Published in final edited form as:
Psychol Sport Exerc. 2011 November ; 12(6): 615–620. doi:10.1016/j.psychsport.2011.06.002.

An investigation of the theoretical content of physical activity brochures

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Abstract

New evidence-based physical activity guidelines and recommendations for constructing messages supplementing the guidelines have been put forth. As well, recent reviewshave identified theoretical constructs that hold promise as targets for intervention: self-regulation, outcome expectancies and self-efficacy. The purpose of this study was to examine the integration of messages targeting self-regulation, self-efficacy and outcome expectancies in existing physical activity brochures. Twenty-two PA brochures from Canadian and American National Health Organizations were assessed for their use self-efficacy, self-regulatory processes and outcome expectancies. Brochures were analyzed line-by-line using a modified version of the validated Content Analysis Approach to Theory-Specified Persuasive Educational Communication (CAATSPEC; Abraham et al., 2007). One third of the brochures were coded by two independent raters coded a third of the brochures (n = 7). Inter-rater reliability was acceptable for 17 of the 20 categories (*rs*> .79). Discrepancies in all categories were discussed and agreement was reached. The remaining brochures were coded by one of the two raters. Usage of thethree key theoretical constructs accounted for only 36.43% of brochure content (20.23% self-efficacy, 10.40% outcome expectancies, 5.80% self-regulation). Brochures lacked the use of a variety of theoretical strategies, specifically goal-setting, planning and verbal persuasion and rarely highlighted the affective benefits of physical activity. In the future brochures should aim to place increased emphasis on self-regulation, self-efficacy, and affective outcome expectancies.

Several countries (e.g., United States, Canada, United Kingdom) and international organizations (e.g., WHO) recently released new physical activity guidelines (BHF, 2011; CSEP, 2011;Haskell et al., 2008). These guidelines provide information about the frequency, intensity, duration and type of activity people should do to achieve health benefits. By nature, these guidelines neither provide information to persuade people to become more active nor do they provide tips about how to achieve the recommended amount of physical activity. Thus, to motivate people to become active, the guidelines must

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be supplemented with messages that convey *why* and *how* to achieve the recommended activity level.

Evidence-based recommendations for constructing messages supplementing the guidelines have been put forth (c.f., Brawley and Latimer, 2007; Latimer, Brawley & Bassett, 2010). A key recommendation is that messages incorporate theory-based behaviour change techniques (Brawley & Latimer, 2007). Although there are a variety of techniques that could be used (cf. Abraham & Michie, 2008), reviews evaluating interventions promoting physical activity have begun to identify specific theoretical constructs and techniques that may hold promise as targets for intervention (Bélanger-Gravel, Godin & Amireault, 2011; Dombrowski et al., 2010; McAuley & Blissmer, 2000; Michie, Abraham, Whittington & McAteer, 2009;Michie & Prestwich, 2010; Rhodes & Pfaeffi, 2010; Williams & French, 2011). From these reviews self-regulation behaviours such as self-monitoring and implementation intentions emerge consistently as effective techniques for promoting increased participation in physical activity. Although the evidence is somewhat limited, several reviewsalso suggest potential utility for intervention techniques targeting self-efficacy and outcome expectancies (McAuley & Blissmer, 2000; Rhodes & Pfaeffi, 2010; Williams & French, 2011). Accordingly, in the current study weconsider the use of messages emphasizing the theoretical constructs of self-regulation, outcome expectancies, and self-efficacy. Collectively these constructs represent intervention strategies that have shown promise in the physical activity literature and that can be applied broadly during motivational (individual forms intention to adopt a behaviour) and volitional phases (individual engages in the behaviour) of behavior change (Schwarzer, 1992; Schwarzer, 2008;). Broad applicability is important when considering the development of generic physical activity messages – an approach widely used in practical settings (Brawley & Latimer, 2007)

