you have back pain you should try to stay active” as compared to 56% prior to the campaign. Respondents were also more likely to disagree with a statement regarding the need to rest. Unfortunately, the positive changes in beliefs were not accompanied by measurable reductions in health care utilization or work disability. Additionally, no improvements were observed in beliefs of students in training programs for occupations at high risk for back pain.

One potential reason why improvements in beliefs were not accompanied by changes in behavioural indicators is the very specific nature of the campaign messaging. As mentioned, the campaign was focused on the importance of staying active. There were no key messages related to the importance of staying at work, returning to work early, or self-management as opposed to relying on health care providers for care and advice. The earlier Australian campaign did contain advertisements with a wider range of messages, including clear advice

related to work and avoidance of over-medicalizing the condition.<sup>17, 18</sup> A 3-point improvement in Back Beliefs Questionnaire scores was observed in the general public, an improvement that has been sustained for three years.<sup>16, 19, 27</sup> Thus, it may be advantageous for future campaigns to contain a wider range of direct, explicit messages, such as were transmitted in the Australian campaign.

Results are consistent with studies of campaigns in Scotland and Norway.<sup>14, 15</sup> These campaigns also had limited budgets and did not rely on television as the primary media. In both, public beliefs appeared to improve while no changes were seen in behavioural indicators. Only the Australia campaign appears to have influenced health use and work disability. The Australian campaign was much more intensive and expensive (~10x as expensive for the entire three year campaign), and relied predominantly on television. Perhaps meaningful changes in disability behaviours are only possible with larger campaigns. The cost-savings associated with the Australian campaign have been estimated as many times greater than the cost of the campaign, potentially making such a campaign worthwhile.<sup>20</sup>

One indicator of the modest impact of the Alberta campaign is the low awareness level of campaign messaging. In fact, we observed little change across years in the proportion of respondents reporting awareness of any back pain advertising. The 49% awareness level in Alberta was only modestly higher than the 39% reported in the control province. Campaign awareness in Saskatchewan could

be due to some penetration of the campaign into the province or respondents being exposed to the campaign when visiting Alberta. Alternatively, it could be due to social desirability response bias leading subjects to report awareness despite not having seen the campaign.<sup>28</sup> The level of awareness of campaign messaging in Alberta was much lower than the 86% of Australians reporting exposure, and lower than the 60% awareness in Scotland. In addition to a larger budget, the Australian campaign was also unique in that a variety of trusted individuals delivered the stay-active message including health professionals, athletes, and well-known celebrities. However, the most effective method of transmitting messages through the media is unknown, and likely varies across countries, cultures and jurisdictions.<sup>20</sup>

This study built on and enhanced previous related research by including a wide variety of behavioural measures from both publicly funded and workers' compensation administrative databases. Unlike previous campaign evaluations, we were able to obtain pre-campaign data of sufficient duration to enable detailed analysis of trends occurring before and after implementation, which is a study strength with respect to evaluating health care utilization and disability.<sup>21</sup> On the other hand, the modest response rates to the population belief surveys are a limitation. Despite using strategies known to increase response rates including trained interviewers, establishing of researcher credentials at the beginning of the survey, and making at least ten call attempts at targeted call times,<sup>29</sup> response rates ranged from a high of 29% in 2006 to a low of 22% in

2008. Thus, we cannot be completely confident that our results are generalizable to the broader Alberta population. However, the back pain histories of our survey respondents were similar to previously published prevalence estimates in Saskatchewan obtained from samples of clearly higher response rates.<sup>30</sup> Characteristics of the survey respondents changed slightly over the four years, with later samples having a higher proportion of females, older subjects, and subjects who lived in rural areas. However, our principle test of effect (interaction between province and time) for the stay active question remained statistically significant after adjusting for these potential confounders. This indicates that changes in beliefs cannot be completely explained by changes in sample characteristics over time.

### *Conclusions*

A Canadian media campaign appears to have had a small impact on public beliefs specifically related to campaign messaging to stay active, but no impact was observed on work disability or health utilization outcomes. Results are likely due to the modest level of awareness achieved by the campaign, and future campaigns will likely require more extensive media coverage. Additionally, explicit messages should be conveyed related to the importance of work activity during back pain and avoiding over-medicalization of the condition, if these are targeted outcomes of interest.

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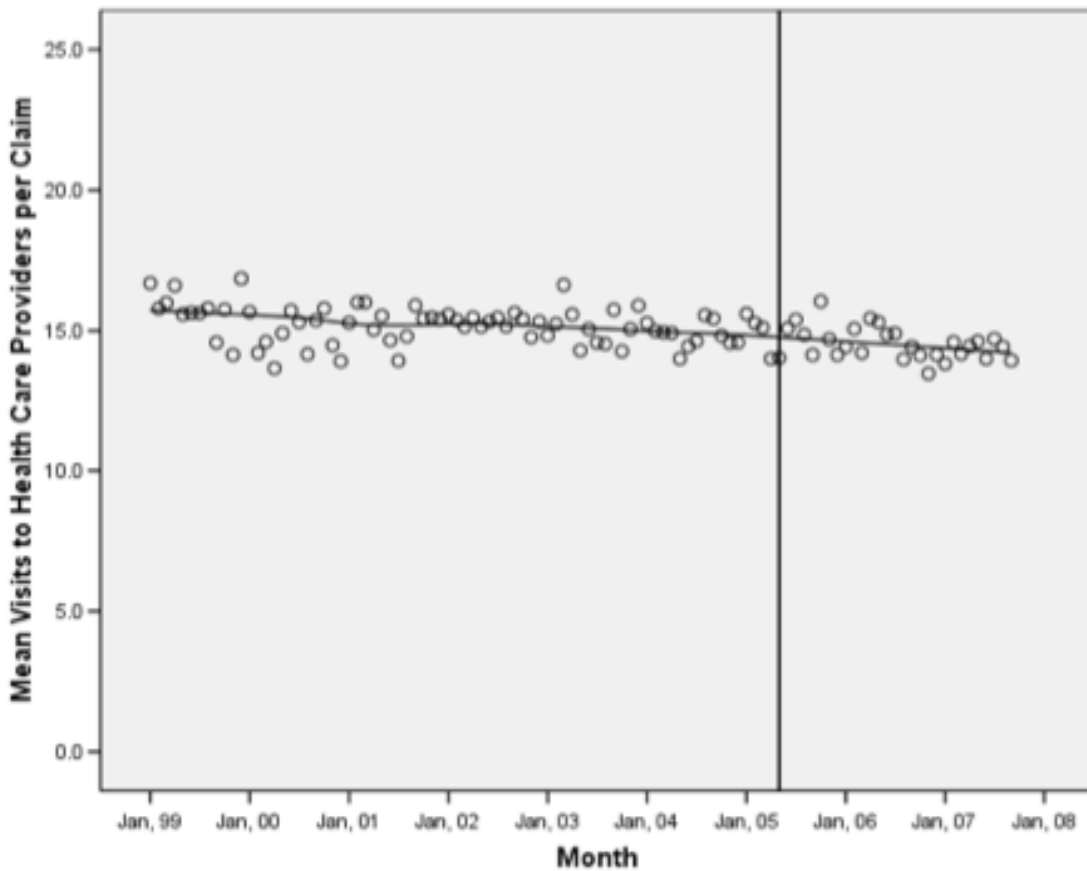
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Figure I

Mean Visits to Health Care Providers in the Year Following Claim Opening  
in Alberta Back Claims

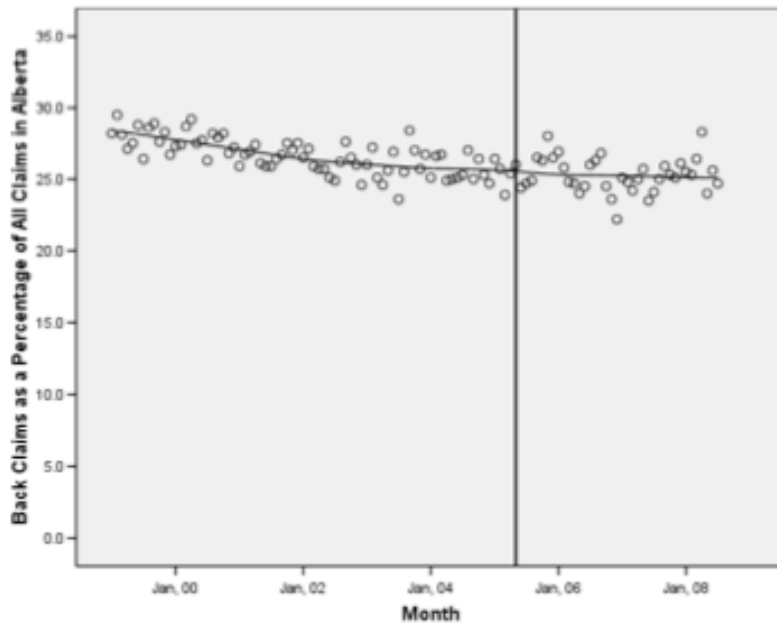


*Vertical line represents the start of the back pain campaign in May 2005.*

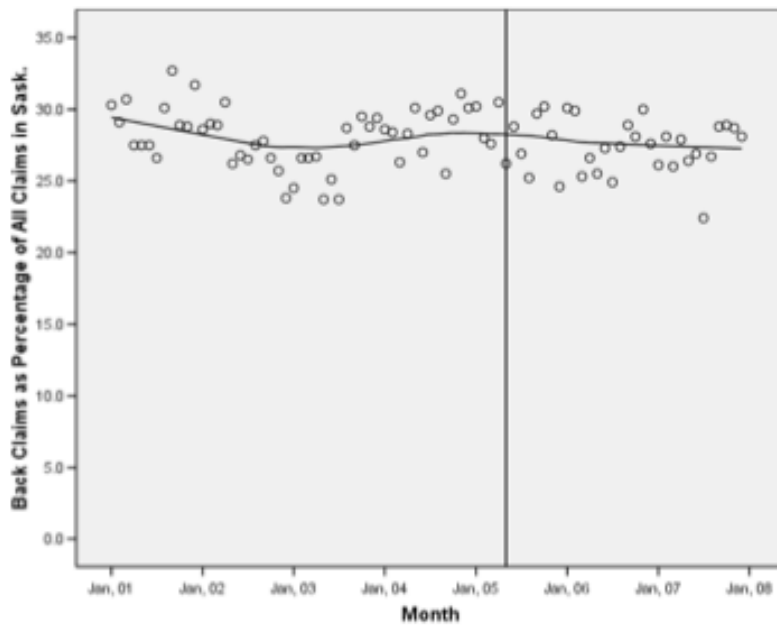
*Changes in the trend line after implementation are not statistically significant.*

Figure II

Back Claims as a Percentage of All Claims in Alberta and Saskatchewan



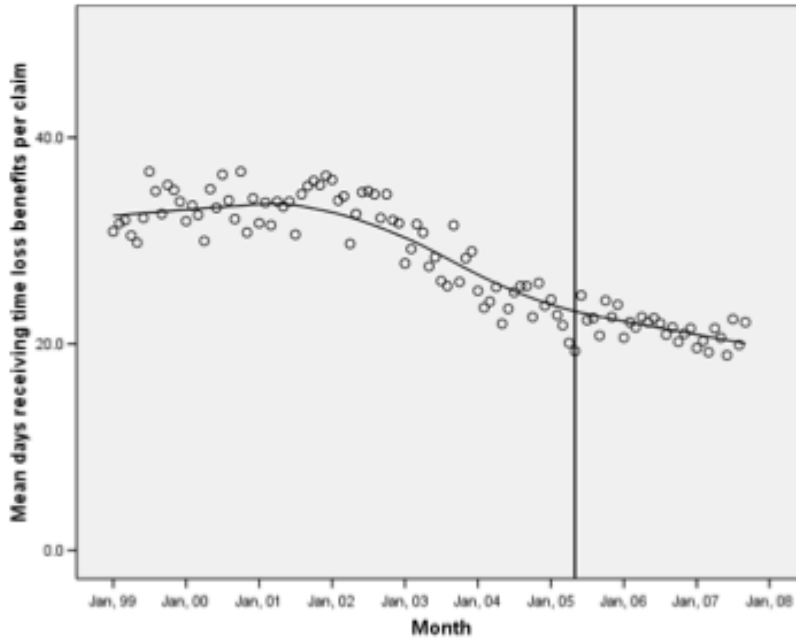
Alberta: Vertical line represents the start of the back pain campaign. Changes in the trend line are not statistically significant.



