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Who's Even Interested in the Exercise Message? Attentional Bias for Exercise and Sedentary-Lifestyle Related Words

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No research exists that examines attentional bias for exercise related stimuli, yet this is an important area as it is possible that nonexercisers are not paying attention to exercise related cues, thereby limiting the potential effectiveness of health promotion advertising. This research used a Stroop task to examine attentional bias for exercise and sedentary-lifestyle related stimuli. Experiment 1 included exercise related words and matched control words and revealed that exerciser schematics showed delayed response latencies for exercise related words. Experiment 2 expanded on Experiment 1 by further including sedentary-lifestyle related words and matched control words. Results replicated the first study and further revealed that nonexerciser schematics showed delayed response latencies for sedentary-lifestyle related words but not for exercise related words. Results are discussed in terms of attentional bias or the possibility of a threat-driven slowdown, and in relation to health promotion and exercise behavior.

Key Words: information processing, Stroop, schema, health messages

Regular physical activity can reduce the risk of many diseases including cardiovascular disease, obesity, type II diabetes, colon cancer, osteoporosis, and several psychological disorders (Blair & Brodney, 1999). However, campaigns promoting physical activity using health as a motivator have been shown to have little or no impact on intentions to exercise or exercise behavior (Cavill, 1998; Cavill & Bauman, 2004; Hillsdon, Cavill, Nanchahal, Diamond, & White, 2001; Marshall, Bauman, Owen, et al., 2004). Although there is generally an awareness of the campaigns, whether they result in changes in knowledge, beliefs, or understanding of the benefits of physical activity remains unclear (Cavill & Bauman, 2004). Further, whether the campaigns are reaching their target audiences is questionable. In one campaign, only 5% of targeted individuals called an advertised help line, and of the callers, over half were already active (Wimbush, MacGregor, & Fraser,

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1998). Similarly, it has been reported that recall of a physical activity campaign was higher among those who were already active or planning to become active (Hillsdon et al., 2001).

In a lab study it was found that health promotion advertising had a significant positive effect on self-presentational beliefs (i.e., how people attempt to control the impressions they make on others), but only for those participants who were already active (Berry & Howe, 2004). Although research has examined health promotion campaigns, there is a paucity of basic research examining the construction of exercise promotion messages and how individuals process and are affected by such messages. There is clearly a need for research that goes beyond recognizing that exercise related advertising is largely ineffectual to look more closely at *why* such advertising is ineffective in increasing exercise behavior.

Part of the reason for relatively unsuccessful health promotion campaigns may be related to the automatic processing of information. Automatic cognitive processes are those that do not require effort but are set in motion by environmental triggers, while conscious cognitive processes are intentional and require effort. Automatic processes can be broken down into goal dependent processes (skills that after a great deal of practice need little attention, such as typing) or preconscious processes such as attentional bias (Bargh & Chartrand, 1999), which refers to how an individual pays selective attention to material that matches his or her interest (MacLeod, Mathews, & Tata, 1986) and results from sensitivity and preoccupation to environmental cues that match the interest (Williams, Mathews, & Macleod, 1996).

The possibility that automatic processes may play a role in the success of exercise promotion needs to be examined, as researchers have provided evidence of implicit (i.e., automatic) preference for advertisements and logos when the effects of explicit memory were controlled for (Perfect & Heatherley, 1997). Along that same line, Rosen (2000) found that participants who already had a positive attitude about exercise were more likely to elaborate on an exercise message than were those who had a poor attitude toward exercise. It is important to expand upon such research to further examine automatic processes with exercise related stimuli because there is evidence that self-regulatory decision-making, such as choices about physical activity, has an automatic component (Bargh & Chartrand, 1999).