Specifically self-regulation, described as effortful control or willpower, refers to processes by which individuals enact their self-concept, revise their behaviour or change the environment to bring about outcomes that concur with their self-perception and personal goals (Baumeister & Vohs, 2004; Fiske & Taylor, 1991). Self-regulation can include intervention techniques such as goal setting, self-monitoring, and planning (Fiske & Taylor, 1991) Interventions affecting self-regulation may help individuals move from a motivational stage of behavior change to a volitional stage (Baumeister & Vohs, 2004) and therefore seem to affect physical activity behaviour more consistently than interventions affecting other theoretical constructs (Rhodes & Pfaeffli, 2010). Outcome expectancies reflect an individual's positive or negative evaluations of a behaviour (Ajzen, 1991). Evaluations can reflect instrumental (i.e., the benefits or costs associated with the behaviour) or affective (i.e., emotion-laden judgements about the consequences of the behaviour) domains of a behaviour. Emerging evidence indicates that interventions targeting affective outcome expectancies may be especially effective in promoting physical activity behavior change (Rhodes & Pfaeffli, 2010). Self-efficacy refers to one's confidence in his or her ability to perform a behaviour (Bandura, 1977). Interventions affecting outcome expectancies and self-efficacy are thought to be important for encouraging physical activity participation among people in the motivational phase of behavior change (Schwarzer, 2008).

The purpose of this study was to examine the integration of messages targeting self-regulation, self-efficacy and outcome expectancies in existing physical activity brochures. Despite a rapidly advancing technological landscape, it is important to evaluate the content of print brochures. A survey of 954 Canadian physical activity service providers revealed that print resources were identified a critical resource for communicating the new physical activity guidelines (Public Health Agency of Canada, 2010). Indeed, there are many instances where brochures are the most practical method of providing information (e.g., doctors offices, clinics, pharmacies) and in some cases print materials are more effective in

promoting physical activity than web-based messages (Marshall, Leslie, Bauman, Marcus & Owen, 2003; Marks et al., 2006).

Despite the widespread use of print materials for promoting physical activity, whether prominent physical activity promotion organizations commonly incorporate theory-based approaches for changing physical activity behaviour into their print materials is unknown. The theory-based content of physical activity websites has been evaluated and results indicated that the majority of websites did not use any theory-related content. Rather, website content was directed primarily toward providing knowledge-based information (Doshi et al., 2003). We hypothesized that a similar pattern will be apparent in print materials because we anticipated that many physical activity promotion agencies use similar content in print- and online-based messages. In particular, we hypothesized that print materials will focus primarily on providing knowledge-based information and will lack the use of theory-related content.

This study has important implications for advancing practice and research. From a practical perspective, evaluating the content of existing brochures will help to determine whether they adequately incorporate theory-based approaches for changing behaviour. This evaluation will provide an indication as to whether existing brochures should serve as a template for materials to supplement the new guidelines or whether new materials are needed. Our study also has important implications for advancing research in the realm of physical activity intervention. Abraham and Michie (2008) developed a taxonomy of behaviour change techniques. The approaches used to target the theoretical components that we examined in the brochures are similar to these techniques included in this taxonomy. Our research exemplifies how these techniques are being incorporated into print brochures, a practical interventions tool, and provides additional evidence of the face validity of Abraham and Michie's(2008) evaluation tool.

Method

In order to collect a comprehensive sample of brochures promoting physical activity to the general public, we visited websites of national organizations promoting physical activity (Centers for Disease Control and Public Health Agency of Canada). In addition, we visited websites of major organizations that work to prevent chronic diseases for which there is a clear link between physical activity and disease prevention (diabetes, heart and stroke, cancer, osteoporosis). Where no online copy of a brochure was available, a print version was requested from the organization. Prior to coding in November 2008, we re-assessed all brochures to ensure that we had obtained the most recent copy available. In total, 22 print brochures from major organizations were selected. Brochures that targeted children or older adults, or a specific segment of the population (for example, individuals with arthritis) were excluded. In cases where there was more than one edition of a brochure, the most up-to-date version was examined. While the release date of all brochures could not be determined, the average release date for brochures (n =10) was 2005.

The brochures were coded and analyzed according to a modified version of the Content Analysis Approach to Theory-Specified Persuasive Educational Communication (CAATSPEC; Abraham et al., 2007). CAATSPEC is a type of quantitative content analysis to determine the degree to which text-based messages are in line with research-based recommendations (Abraham et al., 2007).