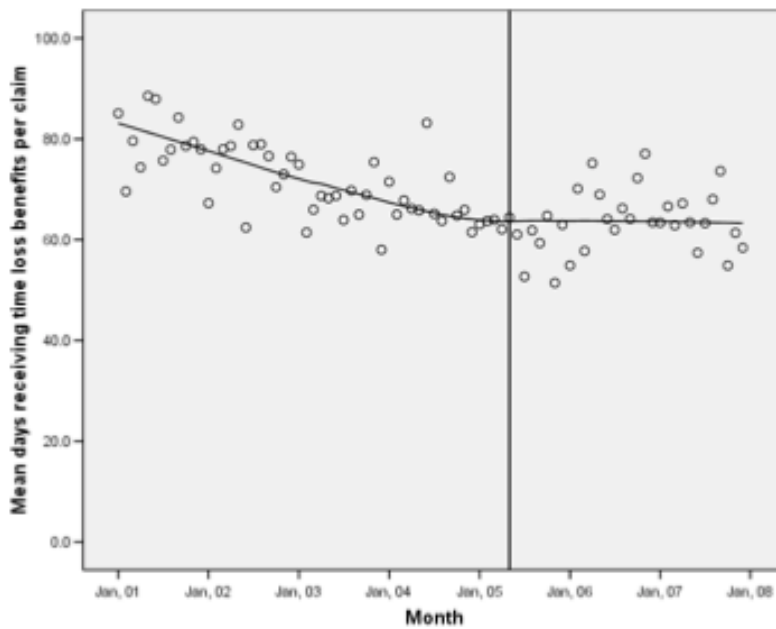
Saskatchewan – Data available from January 2001

Figure III

Mean Duration of Time Loss Benefit Reception per Back Claim Filed in Each Month



Alberta: Vertical line represents the start of the back pain campaign. Changes in the trend line are not statistically significant after the campaign.



Saskatchewan – Data available from January 2001

**Table I: Characteristics of Subjects Participating in Back Pain Belief Surveys**

	Alberta				Saskatchewan			
	2005	2006	2007	2008	2005	2006	2007	2008
Number of interviews	1060	1065	1069	1072	1072	1067	1097	1064
All values represent percentages								
Male Gender*	49.7	51.4	36.9	38.0	51.2	50.7	39.0	35.5
Age Category*								
18-24	10.5	7.4	6.1	4.8	9.2	7.3	7.7	7.3
25-34	20.5	19.0	15.9	15.2	15.3	14.6	14.9	13.0
35-49	32.1	34.6	36.4	32.6	31.4	30.6	28.6	27.4
50-65	25.9	27.0	29.3	31.7	27.6	31.5	32.4	30.3
> 65	11.0	11.9	12.3	15.7	16.5	16.0	16.4	21.9
Urban Residence*	50.9	46.1	41.3	44.7	44.2	40.0	41.7	39.9
Ever Had Back Pain	83.6	82.4	84.4	85.4	84.2	84.3	84.7	83.6
Back Pain in Last Year	62.0	61.1	64.3	62.0	62.0	63.4	62.4	62.5
Back Pain in Last Week	34.0	31.8	37.4	33.0	34.1	37.3	36.5	34.2
Aware of Any Back Pain								
Advertising	53.1	52.0	52.0	53.7	54.9	56.9	55.2	56.8
Pre-campaign Awareness of “Stay Active” Messaging	4.0	-	-	-	3.2	-	-	-
Post-campaign Awareness of Campaign Messaging*	-	31.9	42.7	49.2	-	32.0	36.5	38.8
Advertising changed attitudes or beliefs*	12.1	19.3	26.5	29.7	15.0	20.3	25.0	28.6

\* Significant difference in Alberta between surveys (P < 0.001)

**Table II: Back Pain Beliefs of Population Survey Participants**

	Alberta				Saskatchewan			
	2005	2006	2007	2008	2005	2006	2007	2008
Mean BBQ* score	26.7(6.4)	26.7(6.4)	26.1(6.7)	26.7(7.0)	26.2(6.3)	26.0(6.7)	25.6(6.5)	25.5(6.5)

*Items Used in Scotland Campaign Evaluation*

% Agreeing with item: *If you have back pain you should try to stay active.\*\**

Alberta 2005	55.5	Alberta 2006	61.8	Alberta 2007	61.5	Alberta 2008	63.4	Saskatchewan 2005	59.7	Saskatchewan 2006	59.0	Saskatchewan 2007	62.8	Saskatchewan 2008	58.3
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% Disagreeing with item: *If you have back pain you should rest until it gets better.†*

Alberta 2005	46.4	Alberta 2006	47.2	Alberta 2007	50.0	Alberta 2008	50.9	Saskatchewan 2005	47.1	Saskatchewan 2006	47.0	Saskatchewan 2007	45.1	Saskatchewan 2008	44.4
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% Agreeing with item: *Simple painkillers are usually enough to control most back pain.*

Alberta 2005	25.3	Alberta 2006	25.7	Alberta 2007	27.0	Alberta 2008	25.6	Saskatchewan 2005	24.9	Saskatchewan 2006	26.6	Saskatchewan 2007	27.3	Saskatchewan 2008	25.1
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% Agreeing with item: *Most back pain settles quickly and you can get on with normal activities such as going to work.*

Alberta 2005	26.5	Alberta 2006	26.7	Alberta 2007	29.7	Alberta 2008	27.5	Saskatchewan 2005	25.4	Saskatchewan 2006	28.6	Saskatchewan 2007	25.0	Saskatchewan 2008	25.1
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\* BBQ = Back Beliefs Questionnaire, Maximum score = 45 with higher scores indicating more positive back pain beliefs

\*\* Significant interaction ( $p = 0.018$ ) between province and time after adjusting for age, sex, urban residence, previous back pain experience and awareness of back pain media messaging (adjusted OR = 0.91 (0.84 - 0.98))

† Significant interaction ( $p = 0.012$ ) between province and time after adjusting for age, sex, urban residence, previous back pain experience and awareness of back pain media messaging (adjusted OR = 0.91 (0.84 - 0.98))

Table III

## Characteristics and Back Pain Beliefs of Nursing and Construction Trade

Students			
	Before Campaign	After	p Value
<b>Construction Trade Students</b>	<i>(n = 169)</i>	<i>(n = 257)</i>	
Age in Years	25.6	24.6	0.08
Female Gender	11.2	5.8	0.04
Previous Back Pain	91.1	88.3	0.36
Mean BBQ* score	26.5 (6.1)	26.4 (6.8)	0.92
% Agreeing with item:			
<i>Back trouble must be rested.</i>	82.8	84.0	0.74
<i>A bad back should be exercised.</i>	78.1	76.7	0.73
<b>Nursing Students</b>	<i>(n = 108)</i>	<i>(n = 60)</i>	
Age in Years	21.2	20.7	0.34
Female Gender	91.7	96.7	0.21
Previous Back Pain	88.9	88.3	0.94
Mean BBQ* score	28.6 (5.4)	29.0 (6.1)	0.67
% Agreeing with item:			
<i>Back trouble must be rested.</i>	87.0	81.7	0.35
<i>A bad back should be exercised.</i>	74.1	61.7	0.09

\* BBQ = Back Beliefs Questionnaire

## Paper Three

### Validity and Factor Structure of the Back Beliefs Questionnaire

Bostick GP, Schopflocher D, Gross DP. For submission to the Clinical Journal of Pain.

#### Abstract

**Background** We examined the factor structure and internal consistency of the Back Beliefs Questionnaire (BBQ) in a sample of the general population. We hypothesized that the factor structure would be similar to that reported by the initial developers.

**Methods** A population-based, cross-sectional study was conducted. Data for this project was obtained as part of a larger study evaluating a back pain social marketing intervention. Computer-Assisted Telephone Interviews (CATI) were conducted in three survey waves from April 2006 to May 2008 and overall 7,201 individuals participated in the survey. In order to measure beliefs about back pain, the Back Beliefs Questionnaire (BBQ) was administered. Exploratory factor analytic techniques were used.

**Results** The internal consistency of the 14-item scale was adequate at  $\alpha = 0.74$ . The factor solutions contain the same items used in the initial scoring of the BBQ, while distracter items loaded onto a second factor. Thus, our derived factor solutions support the factor structure described by the developers of the BBQ.

**Conclusions** This study provides strong evidence supporting the validity of the BBQ. Future work on the validity of the BBQ should confirm the factor structure in large clinical samples, evaluate the external component of validity (e.g. convergent, divergent, and construct validity) and potential differences between BBQ scores with and without the distracter items included.

### Introduction

Back pain is a significant burden to both the individual affected and society. The optimal method to manage back pain remains elusive. Thus, novel approaches to minimize individual and societal burden have been developed. For example, researchers have constructed mass-media campaigns to modify maladaptive beliefs of the public to become more in line with evidenced-based guidelines [1-3]. These campaigns have consistently been successful in modifying public beliefs about back pain [1-3] and at times have been associated with reduced disability from back pain [1]. However, more research is needed to evaluate such campaigns and determine the most effective mode of delivery [4].

In previous evaluations as well as other studies examining back pain beliefs, a variety of measurement tools have been used. One commonly used self report instrument used to measure beliefs about back pain is the Back Beliefs Questionnaire (BBQ) [5]. The BBQ has been used in a variety of settings [6-11], however the evidence of its validity is not extensive. Important components of the validity of a measurement tool are its factor structure and internal consistency. Moreover, the structure of any measurement tool is imperative to examine as this has important implications for score interpretation [12]. The factor structure of the BBQ has been reported by the developing authors; however it has not been formally evaluated outside of that cohort.

The aim of this study was to examine the factor structure and internal consistency of the BBQ in a general population sample. We hypothesized that the factor structure and internal consistency of the BBQ would be similar to that reported by the developers.

### **Methods**

#### *Study Design and Participants*

A population-based, cross-sectional study was conducted. Data for this project was obtained as part of a larger study evaluating a back pain social marketing intervention. Computer-Assisted Telephone Interviews (CATI) were conducted in three survey waves from April 2006 to May 2008. A simple randomized sampling technique was used to select individuals 18 years and older from Alberta and Saskatchewan. The sample was equally split between the two provinces and overall 7,201 individuals participated in the survey. The University of Alberta Health Research Ethics Board approved this study.

#### *Survey instrument*

In order to measure beliefs about back pain, the Back Beliefs Questionnaire (BBQ) was administered. The BBQ was designed to measure beliefs about the inevitable consequences of low back problems [5]. This questionnaire has been used to evaluate beliefs in both general and clinical populations. The scale's developers have reported adequate internal consistency ( $\alpha = 0.70$ ) and test-retest reliability ( $ICC = 0.87$ ) [5], however this has not been replicated in a separate, independent sample. The questionnaire consists of 14 items (Table I) and each item is scored on a five-point Likert agreement scale. Nine items are used in the scoring of the questionnaire with the

remaining items considered distracters. These nine items have been reported as comprising one factor [5]. Possible scores range between 9 and 45 with lower scores indicating more maladaptive or pessimistic beliefs about back pain.

Along with the BBQ, additional sample characteristics were gathered such as demographics (age, gender, rural vs. urban residence, residing province) and history of back pain.

### *Analysis*

Descriptive statistics were used to summarize the study participant's characteristics as well as their BBQ scores. Reliability was assessed using Cronbach's alpha ( $\alpha$ ) estimate of internal consistency with a coefficient greater than 0.70 being considered adequate scale consistency [13]. While previous evidence exists for the factor structure of the BBQ, it has not been studied extensively enough to warrant the use of confirmatory factory analysis. Thus, exploratory factor analytic techniques were used to examine the factor structure of the BBQ. Based on previous work by the scale developers, we hypothesized that the nine items used for scoring on the BBQ would load onto one factor, while the distractor items would load onto another factor(s) and would likely not be interpretable.

The data was randomly divided into two samples. Exploratory factor analysis was performed on each sample and the solutions compared to determine if the solutions were stable. Exploratory factor analysis was performed in three steps. Initially, we

determined the number of factors to retain for analysis using two factor retention rules: the Kaiser-Guttman criterion and examination of the scree plot. The Kaiser-Guttman criterion determines the number of factors as the number of eigenvalues equal to or greater than one. The scree plot involves a qualitative evaluation of a graph with eigenvalues plotted on the y-axis and number of factors on the x-axis. Multiple retention rules were used to minimize the risk of over- or underestimating the numbers of factors retained [14]. Once the number of factors was estimated, the second step was to perform factor extraction. Principle axis and principle components extraction were both used as they can yield different results. The primary difference between the two extraction techniques is that principle components extraction assumes perfect item reliability while principle axis extraction does not. Finally, the factors were rotated. Orthogonal rotation (Varimax) was performed as we assumed that the factors are not correlated and this technique typically allows for more ease in interpreting factor solutions. Moreover, we would not expect a clinically meaningful correlation between the factor that is comprised of the items used for scoring the BBQ and the factor(s) that are comprised of distracter items. Thus, oblique transformations that allow factors to correlate (e.g. Direct Oblimin) were not considered. The criterion factor loading value that determined which items were considered salient was set at  $|0.300|$ . Due to the concern that the factor retention rules occasionally over- or under-estimate the number of factors to be retained, multiple solutions were evaluated. The final solution was the one that best met the interpretability criteria found in Table 2 [13,15]. All data were analyzed using SPSS for Windows version 17 (SPSS Inc., Chicago, IL, USA).