Attentional bias has already been examined within some health issues. For example, researchers have found evidence of attentional bias for smoking cues in current and abstinent smokers over nonsmokers (Bradley, Mogg, Wright, & Field, 2003; Waters, Shiffman, Sayette, et al., 2003). Waters et al. (2003) suggested there may be a causal relationship between attentional bias and the risk of relapse into smoking behavior. A smoker who is highly disposed to smoking may interpret an environment as full of smoking related cues, whereas a smoker who is less disposed to relapse may not recognize the same cues. There is also evidence of attentional bias in individuals with eating disorders over healthy controls for food and body related stimuli (Dobson & Dozois, 2004). Another group of researchers examined the relationship between health information schematics and self-assessments of health and found that self-assessed health was related to automatic processing of health information (Williams, Wasserman, & Lotto, 2003). It is not unreasonable to suspect there is a similar process in thoughts about exercise ability, as self-assessed health may be analogous to self-assessed fitness.

One possibility to examine is whether individuals who hold different exercise related self-schema allocate their attention differently to exercise related stimuli.

Self-schemas are cognitive structures that describe personal interests in terms of self and are used in organizing cognitions (Markus, 1977). Further, self-schemas have been found to influence the speed at which individuals process information related to the self and can guide behavior (Kendzierski, 1990), and there is evidence that exercise schemas moderate the intention-behavior relationship (Estabrooks & Courneya, 1997; Kendzierski, 1994).

Sheeran and Orbell (2000) found that exerciser schematics were more likely to fulfill their intentions to exercise than those who do not hold such schemas. Kendzierski's (1990) work showed that holding an exerciser self-schema affected the content and speed of self-related judgments as well as the retrieval from memory of schema related behavioral information. This is of interest because people who differ in their exercise related schema may show evidence of different information processing of exercise related stimuli. It may be that individuals who do not hold an exerciser schema are not attending to exercise related stimuli. Such research has implications for health promotion, as it has been shown that if there is little cognitive activity associated with a message, it is unlikely there will be enduring attitude change (Petty, Priester, & Brinol, 2002). This contention is based on the Elaboration Likelihood Model of Persuasion which posits that if an individual is actively thinking about a message, the message is processed through a central route, is further elaborated upon, and a long-lasting change regarding the message is possible.

Conversely, when an individual is not actively engaged in the message, attitude change may occur but will result from less thoughtful processing and the attitude change may be different than if the individual carefully considered the message (Booth-Butterfield & Welbourne, 2002). For example, the individual may be swayed by the attractiveness of the source of the message or the number of statements making the same argument rather than the merit of an argument. Further research should examine these possibilities with exercise messages, but a necessary first step is to examine attentional bias for exercise stimuli and whether differential attention is paid to stimuli by persons who hold different exercise related schemas.

Issues in Data Collection

The emphasis in examining attentional bias should be on indirect measures that tap into unconscious processes. Direct measures such as questionnaires or interviews may contaminate the measurement of a process such as attentional bias with conscious processes because they rely on the recall of an event (Jacoby, Lindsay, & Toth, 1992). Further, Williams et al. (2003) found that direct measures were a weaker test of attentional bias than indirect tests.

One indirect measure that could be used to look for evidence of attentional bias in exercisers and nonexercisers is an emotional Stroop task. This paradigm has been found useful in examining attentional bias within health behaviors such as self-assessed health (Williams et al., 2003) and smoking (Bradley et al., 2003). A Stroop task requires participants to name the color that words are printed in, and in an emotional Stroop task these words are either neutral or relevant to the topic being studied (in this case to exercise). Typically, if a word has relevance, the color-naming task will be slower; that is, it will show interference and evidence of attentional bias because the amount of interference in naming colors is a function of the activation of the word's meaning (MacLeod, 1991).