The coding manual

A coding manual, based on the CAATSPEC, was developed to determine the theoretical basis of the physical activity brochures. There were five main sections of the manual and

several subcategories in each section. Each main section was designed to capture distinct and separate types of physical activity messages including knowledge-based information, outcome expectancies, self-regulation messages, self-efficacy, and other messages. The specific type of information coded within each category (i.e., the subcategories) is described below.

Knowledge-based information—This category captured recommendations, guidelines, and general descriptions of physical activity. It included the following subcategories: definitions of PA, statistics about PA, medical information (e.g., when to see your doctor), recommendations for types of activities, and examples of barriers frequently encountered with no suggestion of how to overcome the barriers. Some of these subcategories are theory-based butnone target the constructs we were especially interested in evaluating (self-regulation, self-efficacy, or outcome expectancies).

Self-efficacy messages—This category included strategies to increase confidence and belief in the reader's ability to be active. The subcategories captured the fundamental sources of self-efficacy: modeling, verbal persuasion, mastery experiences.

Outcome expectancies—This category captured outcome expectancies. Outcome expectancies target peoples' attitudes and address why people may or may not chose to engage in physical activity. The subcategories included both positive outcome expectancies from engaging in physical activity and negative outcome expectancies from being sedentary, as well as an “other outcomes” subcategory which included messages about risks associated with physical activity. All statements that were coded as negative or positive outcome expectancies were then coded as either affective or instrumental outcome expectancies.

Self-regulation messages—This category described self-regulation messages. The purpose of these messages is to give people the skills they need to be successful in engaging in physical activity. For this evaluation, the subcategories focused on four elements of self-regulation: goal setting, self-monitoring, corrective behavior in the form of planning and strategies for overcoming barriers.

Other messages—This category was reserved for messages that did not fit into any of the preceding sections. It included content such as titles and headings (e.g., “Active at Any Size”, “Exercise Tips”) and directions on how to use the brochure (e.g., “For answers to your questions, use the resources on the back cover.”). This category also included messages with a theoretical basis but that occurred infrequently (e.g., “And the people who care about you can be a great source of encouragement and support”).

These CAATSPEC categories are comparable to the intervention approaches outlined in Abraham and Michie's (2008) taxonomy of behavior change techniques. In Table 1, we demonstrate the overlap between the CAATSPEC scheme for coding text-based messages and Abraham and Michies's (2008) scheme for coding intervention content. Although the brochures were coded according to the CAATSPEC, demonstrating how the CAATSPEC categories align with common intervention approaches is useful for understanding the types of interventions that can be delivered through print materials.

Coding procedures

A draft coding manual was piloted by two independent raters coding 10 brochures. The initial reliability of this manual proved to be insufficient. The manual was revised and the categories were refined. Next, a line-by-line coding procedure was implemented such that each sentence and picture was coded separately. If more than one category occurred in a

sentence, it was coded for each one. Specific instructions were developed for how to code charts and lists. If the chart or list was in sentence form, each sentence was coded separately, but if each point was just a few words and the points could be combined to form a sentence, then they were coded as one. Two different raters both coded seven brochures to confirm that the reliability of this new coding strategy had been improved. Frequency counts were recorded for each brochure on all coding categories. Once reliability had been confirmed, the remaining brochures were coded by one of the two raters. After all brochures had been coded, two different raters coded all the outcome expectancy statements as either focusing on affective consequences, instrumental consequences or both affective and instrumental consequences. Statements coded as affective or instrumental were given a value of one. If a statement was coded as both affective and instrumental it was given a value of .5 was added to both the frequency counts for the affective and instrumental categories.

Coding reliability

Inter-rater reliability of the revised coding manual was acceptable for 17 of the 20 categories (*rs*> .79, *ps*< .05). Discrepancies between raters were discussed and agreement was reached on all points. The three subcategories with poor agreement were Other Outcome Expectancies, Goal Setting, and Verbal Persuasion. A possible explanation for the low agreement in these categories is that in the seven test brochures, most had 0–1 instances per category. With so few cases, a small discrepancy was magnified. The discrepancies were discussed and easily resolved. Thus, it was deemed acceptable to continue with the coding. For the outcome expectancy statements an inter-rater reliability analysis using the Kappa statistic was performed to determine the consistency among raters. The inter-rater reliability for the raters was found to be Kappa = .85 ($p < .001$).