The sample size requirement for this analysis was based on the primary analysis method, exploratory factor analysis. The sample size was adequate for exploratory factor analysis and also permitted splitting the sample [16].

### **Results**

Of the 7,201 participants, 6,434 (89.3%) had complete data for the primary variable of interest (BBQ). Randomly splitting the data yielded two data sets,  $n_1 = 3,143$  and  $n_2 = 3,051$ . A comparison of descriptive data between those with complete and missing data revealed some statistically significant differences. Participants with missing data were more likely to be older (57.8 versus 48.0 years), and less likely to have a lifetime (74.7% versus 84.1%) or 12-month history of back pain (53.7% versus 62.6%). The description of the sample including the mean BBQ score can be found in Table 3.

#### *Exploratory Factor Analysis*

The Kaiser-Guttman rule suggested a three factor solution for data set one (eigenvalues = 3.5, 1.4 and 1.2) and four for data set two (eigenvalues = 3.5, 1.4, 1.2, 1.0). The scree plot suggested a three factor solution in both data sets. Given this discrepancy, the potential for over- or under-estimation of these two rules and the previous reports of the factor structure of the BBQ, two, three, and four factor solutions were evaluated against the interpretability criteria in both data sets (Table 4). The principle axis solutions were consistently more interpretable when compared to the principle components solutions. Thus, only the principle axis extraction procedures are presented.

Based on the interpretability criteria, either a two or three factor solution was found to be best. The three factor derived solution appears to better represent the observed data (based on the proportion of residual correlations less than 0.05), however the two factor solution has a more simple structure. It should also be noted that the explained variance is relatively low (24.2% - 31.4%) and was similar in both solutions. The first factor in both solutions contain the same items used in the scoring of the BBQ described by the developers, while the distracter items loaded on to the second factor in the two factor solution or the second or third factor in the three factor solution. Thus, our derived factor solutions support the factor structure described by the developers of the BBQ. The only difference in the pattern loading was with item one (“there is no real treatment for back trouble”). In our analysis, item number one did not load on the same factor as the other eight items used in the scoring of the BBQ. It is possible that this item does not measure the same construct as the other eight items. Qualitative analysis of the factor loadings demonstrated that the first factor seemed to tap into an interpretable belief construct possibly labelled pessimism. However, the factor(s) that contain the distracter items do not appear to represent an interpretable construct warranting inclusion in the scoring of the BBQ. Refer to Table 5 for the salient factor loadings and communality coefficients for each item.

### *Internal consistency*

The internal consistency of the 14-item scale was  $\alpha = 0.74$  in data sets one and two. The internal consistency for factor 1 was  $\alpha = 0.75$  in data sets one and two. As expected, in the apparently non-interpretable factor(s) containing the distracter items,

the internal consistency was less than  $\alpha = 0.38$  in both data sets and using a two or three factor solution.

### **Discussion**

Our results support the original factor structure of the BBQ as described by the developers, with the exception of item 1. This supports the construct validity of the BBQ as a measure of beliefs about the inevitable consequences of low back problems. Additionally, the internal consistency of the BBQ found in our study ( $\alpha=0.75$ ) is similar to previous reports and is at an acceptable level [13]. The factor structure and internal consistency were similar in both randomly split samples further supporting the factor structure reported in this study. It should be noted that the explained variance in the factor solutions are quite low. This is potentially problematic in that the interpretation of an overall score may 'lose' important variance explained when items are combined into one score. Therefore, users of the BBQ may want to also interpret individual item scores in addition to the overall score.

The only difference between our findings and the original factor structure of the BBQ was the loading pattern of item 1 ("there is no real treatment for back trouble"). Previous research has included item 1 in the scoring of the BBQ, while our results suggest that it does not tap into the same construct as the other scored items. However, the correlation between the nine-item BBQ and the eight-item (with item 1 removed) remains very high ( $r=0.98$ ). Furthermore, the internal consistency coefficient (Cronbach's alpha) remains unchanged whether item 1 remains in the overall score or

not ( $\alpha=0.75$ ). Thus, in this sample, it is possible that inclusion or exclusion of item 1 does not make a meaningful difference in the scoring of the BBQ. Closer qualitative examination of item 1 may indicate some difficulty in interpreting its meaning. “No real treatment” could be interpreted as treatment effectiveness, or more literally as no treatment is available. This potential discrepancy in interpretation may account for the lack of consistency in the loading pattern of this item.

Given that five or six of the 14-item BBQ are not considered in the overall scoring, some researchers may choose to include only the items involved in the scoring of the instrument for future use. This may lead to significant cost savings when the number of items is considered in determining the cost of data collection, as is the case with CATIs and general population surveys. However, the presence of distracter items may change how the research participant interprets the BBQ. Thus, the interpretation of the BBQ without the distracter items may be different from the original 14-item scale. Further research is necessary to investigate the validity of a short-form BBQ without distractors.

The primary limitation of this study is its cross-sectional nature. This limits the ability to examine other aspects of validity such as the stability of the tool over time and the ability to ascertain a clinically meaningful BBQ score. We also found systematic differences in participants with and without complete data on the BBQ. The potential implications of the effects of missing data on the factor structure cannot be adequately examined in this study, however given the large sample size it is possible that the effect is minimal. Another potential limitation is the low communality estimates which could

indicate the presence of measurement error and may adversely impact the quality of factor analysis. Given the complexity of psychological constructs, relatively low communality coefficients are common [17]. This can also lead to challenges in meeting sample size requirements. However, even after splitting our sample, minimum sample size requirements were easily met [16]. Moreover, the strength of communality coefficients does not necessarily mean they are interpretable [18]. Thus evaluation of the strength of the communality coefficients must be tempered with an evaluation of whether the item(s) under question are interpretable. Given that previous research supports a similar factor structure and the loading patterns of the items are interpretable, the low communality coefficients on their own do not necessarily impact our confidence in the derived factor solution.

### *Conclusion*

We have provided strong evidence in support of the construct validity of the BBQ. Future work on the validity of the BBQ should confirm the factor structure in large clinical samples, evaluate the external component of validity (e.g. convergent, divergent, and construct validity) and potential differences between BBQ scores with and without the distracter items included.

### **Acknowledgements**

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[\[http://faculty.chass.ncsu.edu/garson/PA765/factor.htm\]](http://faculty.chass.ncsu.edu/garson/PA765/factor.htm)

**Table I. Items within the Back Beliefs Questionnaire (BBQ)**

- 
- Q1. There is no real treatment for back trouble.
- Q2. Back trouble will eventually stop you from working
- Q3. Back trouble means periods of pain for the rest of one's life
- Q4. Doctors cannot do anything for back trouble
- Q5. A bad back should be exercised
- Q6. Back trouble makes everything in life worse
- Q7. Surgery is the most effective way to treat back trouble
- Q8. Back trouble may mean you will end up in a wheelchair
- Q9. Alternative treatments are the answer to back trouble
- Q10. Back trouble means long periods of time off work
- Q11. Medication is the only way of relieving back trouble
- Q12. Once you have had back trouble there is always a weakness
- Q13. Back trouble must be rested
- Q14. Later in life back trouble gets progressively worse
-

**Table II. Interpretability criteria adapted from Thurstone and Norman and Striener**

<b>Criteria</b>	<b>Description</b>
Simple structure	Each item has only one salient loading ( $> 0.300$ ) on one factor.
Explained variance	The derived factor solution explains as much variance as possible and the distribution of variance is similar among factors.
Proportion of residuals $< 0.05$	Smaller proportions indicate that the derived factor solution represents the observed data (i.e. good fit).
Qualitative assessment	The item distribution among factors is interpretable based on known literature and theory.

**Table III. Sample characteristics (n = 7,201)**

Variable	Frequency (%) or Mean (SD)
Age category	
18-24	449 (6.2)
25-34	1,054 (14.6)
35-49	2,203 (30.6)
50-65	2,185 (30.3)
over 65	1,289 (17.9)
refused	21 (0.3)
Gender (female)	4,226 (58.7)
Province of residence (Albertan)	3,601 (50.0)
Geographic location of residence (rural)	4,161 (57.8)
Lifetime history of back pain	5,986 (83.1)
History of back pain in past 12 months	4,442 (61.7)
History of back pain in past week	2,510 (34.9)
Mean BBQ score	26.1 (6.6)
SD = standard deviation	

**Table IV. Comparison of two, three and four factor solutions in each data set based on interpretability criteria.**

Criteria	Data set #1 (n=3, 143)			Date set #2 (n=3, 051)		
	2 factor solution	3 factor solution	4 factor solution	2 factor solution	3 factor solution	4 factor solution
Explained variance	24.2%	28.0%	31.4%	24.3%	28.4%	31.4%
Number of complex items	1	2	3	1	3	3
Factor to variable ratio	7:1	4.7:1	3.5:1	7:1	4.7:1	3.5:1
Proportion of residuals < 0.05	26.0%	9.0%	1.0%	27.0%	8.0%	1.0%
Qualitative interpretability	√	√	X	√	√	X

**Table V. Factor loadings and communality coefficients for a two-factor solution derived by Principle axis extraction and Varimax rotation**

Items	Salient factor loadings*		h <sup>2</sup> (Set 1/Set 2)
	(Data Set 1/Data Set 2)		
	Factor 1	Factor 2	
Q1.		0.46/0.50	0.25/0.28
Q2.	0.46/0.48		0.23/0.23
Q3.	0.45/0.47	0.40/0.37	0.36/0.36
Q4.		0.49/0.47	0.28/0.27
Q5.			0.06/0.04
Q6.	0.48/0.49		0.23/0.24
Q7.		0.36/0.39	0.14/0.18
Q8.	0.34/0.40		0.16/0.18
Q9.			0.05/0.04
Q10.	0.57/0.63		0.37/0.42
Q11.		0.55/0.49	0.33/0.30
Q12.	0.55/0.54		0.34/0.32
Q13.	0.42/0.40		0.20/0.17
Q14.	0.60/0.60		0.39/0.39

h<sup>2</sup> = communality coefficient

\*salient loadings > |0.30|

## **Re-conceptualizing the Mechanisms Underlying the Mass Media Campaign**

### **Effectiveness: Implications for Future Evaluations**

M Miciak and Gross DP

#### **Abstract**

This paper briefly describes traditional experimental evaluation theory and challenges faced by this theory. We also provide a detailed consideration of Hornik and Yanovitsky's theory of mass media campaign influence, and discuss challenges faced when comprehensively evaluating social marketing campaigns. We then provide alternative ideas regarding both meta and mid-range theories that may enhance program evaluation and development. When studying social phenomena, such as behavioural change, contextual factors such as social support, psychological characteristics, and personal meaning are implicit to the phenomenon and therefore, to the impact of the intervention. Personal and structural factors are operational in change and need to be understood, not controlled, in order to provide insightful observations and conclusions about social programs, such as social marketing campaigns.

### Introduction

Theory is an integral component of evaluative research. Theory provides the basic tenets and the specific structure to comprehensively develop and institute an evaluation, and theory guides the types of questions that are asked. Not all theories work with all evaluations, nor are all theories complete in their assumptions and foundational components. Therefore, it is important to choose a theory that is congruent with the phenomenon being evaluated and the complexity of questions being asked.

There are different levels of theory. Meta-theory is seen as all encompassing, providing broad principles that can be applied throughout many disciplines and over large groups or institutions. (A.M. Clark 2008; Van Sell & Kalofissudis 2009) Mid-range and low-level theories narrow their focus, becoming more discipline or area specific, moving into smaller groups and individuals. (A.M. Clark 2008; Van Sell & Kalofissudis 2009) All of these levels of theory can be integrated into an evaluation, depending on its intention, scope, and complexity.

In the Alberta Back Pain Evaluation, we studied the impact that a social marketing campaign had on Albertan's beliefs and behaviours regarding the management of low back pain. This campaign was based on a massive and monumentally successful social marketing campaign in Victoria, Australia. The Australian campaign shifted both beliefs and behaviours within both the medical and general population. (Buchbinder, Gross, Werner, & Hayden, 2008) The Alberta evaluation was informed by Hornik and Yanovitsky's theory of the mechanism of mass media campaign impact (Hornik &

Yanovitzky 2003, see Figure I). This mid-range theory is grounded in an experimental evaluation meta-theory, and has been informed by other mid-range theories, such as the theory of reasoned action, health belief model, and social cognitive theory. (Hornik & Yanovitzky, 2003)

The results of the Alberta campaign were not as robust as the Australian results. Only moderate change was found in beliefs, and no significant change in behaviour was noted. These findings prompted us to ask, “Why?” Why does a social marketing campaign, based in a particular theoretical model, work in a particular population but not another? Why do changes in beliefs not consistently lead to changes in behaviour? Are we any further in providing guidance to policy makers and program developers?