Purpose

The purpose of this research was to use an emotional Stroop task in two experiments to examine attentional bias for exercise related words. In the first experiment, exercise related words and matched control words were the stimuli. It was hypothesized that exerciser schematics would show attentional bias to exercise related words while those who did not have an exerciser self-schema (aschematics and nonclassifiables) would not show attentional bias to exercise related words. In the second experiment, in addition to the exercise words, sedentary-lifestyle related words and matched control words were included in the Stroop task. It was hypothesized the results of the first experiment would be replicated, and further, that nonexerciser schematics would show attentional bias for sedentary-lifestyle related words. This is because although nonexerciser schematics consider exercise as being important to their self-image, it has been shown with undergraduate samples that nonexerciser schematics exercise less often than exerciser schematics and are less likely to follow through on their intentions to exercise than are exerciser schematics or aschematics (Estabrooks & Courneya, 1997; Kendzierski, 1994). Thus they may feel that the words which characterize a sedentary lifestyle (e.g., unfit, unmotivated) describe them, as their behavior is incongruent with their values.

Experiment 1

Method

Participants and Materials. Participants were 36 undergraduate students (22 F, 13 M; mean age 20.86 years, *SD* = 1.80) who participated for a $5 reimbursement.

The Stroop task consisted of 12 exercise words and 12 control words (see Appendix). The control words matched the exercise words in terms of length and frequency of use, as advised by Francis and Kucera (1982) using the on-line MRC Psycholinguistic Database version 2.0. An initial list of exercise words was developed through brainstorming, examining existing physical activity advertising, and referring to dictionaries and a thesaurus. A list of 41 words that were thought to relate to either an active or a sedentary lifestyle was created (23 exercise words and 18 sedentary words). These words were piloted with 30 undergraduates in a manner similar to that employed by Harju and Reed (2003). That is, for each word the participants indicated whether they understood what the word meant by circling either yes or no. Then they rated their perception of each word on a 5-point Likert scale: 1 = *relates to a sedentary lifestyle very well*; 2 = *relates to a sedentary lifestyle fairly well*; 3 = *relates to a sedentary or an active life equally well*; 4 = *relates to an active life fairly well;* 5 = *relates to an active life very well*. Any words that two or more participants did not understand the meaning of were excluded. Words that were selected for the Stroop task all had a mean rating of 4 or more, indicating strong agreement that they related to an active lifestyle very well.

Exercise schema information was assessed using the Exercise Schema Questionnaire developed by Kendzierski (1988). This questionnaire consists of three phrases that ask whether being someone who exercises regularly, keeps in shape, or is physically active describes them. The participants rated these on an 11-point scale ranging from 1 = *does not describe me* to 11 = *describes me*. These three phrases are also rated on how important they are to the image the participant holds of him/herself, also rated on an 11-point scale. According to Kendzieski's criteria,

to be classified as an exerciser schematic, participants have to rate two of the three descriptors and two of the three image questions as 8 or greater. To be classified as a nonexerciser schematic, two of the three descriptors have to be rated as 4 or less, and two of the three image questions as 8 or greater. To be classified as an aschematic, two of the three descriptors have to be rated from 5 to 7, and two of the three image questions have to be 7 or less. All other answer combinations are rated as unclassifiable.

Procedure. After completing informed consent, participants were asked to name the colors of words presented on a computer screen as quickly as possible. E-prime software (Schneider, Eschman, & Zucculotto, 2002) was used to present the experiment and to collect responses. All words were presented in one of blue, green, red, or yellow on a light grey background, and the random without replacement feature of E-Prime was used such that for each participant the software created a random presentation order. The experiment began with a practice session consisting of 16 words (the words tree, chair, flower, and table presented once in each of four colors). Any questions were answered in the break after the practice session and then the experimental session began, which consisted of each exercise and matching control word randomly presented once in each of four colors, for a total of 96 word presentations.

Reaction times were collected when a participant said the name of the color into a microphone (which was held by a stand a certain distance away from each participant), and color responses were coded by a research assistant using a response box. Participants were instructed to name the color that words were printed in as fast as possible, to speak clearly and loudly, and to avoid saying "um" or "ah." Inadvertent microphone trips (e.g., because of a cough) were coded as an error. Each word was presented for a maximum of 2,000 ms, and each word presentation was preceded by a fixation cross presented for 1,000 ms. After completing the Stroop task, participants completed the exercise schema questionnaire and finally the word rating task as a manipulation check. A full description of the experiment was given at the end of the session and any questions were answered.