Analyses

To test the hypothesis that brochures would provide information about physical activity, but would not provide the necessary theory-based content, frequency and percentage scores for each coding category and subcategory for each brochure were calculated. Category percentage scores were calculated by dividing the frequency of each coding category by the total frequency of all coded sentences in the brochure. Subcategory percentage scores were calculated by dividing the frequency of each subcategory by the total frequency of the category. To account for skewed data, a square root transformation was used on all data.

To determine if significant differences existed between the five main categories brochure content categories, a Repeated-Measures Analysis of Variance (RM-ANOVA) test was conducted. Bonferroni pairwise comparisons were conducted to identify differences between the five categories. A RM-ANOVA test was conducted to test if significant differences existed between the subcategories within each category. Bonferroni pairwise comparisons were conducted to identify differences between the subcategories. Additionally, paired t-tests were conducted to determine if significant differences existed between the affective and instrumental outcome expectancy subcategories.

Results

Between Category Comparisons

The frequencies and percentages of categorized messages are provided in Table I. Over two-thirds of all brochure content did not target self-regulation, self-efficacy, or outcome expectancies (63.57%). The majority of statements were coded as "*other*" (45.49%). Knowledge information accounted for 18.08% of brochure content. Messages categorized as promoting self-efficacy accounted for 20.23% of brochure content; this is the highest theory-based category. A total of 10.40% of brochure content was classified as outcome

expectancies. Self-regulatory information accounted for the least amount of content representing only 5.80% of the statements included in the brochures.

A RM-ANOVA indicated a significant difference between the five categories, $F(2, 84) = 33.84$, $p < .001$. Bonferroni pairwise comparisons indicated the greatest proportion of content was coded as *other* content ($p < .001$) when compared to all other categories ($d > 4.83$). Moreover, significantly fewer statements were coded as self-regulation messages ($p < .001$) compared to knowledge-based information ($d = 1.06$) and self-efficacy messages ($d = 1.06$). No other significant differences emerged.

With Category Comparisons

Knowledge-based information—Presenting physical activity recommendations was the most prominent subcategory of knowledge-based information, accounting for 74.85% of the total category. A RM-ANOVAwith Bonferonni pairwise comparisons revealed, $F(4, 84) = 35.561$, $p < .001$, that the other four subcategories (definitions, statistics, when to see your doctor and barriers frequently encountered) occurred significantly less frequently than the physical activity recommendation subcategory ($p < .001$, $d > 2.13$). Pairwise comparisons also revealed that brochures had significantly less instances of statistics compared to the other four subcategories ($p < .005$, $d > 1.78$)

Self-efficacy messages—Within this category, 25.03% of brochures used pictures unaccompanied by text to promote self-efficacy through modeling. Self-efficacy messages using verbal persuasion to become physically active were sparsely used (5.11%). There were few instances of physical activity instruction (7.00%), how to get social support (9.15%) and how to increase physical activity (14.27%) but `how to' content did focus on how to avoid injury from physical activity (18.71%). A RM-ANOVA with Bonferonni pairwise comparisons, $F(6, 126) = 4.021$, $p = .001$, revealed that there were significantly more instances of modeling using pictures than instances of modeling in text ($p = .03$, $d = .56$), persuasion ($p = .004$, $d = .98$), and instruction on how to do physical activity ($p = .01$, $d = .92$). There were also significantly more instances of how to get social support than instances of persuasion ($p = .04$, $d = .58$).

Outcome expectancies—Positive outcome expectancies accounted for almost the entirety of the category (91.62%); however, the distribution across brochures was wide with a range of 0–96.39% of the content of this category. Negative outcome expectancies of not participating in physical activity and risks associated with physical activity were very rare, accounting for only 8.38% of the category. A RM-ANOVA with Bonferonni pairwise comparisons, $F(2, 42) = 100.46$, $p = .001$, revealed there were significantly more instances of positive outcome expectancies than negative outcome expectancies ($p < .001$, $d = 2.21$) and other outcome expectancies ($p < .001$, $d = 2.60$).