To answer these questions, we returned to the theories that informed the evaluation. This led us to explore not only the assumptions of Hornik and Yanovitsky’s theory, but also those of the traditional experimental evaluation theory as a whole. We will describe the experimental evaluation theory and challenges faced by this theory. This will be followed by a detailed consideration of Hornik and Yanovitsky’s theory with consideration of the challenges faced when comprehensively evaluating social marketing campaigns. We will then provide alternative ideas regarding both meta and mid-range theory that will not only enhance program evaluation, but program development as well.

### **Description Of Traditional Experimental Evaluation**

In experimental evaluation studies, we are typically looking to identify a cause and effect relationship. In traditional experimental evaluation causation is assumed to be successive in nature, or in other words a cause (intervention) leads to an effect (outcome).(Cornwall & Murrell, 1993; Pawson & Tilley, 1997) The underpinning of this evaluation theory lies in the assumption that we cannot directly observe change (i.e. the cognitive process of someone changing a belief), therefore, the change must be inferred.(Pawson & Tilley, 1997) In order for an accurate inference to be made, we must examine the link between the intervention and outcome. (Pawson & Tilley, 1997)

The theory also posits that contextual factors, or factors internal to the phenomenon being studied, such as past experience, meaning, and social support, can and must be controlled or accounted for in order to maintain the integrity of the causal link. (Pawson & Tilley, 1997) The purported result is an accurate evaluation of the intervention's external effect. For example, if a program is implemented in a community, and there is a positive change in that community, the change is assumed to be due to the intervention. This is especially true if the study design incorporated a comparison group where the intervention was not implemented and there was no change in that group.

The driving inference in this meta-theory is that the positive outcome is the direct result of the intervention. Contextual factors are viewed as limiting in that they interrupt the

ability to cleanly determine the causal link between the intervention and the outcome.(Pawson & Tilley, 1997)

### **Challenges Of Traditional Experimental Theory**

Traditional experimental theory has been widely used within the evaluation literature and is seen as the pre-eminent research theory (Hornik & Yanovitzky's mid-range theory is one application). Even though this theory has underpinnings that may be viable in certain circumstances, such as in laboratory settings, it becomes challenged when it is the primary theory used to evaluate social phenomenon. (A. M. Clark et. al. 2008) This is the case largely because social phenomena are a complex mixture of personal agency and structural factors. (A. M. Clark et al. 2008) We will now outline some of the challenges that this theory presents when working in the social realm.

#### *Method Driven*

As previously described, traditional experimental evaluation theory is based on the assumptions that 1) we can isolate the effect of an intervention through controlling or accounting for factors outside of the intervention that could possibly impact the outcome and 2) through repeating the intervention a number of times, we will be able to infer whether a causal relationship exists or whether it does not exist. In order to be able to fulfill these assumptions, this type of evaluation must rely on very rigorous design parameters.(Cornwall & Murrell, 1993) In condensed terms, the theory is very *method driven*.(Pawson & Tilley, 1997)

The meaning of method driven is quite literal. It implies that the evaluation is specifically focused on how the research is done through the meticulous design of the evaluation. The implication is that the design will produce the correct results because it has controlled for the contextual variables, and has applied the intervention in a systematic and repetitive fashion to ensure adequate and identical exposure to all participants. The more powerful the design in these respects, the better it is able to determine whether a causal effect exists.(Reichl, 2005) The individual or community is considered the receiver of the intervention. The intervention and evaluation, if applied in this rigorous fashion, will produce the outcome.

Even though these assumptions sound logical in theory, they become challenged when implemented in research studying social phenomenon. This is because the social world is complex and uncertain.(Reichl, 2005) When studying social phenomena, such as behavioural change, contextual factors such as social support, psychological characteristics, and personal meaning are implicit to the phenomenon and therefore, must be considered as impacting the intervention. The intervention acts *through* these factors. (Pawson & Tilley, 1997) In fact, these factors likely contribute to the actual processing of the intervention, and therefore, to the outcome. In other words, people and their contexts are the actual generators of effect. (Pawson & Tilley, 1997) The program is not the generator of the effect in isolation. Rather, the intervention is a *suggestion* that is given to a highly complex system of personal and social variables. (Pawson & Tilley, 1997)

Even though the suggestion provided via a mass media campaign is based on sound principles, it still must be interpreted and *chosen* by the participants. Participants are not passive consumers of information. At some point, they must choose to accept information and also choose to act on it. This integrative process is very individual. Within each step of the process, choice exists, and an individual's choice is *constrained* or impacted by a combination of personal, social, and institutional factors. (Pawson & Tilley, 1997) Not all individuals or groups will have the necessary characteristics to integrate the *specific* knowledge put forth in a social marketing campaign. (Pawson & Tilley, 1997) By attempting to control for contextual factors, the researcher can be limiting the ability to understand *why* the program worked or did not work.

To reframe, the impact of any social program needs to be understood within the context of the participants. The program is applied *within* the context, not *to* the individual. Therefore, it becomes how the specific situation digests the program that determines its effectiveness, not solely the program itself.

### *Inconsistent Findings*

Experimental evaluation has been plagued with inconsistent findings when applying interventions across populations. Interventions that have been evaluated to have a positive effect on one population don't have the same effect when applied to other populations. This is in part what happened with the Alberta back campaign. One reason for these discrepancies is that subgroups or samples have changed or have different characteristics, which may make the participants more or less amenable to

change.(Pawson & Tilley, 1997) Instead of trying to identify and understand these characteristics, experimental theory looks to focus on controlling for these characteristics. For example, in an experimental evaluation, the investigator would look to ensure that the sub-groups (control group and intervention group) were equivalent.(Pawson & Tilley, 1997) In other words, the focus would remain on the method to provide a clear answer. Even though experimental designs may seek to identify characteristics, the tendency is to combine the idea of personal choice into one variable, *motivation*, when in fact, an individual's volition to change can be impacted by many other contextual factors. (Pawson & Tilley, 1997)

In summary, traditional evaluation theory is not entirely complete when dealing with social phenomenon on three levels. First, gaining equivalency within control and intervention groups is difficult because personal and group characteristics can constrain choice, thereby impacting the outcome. Second, even if equivalency can be achieved in one population (Victoria, Australia), it does not mean that this population will be equivalent to a different population (Alberta, Canada). Third, the intervention cannot be singled out as the sole cause of the outcome, as outcome in social phenomenon is generated from the potential combination of many factors. Characteristics implicit to each population are key to creating or resisting change. In short, without specifically identifying and understanding the active contextual factors in a population, the outcome of an intervention will not be fully understood. Therefore, making generalizations or claims of effectiveness or non-effectiveness are not entirely accurate.

### **Description Of Hornik And Yanovitsky's Theory Of Social Marketing**

Hornik and Yanovitsky's theory of social marketing is a mid-range theory. It is a mid-range theory because its concepts are not as abstract as with a meta-theory. (Van Sell & Kalofissudis 2009) The concepts are more focused toward health behaviour and can be evaluated. (Van Sell & Kalofissudis 2009) The theory does focus on social marketing campaigns as the instrument of change. As graphically represented in Figure 1, this theory is also based in a *linear* model of change. In general, the theory posits that effective social marketing campaigns lead to health behaviour change. The theory incorporates complexity in two ways: 1) it includes intermediate steps, or causal links, between the intervention and health behaviour change, and 2) it acknowledges that evaluating social phenomenon is complex and incorporates social and institutional factors.

The first point concerning intermediate steps simply states that there is more than one link in the causal chain from intervention to behaviour change. This model, similar to other health behaviour models, assumes that behavioural change occurs in a series of steps, with the completion of one step directly leading to a positive shift in subsequent steps, somewhat like a domino affect. In Hornik and Yanovitsky's theory, the first step required to achieve change in health behaviours is the acquisition of knowledge. Acquisition of knowledge leads to or causes a change in belief. The change in belief then leads to an intention to act. Once an individual has an intention to act, a new behaviour emerges. These steps are linear, mechanistic, and rely on the individual having unimpeded choice to act. (Pawson & Tilley 1997)

The second point of complexity in the theory relates to evaluating social phenomenon. Hornik and Yanovitsky see behavioural change as being impacted not only by an individual's direct exposure to campaign messages, but also through the diffusion of campaign messages through social and institutional pathways.(Hornik & Yanovitzky, 2003) An individual can be directly exposed such as through television advertisements, bus advertisements and pamphlets, or the individual can also be indirectly exposed to the information in these same sources through the diffusion of messages into the person's social circles (family, friends) and institutions (work, organizations).

Even though the sphere of influence has expanded, the idea still remains the same: the marketing campaign is the cause of any measurable changes because the intervention, the campaign message, is what is being diffused. The more times an individual sees an ad, and also, the number of times and places that the information is discussed through social and institutional channels, the greater the chance for change.(Hornik & Yanovitzky, 2003) It assumes that the context of the campaign, or the personal, institutional, and social elements, do not create change, other than through the campaign itself.

This approach is mechanistic in nature.(Pawson & Tilley, 1997) The more the person hears and sees a message, the more likely they are to change their beliefs and subsequent health behaviours. The force that sets this train into motion is the mass media campaign itself. Get the information out to as many people as possible, and the

individual will have no choice but to shift belief and subsequent behaviour. The individuals are seen as having complete and unlimited choice to accept and utilize the information because it has been projected as correct information.

### **Challenges To Hornik And Yanovitsky's Theory**

Hornik and Yanovitsky's mid-range theory of social marketing falls within the experimental evaluation paradigm, and therefore has the same challenges. One of the most structurally obvious successive characteristics of this theory is the positioning of information diffusion as the pre-eminent variable of belief and behavioural change. It is not only the information in the campaign that is to be the cause of change, it is also the number of times an individual gets the information. The more pathways of information that get to the individual the greater the opportunity for change. This speaks to the repeatability of the cause-effect relationship. Even though Hornik and Yanovitsky expand on the pathways of diffusion, they do not expand on the pathways of change. The pathway of change remains the same – knowledge diffusion. They do not consider multiple pathways of individual constrained choice, and they do not address individual powers and liabilities. (Pawson & Tilley, 1997)

Another major challenge to this theory is the foundational linear model of change. The degree of exposure to the program is assumed to change beliefs that then impact intentions to act and eventually subsequent behaviour. It assumes that once the information gets to the individual, the wheel is set in motion. The social and institutional pathways in this model are only assumed to impact the knowledge diffusion, and are not

intrinsic to each step of the model. Even though Hornik and Yanovitsky suppose that there are institutional barriers, they occur at a single point in the model and provide a direct influence on shifting intention to behaviour. In actuality, personal and structural powers and liabilities exist at all points along the pathway from knowledge diffusion to behavioural change, interacting in a multitude of combinations at various points along the path. (A. M. Clark et al., 2008; Pawson & Tilley, 1997) Even though the process of change may appear linear, many variables must come together in the right combination and under the right circumstances, skewing the causal pathway and making it non-linear. (A. M. Clark et al., 2008; Pawson & Tilley, 1997; Pawson, 2003)

A linear model also assumes that individuals are passive receivers of information, have absolute freedom to make choices, *and* will make choices based on the information provided. There is no inclusion of understanding how or why people make choices, or for that matter, why they do not make certain choices. Without this knowledge, meaningful information pertaining to program effect cannot be provided, resulting in limited ability to modify programs, or apply them to different populations.

Albeit logical, and inclusive of institutional and social phenomena as a function of knowledge diffusion, this model does not comprehensively address complexity within socially driven phenomena. The assumptions made by the model do not explain the gaps in change in beliefs and especially, change in behaviour. Behavioural change is viewed as uni-dimensional and caused by an intervention, when in fact, behavioural change is multi-dimensional and reliant upon human agency and structural variables.

(A. M. Clark et al., 2008) Linear theories fit certain situations, but do not appear comprehensive enough for the design and evaluation of social initiatives such as mass media campaigns. The Hornik and Yanovitsky model, along with many other theories of change, falls short when used to design and evaluate the root generators of change from a social program within a complex social milieu.