Data were analyzed using a 2×2 repeated-measures ANOVA with reaction time to word type as the within-subjects factor and schema type as the between-subjects factor. Responses were filtered for accuracy and for reaction times of greater than 150 milliseconds to screen out any mistakes (e.g., the microphone being tripped because of a cough that wasn't caught by the research assistant). To buffer for possible mistakes or necessary adjustments when starting the experiment, the first three words of the experimental session were not included in the analyses.

Results of Experiment 1

Using the questionnaire results, participants were classified as exerciser schematics ($n = 17$) or unschematics ($n = 16$), aschematics ($n = 7$), and unclassifiable participants ($n = 9$), unschematics being participants who don't hold an exerciser schema. Because of the small number of nonexerciser schematics ($n = 2$), this group was not included in the analysis. The manipulation check showed that for the participants in this study, the words *fit* and *flexible* had mean ratings of less than 4 and thus were not considered to relate to an active lifestyle very well. These words and their matching controls were therefore not used in the analyses, leaving a total of 77 words analyzed after the buffering words were also removed.

Results showed a significant schema-by-word-type interaction for color naming reaction time, $F(1, 31) = 13.65$, $p < .001$, $\eta^2 = .31$. Follow-up tests showed that exerciser schematics responded more slowly to the exercise related words than to the control words, $F(1, 16) = 10.80$, $p < .005$, $\eta^2 = .40$. There was a marginally significant difference between word types for unschematics, $F(1, 15) = 4.33$, $p = .06$, $\eta^2 = .22$, with these participants slower to respond to control words than to the exercise related words. Figure 1 shows the means for both schema types by word type. There was no significant difference for reaction time collapsed across both word types between schema types, $F(1, 33) = .123$, $p = .73$.

Discussion, Experiment 1

These results supported the hypothesis that exerciser schematics would show attentional bias for exercise related words. However, because this was the first study of its kind with exercise related stimuli, the study needs to be replicated. The strong findings for exerciser schematics need confirmation and the marginal results for unschematics need further exploration. In addition, the results of Experiment 1 allow for no insight into what nonexerciser schematics are attending to. Therefore, the purpose of Experiment 2 was to replicate Experiment 1 while also including a

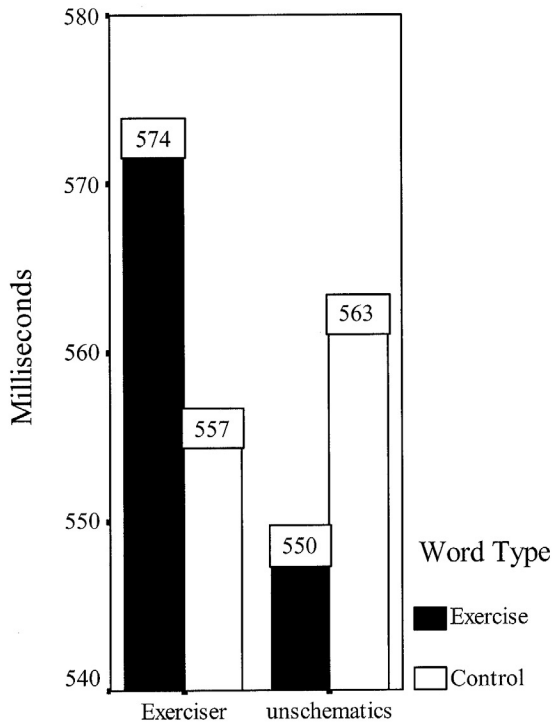

Figure 1 — Word type by schema interaction for Experiment 1.

list of words related to a sedentary lifestyle to see whether nonexerciser schematics would show response latencies to such words.