Of the positive and negative outcome expectancies, 20.53% represented affective outcome expectancies and 79.47% represented instrumental outcome expectancies. A paired t-test indicated that there were significantly more outcome expectancies coded as instrumental than affective, $t(21)=5.08$, $p < .001$, $d = .48$.

Self-regulation—Strategies to overcome barriers was the highest subcategory, accounting for 60.56% of the category. Planning captured only a very small percentage of this category (1.87%). A RM-ANOVA with Bonferonni pairwise comparisons, $F(3, 63) = 5.857$, $p = .001$, revealed there were significantly less instances of planning compared to all other subcategories ($p < .02$, $d = .79$)

Discussion

This study examined the content of physical activity brochures using a quantitative content analysis (a modified version of CAATSPEC). Overall, brochures did not reflect the evidence identifying effective techniques for promoting physical activity (Bélanger-Gravel, Godin & Amireault, 2011; Dombrowski et al., 2010; McAuley & Blissmer, 2000; Michie, Abraham, Whittington & McAteer, 2009;; Michie & Prestwich, 2010; Rhodes & Pfaeffi, 2010; Williams & French, 2011). Brochures rarely made use of self-regulation messages and infrequently highlighted the affective benefits of physical activity. However, there were more instances of knowledge provision as well as self-efficacy. Thus, the content of existing physical activity brochures may not be optimal as research demonstrates that approaches targeting self-regulation, self-efficacy, and affective outcome expectancies are important strategies for changing physical activity behavior (Anderson, Wojcik, Winett, & Williams, 2006; Lowe, Eves & Carroll, 2002; Kraft, Rise, Sutton, Roysamb, 2005; Rhodes & Pfaeffli, 2010). Therefore, it seems advisable that existing brochures be revised to supplement the new physical activity guidelines. Revised materials should incorporate approaches for increasing self-regulation, self-efficacy, and affective outcome expectancies.

The findings from the current study are consistent with the work of Doshi et al. (2003) and Abraham et al. (2007). Brochures were successful at providing information, general knowledge, and guidelines, yet did not make full use of theory-based messages. Similar to the results of Doshi et al. (2003), self-regulation was found to be one of the least common theoretical strategies. This result may indicate a gap in translating research knowledge into practice. The major organizations whose brochures we coded may not have been aware of the amount of detail needed when incorporating self-regulation strategies into print materials. Additionally, organizations also may be uninformed about the advantage of focusing on affective outcome expectancies when promoting physical activity. The release of new physical activity guidelines provides the opportunity to translate research knowledge into practice. In particular, organizations should be encouraged to utilize self-regulation, affective outcome expectancies and self-efficacy as strategies to promote physical activity when creating new brochures to reflect the new guidelines.

In addition to providing direction for developing print materials to accompany new physical activity guidelines, this study provides empirical support for Abraham and Michie's (2008) taxonomy for behavior change techniques. All of the approaches used to target self-regulation, self-efficacy, and outcomes expectancies were captured by this taxonomy. This finding suggests that the taxonomy is comprehensive and captures intervention approaches incorporated into a practical tool such as print materials.

It is important to note that our message evaluation and our subsequent recommendations are based on the premise of creating generic messages suitable for people in either the motivational or the volitional phases of behavior change. An evaluation designed to determine the prevalence of phase-specific intervention techniques in existing brochures would benefit from a coding scheme covering a broader range of phase-specific constructs. The comprehensive and rigorously tested coding schemes evolving from Michie and colleagues work (Michie, Abraham, Whittington, McAteer, 2009; Michie, Abraham, Eccles, Francis, Hardeman & Johnston, 2011) would capture these constructs and would be provide a thorough understanding of brochure content.

Another limitation of this study was that we only evaluated North American, English language brochures. Practitioners in other parts of the world may use different physical activity promotion initiatives and their print materials may have different theoretical content. Also, we only evaluated the frequency of theoretical strategies within the brochures

therefore we cannot make claims about the quality of the theoretical content within the brochures. An additional limitation is that our content analysis did not consider the impact of the brochures on thoughts and behavior. As a result we could not evaluate the link between theory-based brochure content and behavior. However, a recent study indicated that internet-based interventions that incorporate more theoretical behavior change content demonstrated greater effect size and had substantial effects on behavior when compared to interventions that used less theoretical content (Webb et al., 2010). Additionally, changing physical activity behavior may require a multi-faceted approach in which messaging may act as the first step to behavior change (Kahn et al., 2002). Finally, we only assessed brochures that were targeted at the general population.