### **Alternatives To Traditional Experimental Theory**

In critiquing experimental evaluation's application to social programs, we have come to one broad conclusion: personal and structural factors are operational in change and need to be understood, not controlled, in order to provide insightful observations and conclusions about social programs, such as social marketing campaigns. Social phenomena exist in open systems, and therefore, cannot be holistically evaluated using the assumptions of a closed system, such as that which underpins experimental evaluation. (A. M. Clark et al., 2008)

In order to provide a structure for evaluations addressing this conclusion, further study of relevant meta-theory is necessary. Two such meta-theories that have previously been used in evaluating social programs and behavioural change are *critical realism* and *realistic evaluation*. Both of these meta-theories operate within a generative versus a successive causation theory. (Pawson & Tilley, 1997) They are generative in that a key tenet to both is the idea that the individual or community is the generator of change and that change in this manner is not linear, but relies upon the interaction of multiple factors within a particular context to determine change. (A. M. Clark et al.,

2008; Pawson & Tilley, 1997; Pawson, 2003) It moves beyond the simple and sole explanation of information diffusion as the primary cause of change. It also moves toward addressing the complexity of social phenomenon by identifying patterns in social phenomena, then going underneath the identified patterns to understand *why* these patterns exist. (A. M. Clark et al., 2008)

Variables that generate change include both personal and structural factors. Personal factors include beliefs, attitudes, and personal meaning. (A. M. Clark et al., 2008) Structural factors include components such as social norms, physical environment, and geography. (A. M. Clark et al., 2008) These factors coalesce in relatively unpredictable ways to transform individual or group behaviour. (A. M. Clark et al., 2008; Pawson & Tilley, 1997) The intervention is important as it functions within a specific context. Researchers must therefore evaluate the relationship between intervention and the context. This evaluation includes events that are observable, structures that impact the events that may not be directly observable, and human perceptions and experiences. (A. M. Clark et al., 2008) We hypothesize that by using a meta-theory, such as critical realism or realistic evaluation, to structure evaluation researchers will be able to create more clear hypotheses as to potential pathways of change for the population under study. This will facilitate the development of comprehensive evaluations of the relevant pathways using both quantitative and qualitative methods as necessary.

Understanding why a program worked or didn't work, or what elements were successful and which weren't allows for: 1) continued evolution of the program that best reflects the

current social state and, 2) other populations to look at a program to see if they could apply the program or modify certain aspects to suit the cultural climate of their population. With this in mind, information from one study can be used to inform other studies in other populations because the evaluation has provided not only the pattern within a population but understanding of the mechanisms of change. In essence, programs are theories in action, and the evaluation of programs helps broaden the contextual knowledge of a particular theory so that this knowledge can be transferred to other program initiatives as it fits a unique context. (Pawson, 2003)

For example, although it appears the Australian back pain campaign led to both belief and behaviour change, we don't know exactly why the intervention was successful. Was it due to the sheer size of the campaign, the Australian cultural attitudes toward social marketing campaigns, the visual images, the text, or other social or personal variables? Additionally, while we know the Alberta campaign had little impact on behaviour change, we can only speculate as to why this was the case. If we knew some of the specific factors that generated change in Australia but not Alberta, we could use these to evaluate other populations and develop social marketing programs that truly reflect present needs.

### *Conclusions*

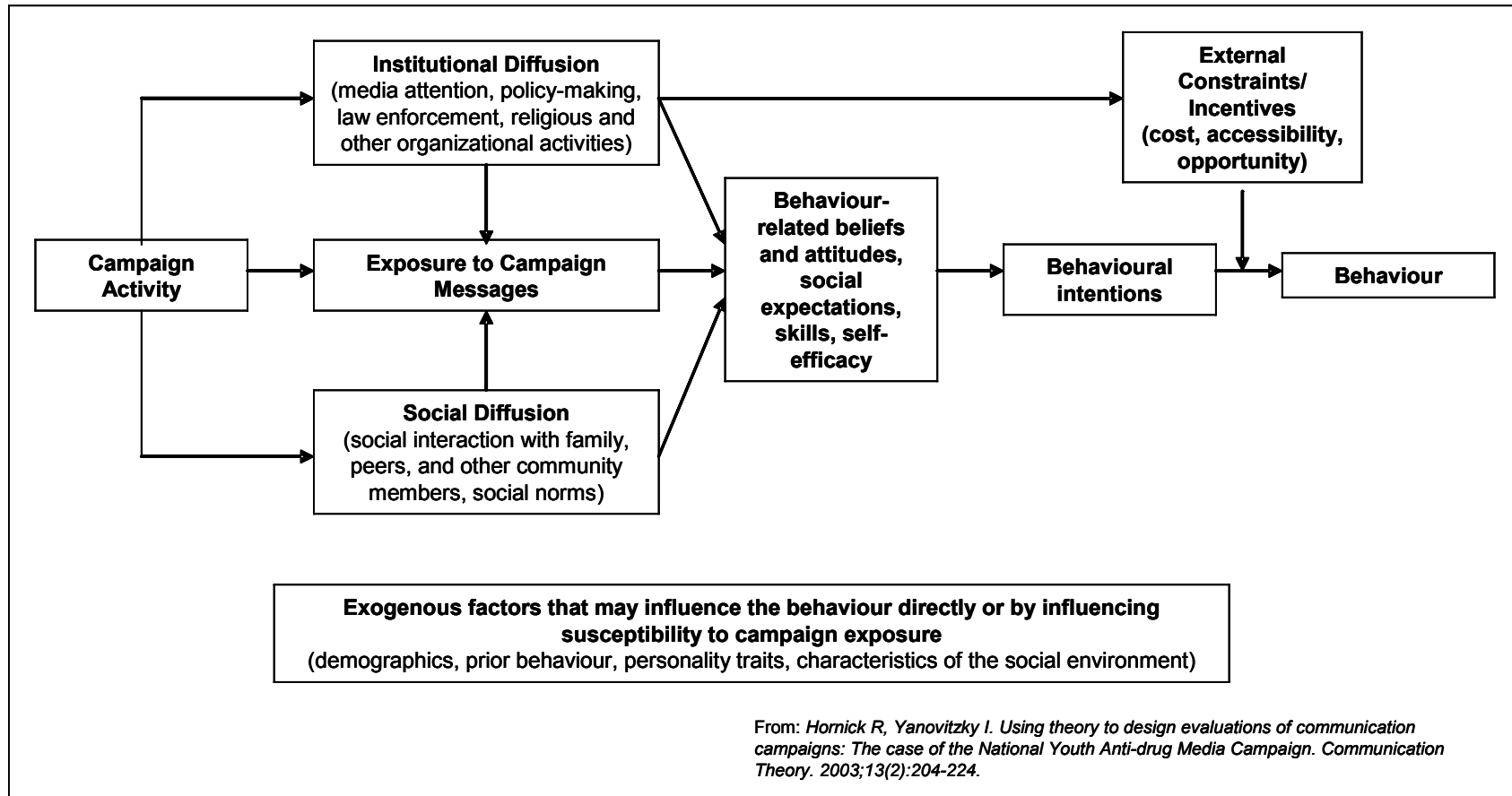
Hornik and Yanovitsky's theory, while informative, did not provide the assumptive framework required to comprehensively evaluate the impact of a social marketing campaign in a way that allows the results to be transferred to other programs. We are left with only speculations regarding *why* the Alberta back pain mass media campaign did not work as well as the previous Australian version. Future research should investigate the applicability of critical realism and realistic evaluation, which may provide more thorough answers to the mechanisms behind intervention effectiveness. Using a meta-theory that embraces the complexity and uncertainty of social programs, such as critical realism, allows mid-range theories like Hornik and Yanovitsky's to be used to guide evaluation of hypothesized specific causal pathways brought forth through the meta-theory. Under the umbrella of a complexity-based meta-theory, Hornik and Yanovitsky's theory can also develop and be used to provide relevant information.

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Figure I

Theoretical framework for mass media interventions (from Hornick and Yanovitzky 2003)



**Table I: Characteristics of Subjects Participating in Back Pain Belief Surveys**

	Alberta				Saskatchewan			
	2005	2006	2007	2008	2005	2006	2007	2008
Number of interviews	1060	1065	1069	1072	1072	1067	1097	1064
All values represent percentages								
Male Gender*	49.7	51.4	36.9	38.0	51.2	50.7	39.0	35.5
Age Category*								
18-24	10.5	7.4	6.1	4.8	9.2	7.3	7.7	7.3
25-34	20.5	19.0	15.9	15.2	15.3	14.6	14.9	13.0
35-49	32.1	34.6	36.4	32.6	31.4	30.6	28.6	27.4
50-65	25.9	27.0	29.3	31.7	27.6	31.5	32.4	30.3
> 65	11.0	11.9	12.3	15.7	16.5	16.0	16.4	21.9
Urban Residence*	50.9	46.1	41.3	44.7	44.2	40.0	41.7	39.9
Ever Had Back Pain	83.6	82.4	84.4	85.4	84.2	84.3	84.7	83.6
Back Pain in Last Year	62.0	61.1	64.3	62.0	62.0	63.4	62.4	62.5
Back Pain in Last Week	34.0	31.8	37.4	33.0	34.1	37.3	36.5	34.2
Aware of Any Back Pain								
Advertising	53.1	52.0	52.0	53.7	54.9	56.9	55.2	56.8
Pre-campaign Awareness of “Stay Active” Messaging	4.0	-	-	-	3.2	-	-	-
Post-campaign Awareness of Campaign Messaging*	-	31.9	42.7	49.2	-	32.0	36.5	38.8
Advertising changed attitudes or beliefs*	12.1	19.3	26.5	29.7	15.0	20.3	25.0	28.6

\* Significant difference in Alberta between surveys (P < 0.001)

**Table II: Back Pain Beliefs of Population Survey Participants**

	Alberta				Saskatchewan			
	2005	2006	2007	2008	2005	2006	2007	2008
Mean BBQ* score	26.7(6.4)	26.7(6.4)	26.1(6.7)	26.7(7.0)	26.2(6.3)	26.0(6.7)	25.6(6.5)	25.5(6.5)

*Items Used in Scotland Campaign Evaluation*

% Agreeing with item: *If you have back pain you should try to stay active.\*\**

Alberta 2005	55.5	Alberta 2006	61.8	Alberta 2007	61.5	Alberta 2008	63.4	Saskatchewan 2005	59.7	Saskatchewan 2006	59.0	Saskatchewan 2007	62.8	Saskatchewan 2008	58.3
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% Disagreeing with item: *If you have back pain you should rest until it gets better.†*

Alberta 2005	46.4	Alberta 2006	47.2	Alberta 2007	50.0	Alberta 2008	50.9	Saskatchewan 2005	47.1	Saskatchewan 2006	47.0	Saskatchewan 2007	45.1	Saskatchewan 2008	44.4
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% Agreeing with item: *Simple painkillers are usually enough to control most back pain.*

Alberta 2005	25.3	Alberta 2006	25.7	Alberta 2007	27.0	Alberta 2008	25.6	Saskatchewan 2005	24.9	Saskatchewan 2006	26.6	Saskatchewan 2007	27.3	Saskatchewan 2008	25.1
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% Agreeing with item: *Most back pain settles quickly and you can get on with normal activities such as going to work.*

Alberta 2005	26.5	Alberta 2006	26.7	Alberta 2007	29.7	Alberta 2008	27.5	Saskatchewan 2005	25.4	Saskatchewan 2006	28.6	Saskatchewan 2007	25.0	Saskatchewan 2008	25.1
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\* BBQ = Back Beliefs Questionnaire, Maximum score = 45 with higher scores indicating more positive back pain beliefs

\*\* Significant interaction ( $p = 0.018$ ) between province and time after adjusting for age, sex, urban residence, previous back pain experience and awareness of back pain media messaging (adjusted OR = 0.91 (0.84 - 0.98))

† Significant interaction ( $p = 0.012$ ) between province and time after adjusting for age, sex, urban residence, previous back pain experience and awareness of back pain media messaging (adjusted OR = 0.91 (0.84 - 0.98))

Table III

## Characteristics and Back Pain Beliefs of Nursing and Construction Trade

Students	Before Campaign	After	p Value
<b>Construction Trade Students</b>	<i>(n = 169)</i>	<i>(n = 257)</i>	
Age in Years	25.6	24.6	0.08
Female Gender	11.2	5.8	0.04
Previous Back Pain	91.1	88.3	0.36
Mean BBQ* score	26.5 (6.1)	26.4 (6.8)	0.92
% Agreeing with item:			
<i>Back trouble must be rested.</i>	82.8	84.0	0.74
<i>A bad back should be exercised.</i>	78.1	76.7	0.73
<b>Nursing Students</b>	<i>(n = 108)</i>	<i>(n = 60)</i>	
Age in Years	21.2	20.7	0.34
Female Gender	91.7	96.7	0.21
Previous Back Pain	88.9	88.3	0.94
Mean BBQ* score	28.6 (5.4)	29.0 (6.1)	0.67
% Agreeing with item:			
<i>Back trouble must be rested.</i>	87.0	81.7	0.35
<i>A bad back should be exercised.</i>	74.1	61.7	0.09

\* BBQ = Back Beliefs Questionnaire

## Paper Three

### Validity and Factor Structure of the Back Beliefs Questionnaire

Bostick GP, Schopflocher D, Gross DP. For submission to the Clinical Journal of Pain.