In addition to the main analyses, the word-rating task itself yielded some interesting results. Words that may often be associated with physical activity, particularly in health promotion advertising such as walk and stretch, had mean ratings of less than 4 in the pilot word rating task. This indicates that participants did not feel these words related very well to an active lifestyle. Although researchers distinguish between physical activity and exercise (Biddle & Mutrie, 2001), and physical activity has been defined as any movement that results in energy expenditure (including walking) whereas exercise can be described as planned and structured movement for the purpose of physical fitness (Buckworth, 2000), this distinction may not yet be clear to the general public.

Experiment 2

Method

Participants. Participants were 87 undergraduate students who participated for a $5 reimbursement. Data from 9 participants were not used because they made more than 10 mistakes in the Stroop task. Data from 3 participants were excluded because they did not understand more than 6 words on the word rating task (manipulation check), and the data from 3 other participants were not used because English was their second language. Subsequent analyses are on the data of 72 participants (mean age 20.01 years, $SD = 1.93$; 42 F, 28 M, and 2 who did not report gender).

Materials. The Stroop task was modified so that the words *fit* and *flexible* and matching controls were removed from the exercise word list and a list of sedentary and matching control words were included (see Appendix). The sedentary words were selected from the list originally piloted and were words with a mean rating of 2 or less. Procedure and data analyses were the same as in Experiment 1, except that the analysis consisted of a 4×3 repeated-measures analysis with reaction time to word type (exercise and matching controls and sedentary and matching controls) as the within-subjects factor, and schema type as the between-subjects factor (including exerciser schematics, nonexerciser schematics, and unschematics).

Results of Experiment 2

Based on the results of the schema questionnaire, 35 participants were classified as exerciser schematics, 8 as nonexerciser schematics, 6 as aschematics, and 23 were unclassifiable (resulting in 29 unschematics). These numbers are somewhat similar to those reported by Kendzierski (1988), who found that 53% of participants were exerciser schematics, 6.4% were nonexerciser schematics, 8.6% were aschematics, and 32.3% were unclassifiable. The word-rating task indicated that 22 participants did not understand the meaning of the word *lethargic*, 9 did not understand the meaning of the word *loaf,* and 7 did not understand the meaning of the word *idle*. These words and their matching controls were therefore not used in the analyses. All other words maintained their mean ratings of 4 or greater for exercise related words, and 2 or less for sedentary-lifestyle related words. Subsequently, in this analysis the data from 133 words were analyzed (4 each of 10 exercise words and 10 matching controls, and 7 sedentary words with 7 matching control words, with 3 buffer words omitted).

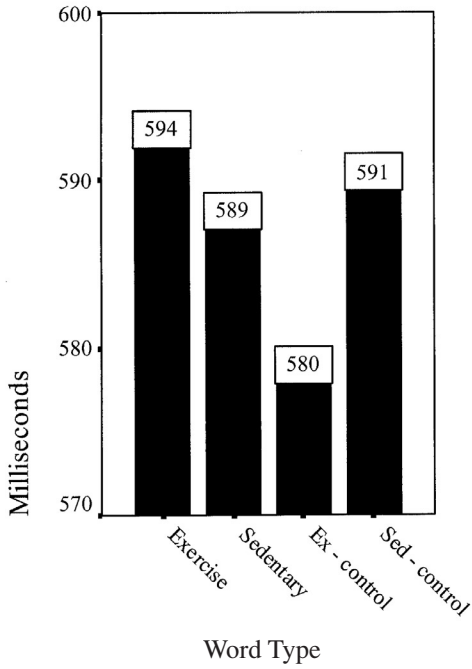

Figure 2 — Mean reaction times for exerciser schematics for Experiment 2.