Conclusion

The aim of this study was to determine the content of physical activity brochures. Existing physical activity brochures placed little emphasis on the three key theoretical constructs of self-regulation, self-efficacy, and affective outcome expectancies. As new materials are developed to supplement the new physical activity guidelines, it may be beneficial to increase the theoretical content of brochures in hopes of optimizing their impact. In the meantime it may be advisable for practitioners to consider the theoretical content of existing brochures when selecting print materials for distribution among clients. Finally, while it is known that theory-based intervention approaches can lead to physical activity behaviour change (Rhodes & Pfaeffli, 2010), future research should continue to test the optimal theory-based content of physical activity messages.

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Highlights

- Examined use of behaviour change techniques in physical activity brochures.
- Brochures lacked the use of a variety of theoretical strategies.
- Goal-setting, planning, affective benefits and persuasion rarely used.
- Knowledge translation needed.

Table 1

Frequency of inclusion of categorized text.

Category	Abraham & Michie's (2008) Corresponding Taxonomy Technique	Content Distribution by Category				Content Distribution by Subcategory
		%	M	SD	Max	% of subcategory
Knowledge-Based Information		18.08■	30.18	26.95	92	
1. Definitions of physical activity.	n/a	1.38	2.27	2.898	10	7.53
2. Statistics	Provide general information	.26	.36	.953	4	1.20*
3. When to see your doctor.	n/a	1.38	2.41	3.034	12	8.00
4. Suggestions and recommendations	n/a	12.88	22.59	21.64	82	74.85*
5. Barriers frequently encountered.	n/a	1.30	2.55	4.15	16	8.42
Outcome Expectancies		10.40	17.36	16.42	69	
6. Negative outcomes of not exercising.	Provide information on consequences	0.34	1.09	2.136	7	6.28
7. Positive of outcomes of physical activity.	Provide information on consequences	12.22	15.91	13.97	58	91.62*
8. Other outcomes: Risks associated with PA.	Provide information on consequences	0.12	.36	.90	4	2.10
Self-Regulation Messages		5.80▲,■	9.68	14.311	65	
9. Encourage self-monitoring.	Prompt self-monitoring	1.57	1.95	2.28	8	20.19
10. Encourage goal setting.	Prompt intention formation	1.00	1.68	2.55	7	17.37
11. Encourage planning.	Prompt specific goal setting.	.13	.18	.50	2	1.87*
12. Other strategies to manage and overcome barriers.	Prompt barriers identification	2.97	5.86	13.55	62	60.56
Self-Efficacy Messages		20.23▲	33.77	61.94	285	
13. Modeling with Text	Prompt identification of role model	1.63	7.00	24.07	112	20.73▲
14. Modeling with Pictures	Prompt identification of role model	4.37	8.45	13.53	62	25.03▲,■,•
15. Persuasion	Provide general encouragement	.90	1.73	3.77	16	5.11■
16. How to get social support.	Plan social support	2.04	3.09	3.73	13	9.15◊
17. How to do physical activity.	Provide instruction	.98	2.36	6.42	30	7.00•,◊
18. How to avoid injury, dehydration, fatigue etc.	Provide instruction	3.19	6.32	11.20	46	18.71
19. How to increase physical activity	Set graded tasks	1.68	4.82	13.39	63	14.27

Category	Abraham & Michie's (2008) Corresponding Taxonomy Technique	Content Distribution by Category				Content Distribution by Subcategory
		%	M	SD	Max	% of subcategory
Other Messages						
20. Other	n/a	45.49*	75.95	61.91	262	n/a

Note.

*significantly different from all other groups (p<.05)

■significantly different from all groups with the same symbol (p<.05).

▲significantly different from all groups with the same symbol (p<.05).

•significantly different from all groups with the same symbol (p<.05).

◊significantly different from all groups with the same symbol (p<.05).