#### Abstract

**Background** We examined the factor structure and internal consistency of the Back Beliefs Questionnaire (BBQ) in a sample of the general population. We hypothesized that the factor structure would be similar to that reported by the initial developers.

**Methods** A population-based, cross-sectional study was conducted. Data for this project was obtained as part of a larger study evaluating a back pain social marketing intervention. Computer-Assisted Telephone Interviews (CATI) were conducted in three survey waves from April 2006 to May 2008 and overall 7,201 individuals participated in the survey. In order to measure beliefs about back pain, the Back Beliefs Questionnaire (BBQ) was administered. Exploratory factor analytic techniques were used.

**Results** The internal consistency of the 14-item scale was adequate at  $\alpha = 0.74$ . The factor solutions contain the same items used in the initial scoring of the BBQ, while distracter items loaded onto a second factor. Thus, our derived factor solutions support the factor structure described by the developers of the BBQ.

**Conclusions** This study provides strong evidence supporting the validity of the BBQ. Future work on the validity of the BBQ should confirm the factor structure in large clinical samples, evaluate the external component of validity (e.g. convergent, divergent, and construct validity) and potential differences between BBQ scores with and without the distracter items included.

### Introduction

Back pain is a significant burden to both the individual affected and society. The optimal method to manage back pain remains elusive. Thus, novel approaches to minimize individual and societal burden have been developed. For example, researchers have constructed mass-media campaigns to modify maladaptive beliefs of the public to become more in line with evidenced-based guidelines [1-3]. These campaigns have consistently been successful in modifying public beliefs about back pain [1-3] and at times have been associated with reduced disability from back pain [1]. However, more research is needed to evaluate such campaigns and determine the most effective mode of delivery [4].

In previous evaluations as well as other studies examining back pain beliefs, a variety of measurement tools have been used. One commonly used self report instrument used to measure beliefs about back pain is the Back Beliefs Questionnaire (BBQ) [5]. The BBQ has been used in a variety of settings [6-11], however the evidence of its validity is not extensive. Important components of the validity of a measurement tool are its factor structure and internal consistency. Moreover, the structure of any measurement tool is imperative to examine as this has important implications for score interpretation [12]. The factor structure of the BBQ has been reported by the developing authors; however it has not been formally evaluated outside of that cohort.

The aim of this study was to examine the factor structure and internal consistency of the BBQ in a general population sample. We hypothesized that the factor structure and internal consistency of the BBQ would be similar to that reported by the developers.

### **Methods**

#### *Study Design and Participants*

A population-based, cross-sectional study was conducted. Data for this project was obtained as part of a larger study evaluating a back pain social marketing intervention. Computer-Assisted Telephone Interviews (CATI) were conducted in three survey waves from April 2006 to May 2008. A simple randomized sampling technique was used to select individuals 18 years and older from Alberta and Saskatchewan. The sample was equally split between the two provinces and overall 7,201 individuals participated in the survey. The University of Alberta Health Research Ethics Board approved this study.

#### *Survey instrument*

In order to measure beliefs about back pain, the Back Beliefs Questionnaire (BBQ) was administered. The BBQ was designed to measure beliefs about the inevitable consequences of low back problems [5]. This questionnaire has been used to evaluate beliefs in both general and clinical populations. The scale's developers have reported adequate internal consistency ( $\alpha = 0.70$ ) and test-retest reliability (ICC = 0.87) [5], however this has not been replicated in a separate, independent sample. The questionnaire consists of 14 items (Table I) and each item is scored on a five-point Likert agreement scale. Nine items are used in the scoring of the questionnaire with the

remaining items considered distracters. These nine items have been reported as comprising one factor [5]. Possible scores range between 9 and 45 with lower scores indicating more maladaptive or pessimistic beliefs about back pain.

Along with the BBQ, additional sample characteristics were gathered such as demographics (age, gender, rural vs. urban residence, residing province) and history of back pain.

### *Analysis*

Descriptive statistics were used to summarize the study participant's characteristics as well as their BBQ scores. Reliability was assessed using Cronbach's alpha ( $\alpha$ ) estimate of internal consistency with a coefficient greater than 0.70 being considered adequate scale consistency [13]. While previous evidence exists for the factor structure of the BBQ, it has not been studied extensively enough to warrant the use of confirmatory factory analysis. Thus, exploratory factor analytic techniques were used to examine the factor structure of the BBQ. Based on previous work by the scale developers, we hypothesized that the nine items used for scoring on the BBQ would load onto one factor, while the distractor items would load onto another factor(s) and would likely not be interpretable.

The data was randomly divided into two samples. Exploratory factor analysis was performed on each sample and the solutions compared to determine if the solutions were stable. Exploratory factor analysis was performed in three steps. Initially, we

determined the number of factors to retain for analysis using two factor retention rules: the Kaiser-Guttman criterion and examination of the scree plot. The Kaiser-Guttman criterion determines the number of factors as the number of eigenvalues equal to or greater than one. The scree plot involves a qualitative evaluation of a graph with eigenvalues plotted on the y-axis and number of factors on the x-axis. Multiple retention rules were used to minimize the risk of over- or underestimating the numbers of factors retained [14]. Once the number of factors was estimated, the second step was to perform factor extraction. Principle axis and principle components extraction were both used as they can yield different results. The primary difference between the two extraction techniques is that principle components extraction assumes perfect item reliability while principle axis extraction does not. Finally, the factors were rotated. Orthogonal rotation (Varimax) was performed as we assumed that the factors are not correlated and this technique typically allows for more ease in interpreting factor solutions. Moreover, we would not expect a clinically meaningful correlation between the factor that is comprised of the items used for scoring the BBQ and the factor(s) that are comprised of distracter items. Thus, oblique transformations that allow factors to correlate (e.g. Direct Oblimin) were not considered. The criterion factor loading value that determined which items were considered salient was set at  $|0.300|$ . Due to the concern that the factor retention rules occasionally over- or under-estimate the number of factors to be retained, multiple solutions were evaluated. The final solution was the one that best met the interpretability criteria found in Table 2 [13,15]. All data were analyzed using SPSS for Windows version 17 (SPSS Inc., Chicago, IL, USA).

The sample size requirement for this analysis was based on the primary analysis method, exploratory factor analysis. The sample size was adequate for exploratory factor analysis and also permitted splitting the sample [16].

### **Results**

Of the 7,201 participants, 6,434 (89.3%) had complete data for the primary variable of interest (BBQ). Randomly splitting the data yielded two data sets,  $n_1 = 3,143$  and  $n_2 = 3,051$ . A comparison of descriptive data between those with complete and missing data revealed some statistically significant differences. Participants with missing data were more likely to be older (57.8 versus 48.0 years), and less likely to have a lifetime (74.7% versus 84.1%) or 12-month history of back pain (53.7% versus 62.6%). The description of the sample including the mean BBQ score can be found in Table 3.

#### *Exploratory Factor Analysis*

The Kaiser-Guttman rule suggested a three factor solution for data set one (eigenvalues = 3.5, 1.4 and 1.2) and four for data set two (eigenvalues = 3.5, 1.4, 1.2, 1.0). The scree plot suggested a three factor solution in both data sets. Given this discrepancy, the potential for over- or under-estimation of these two rules and the previous reports of the factor structure of the BBQ, two, three, and four factor solutions were evaluated against the interpretability criteria in both data sets (Table 4). The principle axis solutions were consistently more interpretable when compared to the principle components solutions. Thus, only the principle axis extraction procedures are presented.

Based on the interpretability criteria, either a two or three factor solution was found to be best. The three factor derived solution appears to better represent the observed data (based on the proportion of residual correlations less than 0.05), however the two factor solution has a more simple structure. It should also be noted that the explained variance is relatively low (24.2% - 31.4%) and was similar in both solutions. The first factor in both solutions contain the same items used in the scoring of the BBQ described by the developers, while the distracter items loaded on to the second factor in the two factor solution or the second or third factor in the three factor solution. Thus, our derived factor solutions support the factor structure described by the developers of the BBQ. The only difference in the pattern loading was with item one (“there is no real treatment for back trouble”). In our analysis, item number one did not load on the same factor as the other eight items used in the scoring of the BBQ. It is possible that this item does not measure the same construct as the other eight items. Qualitative analysis of the factor loadings demonstrated that the first factor seemed to tap into an interpretable belief construct possibly labelled pessimism. However, the factor(s) that contain the distracter items do not appear to represent an interpretable construct warranting inclusion in the scoring of the BBQ. Refer to Table 5 for the salient factor loadings and communality coefficients for each item.

### *Internal consistency*

The internal consistency of the 14-item scale was  $\alpha = 0.74$  in data sets one and two. The internal consistency for factor 1 was  $\alpha = 0.75$  in data sets one and two. As expected, in the apparently non-interpretable factor(s) containing the distracter items,

the internal consistency was less than  $\alpha = 0.38$  in both data sets and using a two or three factor solution.

### **Discussion**

Our results support the original factor structure of the BBQ as described by the developers, with the exception of item 1. This supports the construct validity of the BBQ as a measure of beliefs about the inevitable consequences of low back problems. Additionally, the internal consistency of the BBQ found in our study ( $\alpha=0.75$ ) is similar to previous reports and is at an acceptable level [13]. The factor structure and internal consistency were similar in both randomly split samples further supporting the factor structure reported in this study. It should be noted that the explained variance in the factor solutions are quite low. This is potentially problematic in that the interpretation of an overall score may 'lose' important variance explained when items are combined into one score. Therefore, users of the BBQ may want to also interpret individual item scores in addition to the overall score.

The only difference between our findings and the original factor structure of the BBQ was the loading pattern of item 1 ("there is no real treatment for back trouble"). Previous research has included item 1 in the scoring of the BBQ, while our results suggest that it does not tap into the same construct as the other scored items. However, the correlation between the nine-item BBQ and the eight-item (with item 1 removed) remains very high ( $r=0.98$ ). Furthermore, the internal consistency coefficient (Cronbach's alpha) remains unchanged whether item 1 remains in the overall score or

not ( $\alpha=0.75$ ). Thus, in this sample, it is possible that inclusion or exclusion of item 1 does not make a meaningful difference in the scoring of the BBQ. Closer qualitative examination of item 1 may indicate some difficulty in interpreting its meaning. “No real treatment” could be interpreted as treatment effectiveness, or more literally as no treatment is available. This potential discrepancy in interpretation may account for the lack of consistency in the loading pattern of this item.

Given that five or six of the 14-item BBQ are not considered in the overall scoring, some researchers may choose to include only the items involved in the scoring of the instrument for future use. This may lead to significant cost savings when the number of items is considered in determining the cost of data collection, as is the case with CATIs and general population surveys. However, the presence of distracter items may change how the research participant interprets the BBQ. Thus, the interpretation of the BBQ without the distracter items may be different from the original 14-item scale. Further research is necessary to investigate the validity of a short-form BBQ without distractors.

The primary limitation of this study is its cross-sectional nature. This limits the ability to examine other aspects of validity such as the stability of the tool over time and the ability to ascertain a clinically meaningful BBQ score. We also found systematic differences in participants with and without complete data on the BBQ. The potential implications of the effects of missing data on the factor structure cannot be adequately examined in this study, however given the large sample size it is possible that the effect is minimal. Another potential limitation is the low communality estimates which could

indicate the presence of measurement error and may adversely impact the quality of factor analysis. Given the complexity of psychological constructs, relatively low communality coefficients are common [17]. This can also lead to challenges in meeting sample size requirements. However, even after splitting our sample, minimum sample size requirements were easily met [16]. Moreover, the strength of communality coefficients does not necessarily mean they are interpretable [18]. Thus evaluation of the strength of the communality coefficients must be tempered with an evaluation of whether the item(s) under question are interpretable. Given that previous research supports a similar factor structure and the loading patterns of the items are interpretable, the low communality coefficients on their own do not necessarily impact our confidence in the derived factor solution.

### *Conclusion*

We have provided strong evidence in support of the construct validity of the BBQ. Future work on the validity of the BBQ should confirm the factor structure in large clinical samples, evaluate the external component of validity (e.g. convergent, divergent, and construct validity) and potential differences between BBQ scores with and without the distracter items included.

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**Table I. Items within the Back Beliefs Questionnaire (BBQ)**

- 
- Q1. There is no real treatment for back trouble.
- Q2. Back trouble will eventually stop you from working
- Q3. Back trouble means periods of pain for the rest of one's life
- Q4. Doctors cannot do anything for back trouble
- Q5. A bad back should be exercised
- Q6. Back trouble makes everything in life worse
- Q7. Surgery is the most effective way to treat back trouble
- Q8. Back trouble may mean you will end up in a wheelchair
- Q9. Alternative treatments are the answer to back trouble
- Q10. Back trouble means long periods of time off work
- Q11. Medication is the only way of relieving back trouble
- Q12. Once you have had back trouble there is always a weakness
- Q13. Back trouble must be rested
- Q14. Later in life back trouble gets progressively worse
-

Table II. Interpretability criteria adapted from Thurstone and Norman and Striener

Criteria	Description
Simple structure	Each item has only one salient loading ( $> 0.300$ ) on one factor.
Explained variance	The derived factor solution explains as much variance as possible and the distribution of variance is similar among factors.
Proportion of residuals $< 0.05$	Smaller proportions indicate that the derived factor solution represents the observed data (i.e. good fit).
Qualitative assessment	The item distribution among factors is interpretable based on known literature and theory.