A repeated-measures ANOVA across all words and schema classifications showed a significant main effect for word type, $F(3, 64) = 7.46$, $p < .001$, $\eta^2 = .62$, and a significant interaction of word type by schema, $F(6, 130) = 3.88$, $p < .05$, $\eta^2 = .12$. Follow-up tests showed that exerciser schematics showed significant response latencies for exercise related words over control words, $F(1, 34) = 6.24$, $p < .05$, $\eta^2 = .16$. There was no significant effect for sedentary related words, $F(1, 34) = 0.16$, $p = .69$. Figure 2 shows the mean reaction times for exerciser schematics across word type. There were also significant differences for nonexerciser schematics for sedentary-lifestyle related words over their matched control words, $F(1, 7) = 5.71$, $p < .05$, $\eta^2 = .45$. There were no significant differences for nonexerciser schematics for exercise related words, $F(1, 7) = 0.17$, $p = .69$.

Figure 3 shows the mean reaction times for nonexerciser schematics across all word types. There were no significant differences between exercise words and matching control for unschematics, $F(1, 28) = 0.54$, $p = .47$, nor were there differences between sedentary words and matching control for this group, $F(1, 28) = 0.29$, $p = .59$. A test of reaction time differences between schema classifications, when collapsed across all words, showed no significant results, $F(2, 69) = 1.52$, $p = .23$. However, nonexerciser schematics did show a trend to slower overall reaction times (mean = 636.24 ms) when compared to exerciser schematics (mean = 588.60 ms) and unschematics (mean = 586.12 ms), but this difference is largely accounted for by the slow reaction times to sedentary-lifestyle related words on the part of nonexerciser schematics.

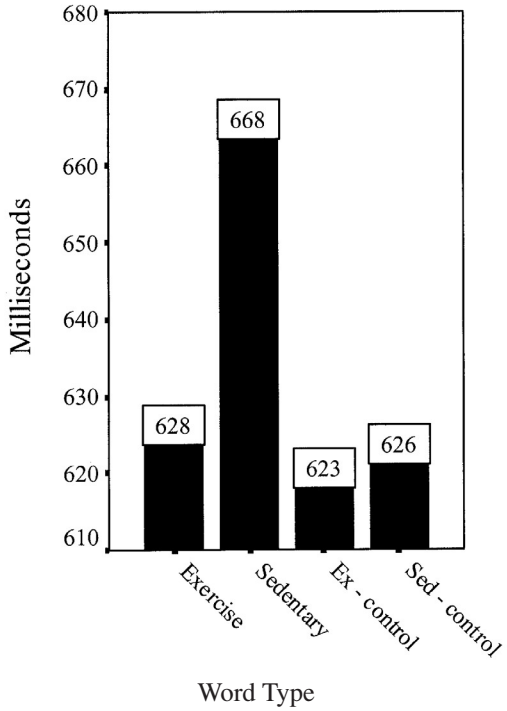

Figure 3 — Mean reaction times for nonexerciser schematics for Experiment 2.

General Discussion

The results of both experiments supported the hypothesis that exerciser schematics would show attentional bias for exercise related words. These results are similar to findings in other health areas such as self-assessed health (Williams et al., 2003) and smoking (Waters et al., 2003). They may be a consequence of exercisers being attracted to stimuli that confirm their self-identity because exerciser schematics are individuals who report that being physically active, in shape, or being someone who exercises regularly both describes them and is also important to their self-image. In their study of self-assessed health, Williams et al. (2003) indicated that individuals who over-attend to health relevant information may be those who overuse health services.

In a similar vein, the results of the present study suggest that it may be those who are already active who are attending to exercise related stimuli and are perhaps more likely to seek out opportunities to be active, but this contention requires further examination. Conversely, neither unschematics nor nonexerciser schematics showed delayed response latencies to the exercise related words; these results may have implications for the success of health promotion, as these individuals are generally the target audience for such materials. It may be that the stimuli included in exercise messages are not entering the consciousness of nonexercisers or unschematics, making it unlikely that the exercise message will have the desired

effect. However, more research is needed to help us better understand how exercise messages are processed and the effects of such messages on consumers (especially the possible effects of sedentary-lifestyle words on nonexercisers) before we can begin to construct better messages.

The results of the second experiment supported the hypothesis that nonexerciser schematics would show attentional bias for sedentary-lifestyle related words. These results can be related to the findings of Sheeran and Orbell (2000), who provided evidence that it was the self-image aspect of the self-schema questionnaire which moderated the relationship between intention to exercise and behavior; that is, the more somebody rated exercise as important to their self-image, the more likely they were to act on intentions to exercise. However, Sheeran and Orbell's results differ from the findings of Kendzierski (1994), who found that exercise intention predicted exercise behavior only for exerciser schematics, not for nonexerciser schematics.

Although there is some debate regarding the intention-behavior relationship and the mediating role of exercise self-schema, it is of interest that Harju and Reed (2003) reported that implicit exercise attitudes were related to the importance placed on being an exerciser while simultaneously avoiding being a nonexerciser. Participants in their study who identified themselves as the "feared nonexerciser" were more likely to dwell on negative thoughts about how to avoid being that self. This is of interest given that nonexerciser schematics in the present study, who consider exercise as important to their self-image but don't consider being somebody who exercises as descriptive, showed delayed latencies to words such as *unmotivated*, *lazy*, and *weak*, which may highlight the inherent conflict between their desired self and actual behavior. In Harju and Reed's language, nonexerciser schematics may be dwelling on the "feared nonexerciser" and how to avoid being this person.

The results of this study can also be related to the debate regarding the nature of the mechanism that causes the Stroop phenomenon. The emotional Stroop effect has been debated to be due either to the automatic processing of emotional words which therefore interferes with color naming, or to occur due to a dedicated system that automatically captures threatening stimuli (Dalgleish, 2005). Algom, Chajut, and Lev (2004) presented evidence for the threat-driven slowdown hypothesis rather than the attentional mechanism which they argue to be the true Stroop effect. One of their claims was that the emotional effect disappears when emotional and neutral words are presented mixed together in the same block (as in the present study) due to a carryover effect from previous trials (i.e., emotional delay from one word extends to affect processing of subsequent words).

The results of the present study, although not significant, showed that nonexerciser schematics had overall slower reaction times, which could suggest that they find anything to do with exercise threatening. However, the overall slower reaction times seem to be an artifact of the much slower responses to sedentary words over the other word types. Further, Dalgleish (2005) questioned the validity of Algom et al.'s (2004) claim, arguing that the experiment that supports the carryover effect did not include a true emotional Stroop condition. Further, Dalgleish argues that Algom et al. could not unequivocally prove that the words used in their research were threat related. This speaks directly to the results of the present study because although it could be argued that the sedentary words used (e.g., unmotivated, lazy) constitute a threat for nonexerciser schematics, the results for exerciser schematics reacting to exercise related words, and the results from other researchers who

showed an emotional Stroop effect for smokers and smoking-related stimuli, are not necessarily threatening. Rather it would seem that these are topics of great interest to the participants and therefore an attentional matter. Indeed, Dalgleish cites work which shows the emotional Stroop effect in studies that used positive emotion words, or words that are relevant to the participant.

It should be highlighted that the nonexerciser schematics in the present study may possibly have showed bias for the sedentary-lifestyle related words because the words were found threatening since they highlighted the feared self as described by Harju and Reed (2003). While being an exerciser is important to a nonexerciser schematic's self-image, being "physically active" or "someone who exercises regularly" does not describe him or her and this could result in feelings of guilt or a reminder of his/her lack of motivation. However, the meaning of sedentary-lifestyle related words to nonexerciser schematics needs to be further researched.