**Table III. Sample characteristics (n = 7,201)**

Variable	Frequency (%) or Mean (SD)
Age category	
18-24	449 (6.2)
25-34	1,054 (14.6)
35-49	2,203 (30.6)
50-65	2,185 (30.3)
over 65	1,289 (17.9)
refused	21 (0.3)
Gender (female)	4,226 (58.7)
Province of residence (Albertan)	3,601 (50.0)
Geographic location of residence (rural)	4,161 (57.8)
Lifetime history of back pain	5,986 (83.1)
History of back pain in past 12 months	4,442 (61.7)
History of back pain in past week	2,510 (34.9)
Mean BBQ score	26.1 (6.6)
SD = standard deviation	

**Table IV. Comparison of two, three and four factor solutions in each data set based on interpretability criteria.**

Criteria	Data set #1 (n=3, 143)			Date set #2 (n=3, 051)		
	2 factor solution	3 factor solution	4 factor solution	2 factor solution	3 factor solution	4 factor solution
Explained variance	24.2%	28.0%	31.4%	24.3%	28.4%	31.4%
Number of complex items	1	2	3	1	3	3
Factor to variable ratio	7:1	4.7:1	3.5:1	7:1	4.7:1	3.5:1
Proportion of residuals < 0.05	26.0%	9.0%	1.0%	27.0%	8.0%	1.0%
Qualitative interpretability	√	√	X	√	√	X

**Table V. Factor loadings and communality coefficients for a two-factor solution derived by Principle axis extraction and Varimax rotation**

Items	Salient factor loadings*		h <sup>2</sup> (Set 1/Set 2)
	(Data Set 1/Data Set 2)		
	Factor 1	Factor 2	
Q1.		0.46/0.50	0.25/0.28
Q2.	0.46/0.48		0.23/0.23
Q3.	0.45/0.47	0.40/0.37	0.36/0.36
Q4.		0.49/0.47	0.28/0.27
Q5.			0.06/0.04
Q6.	0.48/0.49		0.23/0.24
Q7.		0.36/0.39	0.14/0.18
Q8.	0.34/0.40		0.16/0.18
Q9.			0.05/0.04
Q10.	0.57/0.63		0.37/0.42
Q11.		0.55/0.49	0.33/0.30
Q12.	0.55/0.54		0.34/0.32
Q13.	0.42/0.40		0.20/0.17
Q14.	0.60/0.60		0.39/0.39

h<sup>2</sup> = communality coefficient

\*salient loadings > |0.30|

## **Re-conceptualizing the Mechanisms Underlying the Mass Media Campaign**

### **Effectiveness: Implications for Future Evaluations**

M Miciak and Gross DP

#### **Abstract**

This paper briefly describes traditional experimental evaluation theory and challenges faced by this theory. We also provide a detailed consideration of Hornik and Yanovitsky's theory of mass media campaign influence, and discuss challenges faced when comprehensively evaluating social marketing campaigns. We then provide alternative ideas regarding both meta and mid-range theories that may enhance program evaluation and development. When studying social phenomena, such as behavioural change, contextual factors such as social support, psychological characteristics, and personal meaning are implicit to the phenomenon and therefore, to the impact of the intervention. Personal and structural factors are operational in change and need to be understood, not controlled, in order to provide insightful observations and conclusions about social programs, such as social marketing campaigns.

### Introduction

Theory is an integral component of evaluative research. Theory provides the basic tenets and the specific structure to comprehensively develop and institute an evaluation, and theory guides the types of questions that are asked. Not all theories work with all evaluations, nor are all theories complete in their assumptions and foundational components. Therefore, it is important to choose a theory that is congruent with the phenomenon being evaluated and the complexity of questions being asked.

There are different levels of theory. Meta-theory is seen as all encompassing, providing broad principles that can be applied throughout many disciplines and over large groups or institutions. (A.M. Clark 2008; Van Sell & Kalofissudis 2009) Mid-range and low-level theories narrow their focus, becoming more discipline or area specific, moving into smaller groups and individuals. (A.M. Clark 2008; Van Sell & Kalofissudis 2009) All of these levels of theory can be integrated into an evaluation, depending on its intention, scope, and complexity.

In the Alberta Back Pain Evaluation, we studied the impact that a social marketing campaign had on Albertan's beliefs and behaviours regarding the management of low back pain. This campaign was based on a massive and monumentally successful social marketing campaign in Victoria, Australia. The Australian campaign shifted both beliefs and behaviours within both the medical and general population. (Buchbinder, Gross, Werner, & Hayden, 2008) The Alberta evaluation was informed by Hornik and Yanovitsky's theory of the mechanism of mass media campaign impact (Hornik &

Yanovitzky 2003, see Figure I). This mid-range theory is grounded in an experimental evaluation meta-theory, and has been informed by other mid-range theories, such as the theory of reasoned action, health belief model, and social cognitive theory. (Hornik & Yanovitzky, 2003)

The results of the Alberta campaign were not as robust as the Australian results. Only moderate change was found in beliefs, and no significant change in behaviour was noted. These findings prompted us to ask, “Why?” Why does a social marketing campaign, based in a particular theoretical model, work in a particular population but not another? Why do changes in beliefs not consistently lead to changes in behaviour? Are we any further in providing guidance to policy makers and program developers?

To answer these questions, we returned to the theories that informed the evaluation. This led us to explore not only the assumptions of Hornik and Yanovitsky’s theory, but also those of the traditional experimental evaluation theory as a whole. We will describe the experimental evaluation theory and challenges faced by this theory. This will be followed by a detailed consideration of Hornik and Yanovitsky’s theory with consideration of the challenges faced when comprehensively evaluating social marketing campaigns. We will then provide alternative ideas regarding both meta and mid-range theory that will not only enhance program evaluation, but program development as well.

### **Description Of Traditional Experimental Evaluation**

In experimental evaluation studies, we are typically looking to identify a cause and effect relationship. In traditional experimental evaluation causation is assumed to be successive in nature, or in other words a cause (intervention) leads to an effect (outcome).(Cornwall & Murrell, 1993; Pawson & Tilley, 1997) The underpinning of this evaluation theory lies in the assumption that we cannot directly observe change (i.e. the cognitive process of someone changing a belief), therefore, the change must be inferred.(Pawson & Tilley, 1997) In order for an accurate inference to be made, we must examine the link between the intervention and outcome. (Pawson & Tilley, 1997)

The theory also posits that contextual factors, or factors internal to the phenomenon being studied, such as past experience, meaning, and social support, can and must be controlled or accounted for in order to maintain the integrity of the causal link. (Pawson & Tilley, 1997) The purported result is an accurate evaluation of the intervention's external effect. For example, if a program is implemented in a community, and there is a positive change in that community, the change is assumed to be due to the intervention. This is especially true if the study design incorporated a comparison group where the intervention was not implemented and there was no change in that group.

The driving inference in this meta-theory is that the positive outcome is the direct result of the intervention. Contextual factors are viewed as limiting in that they interrupt the

ability to cleanly determine the causal link between the intervention and the outcome.(Pawson & Tilley, 1997)

### **Challenges Of Traditional Experimental Theory**

Traditional experimental theory has been widely used within the evaluation literature and is seen as the pre-eminent research theory (Hornik & Yanovitzky's mid-range theory is one application). Even though this theory has underpinnings that may be viable in certain circumstances, such as in laboratory settings, it becomes challenged when it is the primary theory used to evaluate social phenomenon. (A. M. Clark et. al. 2008) This is the case largely because social phenomena are a complex mixture of personal agency and structural factors. (A. M. Clark et al. 2008) We will now outline some of the challenges that this theory presents when working in the social realm.

#### *Method Driven*

As previously described, traditional experimental evaluation theory is based on the assumptions that 1) we can isolate the effect of an intervention through controlling or accounting for factors outside of the intervention that could possibly impact the outcome and 2) through repeating the intervention a number of times, we will be able to infer whether a causal relationship exists or whether it does not exist. In order to be able to fulfill these assumptions, this type of evaluation must rely on very rigorous design parameters.(Cornwall & Murrell, 1993) In condensed terms, the theory is very *method driven*.(Pawson & Tilley, 1997)

The meaning of method driven is quite literal. It implies that the evaluation is specifically focused on how the research is done through the meticulous design of the evaluation. The implication is that the design will produce the correct results because it has controlled for the contextual variables, and has applied the intervention in a systematic and repetitive fashion to ensure adequate and identical exposure to all participants. The more powerful the design in these respects, the better it is able to determine whether a causal effect exists.(Reichl, 2005) The individual or community is considered the receiver of the intervention. The intervention and evaluation, if applied in this rigorous fashion, will produce the outcome.

Even though these assumptions sound logical in theory, they become challenged when implemented in research studying social phenomenon. This is because the social world is complex and uncertain.(Reichl, 2005) When studying social phenomena, such as behavioural change, contextual factors such as social support, psychological characteristics, and personal meaning are implicit to the phenomenon and therefore, must be considered as impacting the intervention. The intervention acts *through* these factors. (Pawson & Tilley, 1997) In fact, these factors likely contribute to the actual processing of the intervention, and therefore, to the outcome. In other words, people and their contexts are the actual generators of effect. (Pawson & Tilley, 1997) The program is not the generator of the effect in isolation. Rather, the intervention is a *suggestion* that is given to a highly complex system of personal and social variables. (Pawson & Tilley, 1997)

Even though the suggestion provided via a mass media campaign is based on sound principles, it still must be interpreted and *chosen* by the participants. Participants are not passive consumers of information. At some point, they must choose to accept information and also choose to act on it. This integrative process is very individual. Within each step of the process, choice exists, and an individual's choice is *constrained* or impacted by a combination of personal, social, and institutional factors. (Pawson & Tilley, 1997) Not all individuals or groups will have the necessary characteristics to integrate the *specific* knowledge put forth in a social marketing campaign. (Pawson & Tilley, 1997) By attempting to control for contextual factors, the researcher can be limiting the ability to understand *why* the program worked or did not work.

To reframe, the impact of any social program needs to be understood within the context of the participants. The program is applied *within* the context, not *to* the individual. Therefore, it becomes how the specific situation digests the program that determines its effectiveness, not solely the program itself.

### *Inconsistent Findings*

Experimental evaluation has been plagued with inconsistent findings when applying interventions across populations. Interventions that have been evaluated to have a positive effect on one population don't have the same effect when applied to other populations. This is in part what happened with the Alberta back campaign. One reason for these discrepancies is that subgroups or samples have changed or have different characteristics, which may make the participants more or less amenable to

change.(Pawson & Tilley, 1997) Instead of trying to identify and understand these characteristics, experimental theory looks to focus on controlling for these characteristics. For example, in an experimental evaluation, the investigator would look to ensure that the sub-groups (control group and intervention group) were equivalent.(Pawson & Tilley, 1997) In other words, the focus would remain on the method to provide a clear answer. Even though experimental designs may seek to identify characteristics, the tendency is to combine the idea of personal choice into one variable, *motivation*, when in fact, an individual's volition to change can be impacted by many other contextual factors. (Pawson & Tilley, 1997)

In summary, traditional evaluation theory is not entirely complete when dealing with social phenomenon on three levels. First, gaining equivalency within control and intervention groups is difficult because personal and group characteristics can constrain choice, thereby impacting the outcome. Second, even if equivalency can be achieved in one population (Victoria, Australia), it does not mean that this population will be equivalent to a different population (Alberta, Canada). Third, the intervention cannot be singled out as the sole cause of the outcome, as outcome in social phenomenon is generated from the potential combination of many factors. Characteristics implicit to each population are key to creating or resisting change. In short, without specifically identifying and understanding the active contextual factors in a population, the outcome of an intervention will not be fully understood. Therefore, making generalizations or claims of effectiveness or non-effectiveness are not entirely accurate.

### **Description Of Hornik And Yanovitsky's Theory Of Social Marketing**

Hornik and Yanovitsky's theory of social marketing is a mid-range theory. It is a mid-range theory because its concepts are not as abstract as with a meta-theory. (Van Sell & Kalofissudis 2009) The concepts are more focused toward health behaviour and can be evaluated. (Van Sell & Kalofissudis 2009) The theory does focus on social marketing campaigns as the instrument of change. As graphically represented in Figure I, this theory is also based in a *linear* model of change. In general, the theory posits that effective social marketing campaigns lead to health behaviour change. The theory incorporates complexity in two ways: 1) it includes intermediate steps, or causal links, between the intervention and health behaviour change, and 2) it acknowledges that evaluating social phenomenon is complex and incorporates social and institutional factors.