In addition, the fact that these participants did not react to the exercise related words is of interest and further research is needed to examine why these results occurred. Indeed, it could be argued that if exercise is important to their self-identity, it would seem that nonexerciser schematics would show delayed response to words that match their self-image. More research is needed to replicate these findings with a bigger sample and to further explore the meaning of sedentary related words to nonexercisers to determine whether they are truly threatening or whether they are of interest for some other reason. Results from such research could help us create effective health promotion messages by identifying which stimuli are positively effective for target audiences, versus ineffective or negative stimuli.

The results of this study provide a starting point for research into other automatic processes such as stereotype activation and stereotypical behavior. Researchers have used the Stroop task to provide evidence for stereotype activation when participants were primed with stereotype categories (Kawakami, Dovidio, Moll, Hermsen, & Russin, 2000), and research is needed to explore the stereotypes associated with being sedentary and the consequences of such stereotypes. Martin, Sinden, and Fleming (2000) provided evidence of such stereotypes when they found that targets described as exercisers were considered to be more independent, braver, friendlier, kinder, happier, neater, more intelligent, more sociable, and to have more friends than nonexercising targets.

The interaction of exercise messages in the media and exercise stereotypes calls for examination; Hurtz and Durkin (2004) reported that repeated exposure to stereotypes in the media promote the accessibility of related cognitions. Further, Wheeler and Petty (2001) report that activation of group stereotypes can result in stereotypical behavior, and they cite research showing that stereotypes of the elderly resulted in slower walking speeds for both young and old research participants (Bargh, Chen, & Burrows, as cited in Wheeler & Petty, 2001). Although some research looks at the stereotypes associated with being physically active, there is no research that looks at the behavioral outcomes of either assimilating or rejecting activity stereotypes. Stereotype activation that results from being exposed to exercise messages, whether these messages are positive or negative, is a necessary area for future research if we are to begin to understand how best to promote physical activity and how to positively influence physical activity behavior. The results of this study which showed that sedentary lifestyle words resulted in delayed response only in nonexerciser schematics is a useful starting point for such research.

Limitations

The small number of nonexerciser schematics in Experiment 2 is a limitation that should be addressed in future studies. Although there was a large difference between mean reaction times to sedentary words and matched controls, the fact that no difference was found for exercise words and matched controls should be interpreted with caution, as the nonsignificant results could be due to low power. More research is needed to see whether this finding can be replicated. Further, as pointed out by Dalgleish (2005), the nature of the emotional Stroop task has not yet been resolved; thus whether the results of the present study truly reflect an attentional bias for the stimuli or some other mechanism is inconclusive, and researchers in this area should be aware of how this debate unfolds. Another limitation relates to the generalizability of the results. The participants in this study were university students, for whom messages about exercise might have different connotations than for other participant groups. Future research should explore attentional biases with other populations.

In conclusion, this research provided clear evidence of attentional biases for exercise related words for exerciser schematics. Further research should use similar indirect measures to examine attentional bias for other exercise related stimuli, such as images of exercisers. Such research should also include an examination of the impact that such stimuli have on participants, particularly the possible effect of activating nonexerciser stereotypes in nonexercisers. Similarly, research is needed that further delineates the physical activity and exercise concepts and that examines whether people attend to exercise for health messages differently than they attend to exercise for appearance messages.

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Appendix

Exercise words:*	energetic, vigorous, fit, muscle, strong, athletic, exertion, gymnastic, exercise, conditioned, run, flexible
Exercise-control words:	synthetic, suburban, dog, varied, modern, acoustic, freighter, domestic, occasion, comparative, art, magnetic
Sedentary words:**	unmotivated, lethargic, unfit, lazy, inactive, sluggish, idle, weak, sickly, loaf
Sedentary control words:	consolidate, continual, saucy, dual, outboard, distract, fond, coal, bumper, muse

* Exercise words excluded from Experiment 1 analyses and omitted entirely from the Stroop task in Experiment 2: fit, flexible, dog, magnetic.

** Sedentary words excluded from Experiment 2 analyses: lethargic, idle, loaf, continual, coal, muse.