The first point concerning intermediate steps simply states that there is more than one link in the causal chain from intervention to behaviour change. This model, similar to other health behaviour models, assumes that behavioural change occurs in a series of steps, with the completion of one step directly leading to a positive shift in subsequent steps, somewhat like a domino affect. In Hornik and Yanovitsky's theory, the first step required to achieve change in health behaviours is the acquisition of knowledge. Acquisition of knowledge leads to or causes a change in belief. The change in belief then leads to an intention to act. Once an individual has an intention to act, a new behaviour emerges. These steps are linear, mechanistic, and rely on the individual having unimpeded choice to act. (Pawson & Tilley 1997)

The second point of complexity in the theory relates to evaluating social phenomenon. Hornik and Yanovitsky see behavioural change as being impacted not only by an individual's direct exposure to campaign messages, but also through the diffusion of campaign messages through social and institutional pathways.(Hornik & Yanovitzky, 2003) An individual can be directly exposed such as through television advertisements, bus advertisements and pamphlets, or the individual can also be indirectly exposed to the information in these same sources through the diffusion of messages into the person's social circles (family, friends) and institutions (work, organizations).

Even though the sphere of influence has expanded, the idea still remains the same: the marketing campaign is the cause of any measurable changes because the intervention, the campaign message, is what is being diffused. The more times an individual sees an ad, and also, the number of times and places that the information is discussed through social and institutional channels, the greater the chance for change.(Hornik & Yanovitzky, 2003) It assumes that the context of the campaign, or the personal, institutional, and social elements, do not create change, other than through the campaign itself.

This approach is mechanistic in nature.(Pawson & Tilley, 1997) The more the person hears and sees a message, the more likely they are to change their beliefs and subsequent health behaviours. The force that sets this train into motion is the mass media campaign itself. Get the information out to as many people as possible, and the

individual will have no choice but to shift belief and subsequent behaviour. The individuals are seen as having complete and unlimited choice to accept and utilize the information because it has been projected as correct information.

### **Challenges To Hornik And Yanovitsky's Theory**

Hornik and Yanovitsky's mid-range theory of social marketing falls within the experimental evaluation paradigm, and therefore has the same challenges. One of the most structurally obvious successive characteristics of this theory is the positioning of information diffusion as the pre-eminent variable of belief and behavioural change. It is not only the information in the campaign that is to be the cause of change, it is also the number of times an individual gets the information. The more pathways of information that get to the individual the greater the opportunity for change. This speaks to the repeatability of the cause-effect relationship. Even though Hornik and Yanovitsky expand on the pathways of diffusion, they do not expand on the pathways of change. The pathway of change remains the same – knowledge diffusion. They do not consider multiple pathways of individual constrained choice, and they do not address individual powers and liabilities. (Pawson & Tilley, 1997)

Another major challenge to this theory is the foundational linear model of change. The degree of exposure to the program is assumed to change beliefs that then impact intentions to act and eventually subsequent behaviour. It assumes that once the information gets to the individual, the wheel is set in motion. The social and institutional pathways in this model are only assumed to impact the knowledge diffusion, and are not

intrinsic to each step of the model. Even though Hornik and Yanovitsky suppose that there are institutional barriers, they occur at a single point in the model and provide a direct influence on shifting intention to behaviour. In actuality, personal and structural powers and liabilities exist at all points along the pathway from knowledge diffusion to behavioural change, interacting in a multitude of combinations at various points along the path. (A. M. Clark et al., 2008; Pawson & Tilley, 1997) Even though the process of change may appear linear, many variables must come together in the right combination and under the right circumstances, skewing the causal pathway and making it non-linear. (A. M. Clark et al., 2008; Pawson & Tilley, 1997; Pawson, 2003)

A linear model also assumes that individuals are passive receivers of information, have absolute freedom to make choices, *and* will make choices based on the information provided. There is no inclusion of understanding how or why people make choices, or for that matter, why they do not make certain choices. Without this knowledge, meaningful information pertaining to program effect cannot be provided, resulting in limited ability to modify programs, or apply them to different populations.

Albeit logical, and inclusive of institutional and social phenomena as a function of knowledge diffusion, this model does not comprehensively address complexity within socially driven phenomena. The assumptions made by the model do not explain the gaps in change in beliefs and especially, change in behaviour. Behavioural change is viewed as uni-dimensional and caused by an intervention, when in fact, behavioural change is multi-dimensional and reliant upon human agency and structural variables.

(A. M. Clark et al., 2008) Linear theories fit certain situations, but do not appear comprehensive enough for the design and evaluation of social initiatives such as mass media campaigns. The Hornik and Yanovitsky model, along with many other theories of change, falls short when used to design and evaluate the root generators of change from a social program within a complex social milieu.

### **Alternatives To Traditional Experimental Theory**

In critiquing experimental evaluation's application to social programs, we have come to one broad conclusion: personal and structural factors are operational in change and need to be understood, not controlled, in order to provide insightful observations and conclusions about social programs, such as social marketing campaigns. Social phenomena exist in open systems, and therefore, cannot be holistically evaluated using the assumptions of a closed system, such as that which underpins experimental evaluation. (A. M. Clark et al., 2008)

In order to provide a structure for evaluations addressing this conclusion, further study of relevant meta-theory is necessary. Two such meta-theories that have previously been used in evaluating social programs and behavioural change are *critical realism* and *realistic evaluation*. Both of these meta-theories operate within a generative versus a successive causation theory. (Pawson & Tilley, 1997) They are generative in that a key tenet to both is the idea that the individual or community is the generator of change and that change in this manner is not linear, but relies upon the interaction of multiple factors within a particular context to determine change. (A. M. Clark et al.,

2008; Pawson & Tilley, 1997; Pawson, 2003) It moves beyond the simple and sole explanation of information diffusion as the primary cause of change. It also moves toward addressing the complexity of social phenomenon by identifying patterns in social phenomena, then going underneath the identified patterns to understand *why* these patterns exist. (A. M. Clark et al., 2008)

Variables that generate change include both personal and structural factors. Personal factors include beliefs, attitudes, and personal meaning. (A. M. Clark et al., 2008) Structural factors include components such as social norms, physical environment, and geography. (A. M. Clark et al., 2008) These factors coalesce in relatively unpredictable ways to transform individual or group behaviour. (A. M. Clark et al., 2008; Pawson & Tilley, 1997) The intervention is important as it functions within a specific context. Researchers must therefore evaluate the relationship between intervention and the context. This evaluation includes events that are observable, structures that impact the events that may not be directly observable, and human perceptions and experiences. (A. M. Clark et al., 2008) We hypothesize that by using a meta-theory, such as critical realism or realistic evaluation, to structure evaluation researchers will be able to create more clear hypotheses as to potential pathways of change for the population under study. This will facilitate the development of comprehensive evaluations of the relevant pathways using both quantitative and qualitative methods as necessary.

Understanding why a program worked or didn't work, or what elements were successful and which weren't allows for: 1) continued evolution of the program that best reflects the

current social state and, 2) other populations to look at a program to see if they could apply the program or modify certain aspects to suit the cultural climate of their population. With this in mind, information from one study can be used to inform other studies in other populations because the evaluation has provided not only the pattern within a population but understanding of the mechanisms of change. In essence, programs are theories in action, and the evaluation of programs helps broaden the contextual knowledge of a particular theory so that this knowledge can be transferred to other program initiatives as it fits a unique context. (Pawson, 2003)

For example, although it appears the Australian back pain campaign led to both belief and behaviour change, we don't know exactly why the intervention was successful. Was it due to the sheer size of the campaign, the Australian cultural attitudes toward social marketing campaigns, the visual images, the text, or other social or personal variables? Additionally, while we know the Alberta campaign had little impact on behaviour change, we can only speculate as to why this was the case. If we knew some of the specific factors that generated change in Australia but not Alberta, we could use these to evaluate other populations and develop social marketing programs that truly reflect present needs.

### *Conclusions*

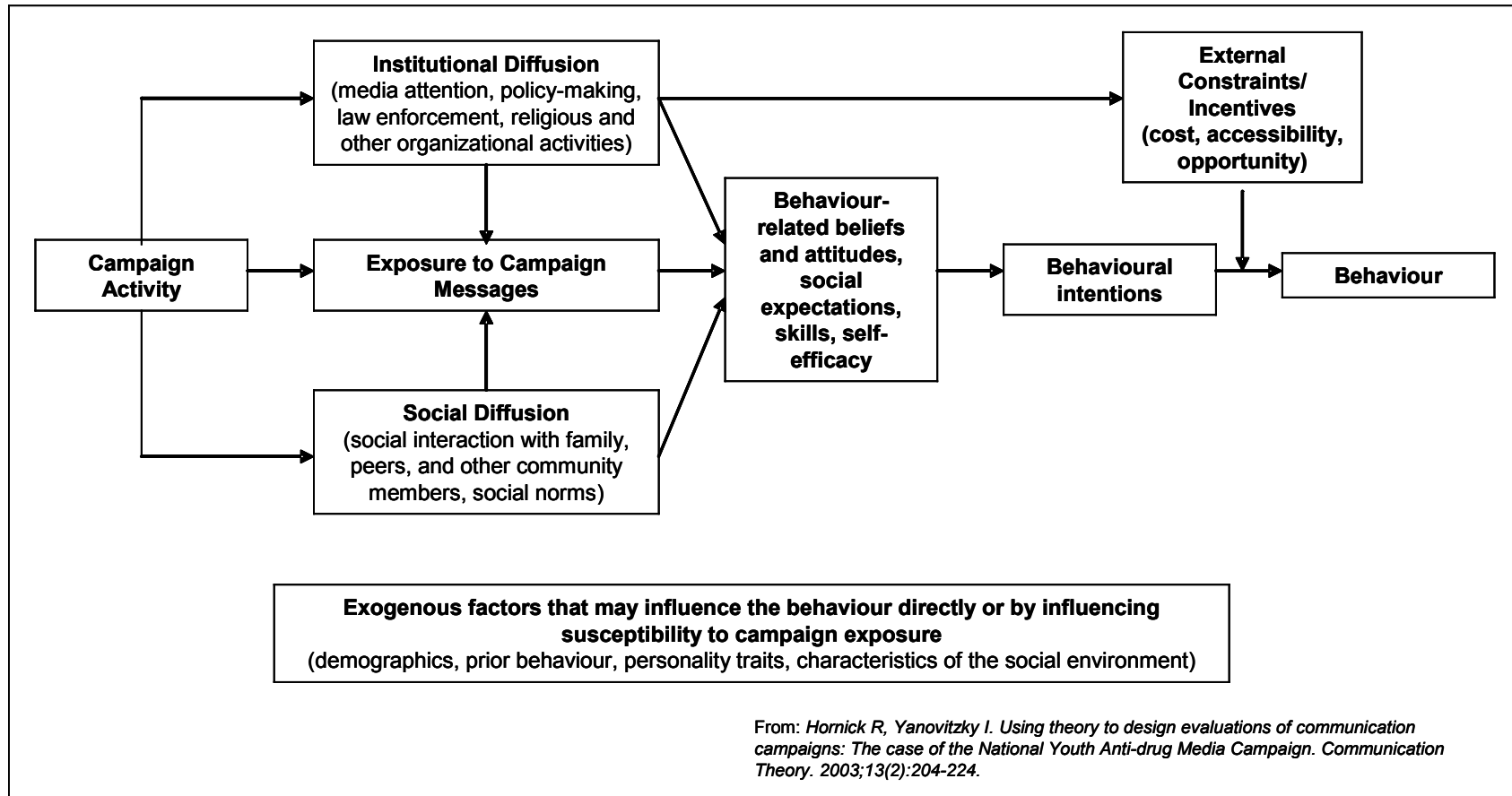
Hornik and Yanovitsky's theory, while informative, did not provide the assumptive framework required to comprehensively evaluate the impact of a social marketing campaign in a way that allows the results to be transferred to other programs. We are left with only speculations regarding *why* the Alberta back pain mass media campaign did not work as well as the previous Australian version. Future research should investigate the applicability of critical realism and realistic evaluation, which may provide more thorough answers to the mechanisms behind intervention effectiveness. Using a meta-theory that embraces the complexity and uncertainty of social programs, such as critical realism, allows mid-range theories like Hornik and Yanovitsky's to be used to guide evaluation of hypothesized specific causal pathways brought forth through the meta-theory. Under the umbrella of a complexity-based meta-theory, Hornik and Yanovitsky's theory can also develop and be used to provide relevant information.

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Figure I

Theoretical framework for mass media interventions (from Hornick and Yanovitzky 2003)



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