Evaluation of a National Physical Activity Intervention for Children

VERB™ Campaign, 2002–2004

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Background: Amid concern for the consequences of physical inactivity among children, the Centers for Disease Control and Prevention started a campaign using commercial marketing methods to promote physical activity to children.

Design: Longitudinal study using a telephone survey to assess physical activity behaviors and attitudes at baseline and for 2 years of follow-up. Relationships of campaign awareness to behavioral and psychosocial effects were analyzed with use of propensity scoring.

Participants: Nationally representative cohort of 2257 parent–child dyads.

Intervention: Marketing campaign (VERB) directed to all U.S. children aged 9 to 13 years. Components included general market and ethnic-specific advertisements on television and radio, in print, and through promotions in communities, schools, and on the Internet. Advertising ran nationally at consistent levels from June 2002 through June 2004.

Main outcome measures: Psychosocial measures and self-reports of free-time and organized physical activity during nonschool hours in the week before the interview and on the day before the interview.

Results: After 2 years, a dose–response effect was detected in the study population. The more children who reported seeing VERB messages, the more physical activity they reported and the more positive their attitudes were about the benefits of being physically active. Children aware of VERB reported engaging in significantly more physical activity than children unaware of VERB. These results were considerably stronger than the effects after Year 1, which were only for physical activity among subpopulations.

Conclusions: The VERB campaign continued to positively influence children's attitudes about physical activity and their physical activity behaviors and expanded the effects to more children. With adequate and sustained investment, health marketing shows promise to affect the attitudes and behavior of children.

(Am J Prev Med 2007;32(1):38–43) © 2007 American Journal of Preventive Medicine

Introduction

VERB is a health marketing campaign that combines national paid advertising with school and community promotions and Internet activities to encourage the nation's 21 million 9- to 13-year-olds to be physically active every day. Launched in 2002 by the Centers for Disease Control and Prevention, VERB uses commercial methods of youth marketing to advertise being physically active as cool, fun, and a chance to have a good time with friends.[1,2] Because habits developed early in life may persist into adulthood,[3] adequate participation in physical activity during childhood and adolescence could be critically important to prevention of chronic diseases later in life.

The VERB campaign is one response to the call of many public health advocates who see the promotion of youth physical activity as an increasingly pressing national priority.[4,5] Despite the physical and mental health benefits associated with children's regular participation in physical activity,[5,6] many youths do not meet national guidelines for engagement in physical activity.[7] Concern for the consequences of a sedentary lifestyle is heightened by the rise in childhood obesity[8] and the diagnosis of children with type 2 diabetes and cardiovascular disease risk factors.[9,10]

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0749-3797/07/$–see front matter
doi:10.1016/j.amepre.2006.08.030

In commercial marketing, a campaign is often built around a brand; in this case, the brand is "VERB," the part of speech that expresses action. Over the first 2 years, the VERB campaign's cumulative congressional appropriation of $194 million was used to develop the brand and implement the campaign, creating professionally produced television, radio, and print advertisements. The theories of planned behavior[11] and social cognitive theory[12] were used to plan and test effects of the campaign.[2] Messages sought to improve children's beliefs about the positive benefits of physical activity and their self-efficacy to overcome the barriers related to participation in physical activity. VERB's intent was to become the children's brand for physical activity, affecting behavioral norms by positioning physical activity as a highly appealing and easy choice.

Improving children's physical activity will require multiple approaches, including more physical education in schools, programs that address transportation and other barriers to being active, public and private efforts to increase access to safe places for children to be active, and marketing physical activity in cool and fun ways directly to children. Other media interventions for youth have addressed a range of behaviors but the results have been uneven.[13–16] By implementing and evaluating an initiative like VERB, the public health community can learn important lessons about the efficacy of using media-based interventions to market healthy choices to children.

The VERB campaign is being evaluated with a longitudinal research design. Changes in physical activity behaviors and attitudes were examined in a cohort of children aged 9 to 13 years at the beginning of the VERB campaign and 11 to 15 years at the Year-2 follow-up. The behavioral and psychosocial effects on these children after 2 years of the campaign intervention are reported here.

Methods

VERB Intervention

Marketing activities were conducted from June 2002 through June 2004. Television advertising, placed mainly on cable networks popular with children, was the primary delivery vehicle for the intervention. Community-focused and school-directed efforts supplemented the advertising in Year 1 and expanded in Year 2; activity promotion kits were delivered to numerous community-based organizations and schools across the nation. Partnerships with national and local groups also increased in Year 2. The aim was to expand opportunities for children to be active. An "activity finder" was added to VERB's child website that directed children to locate an activity of interest in their ZIP code area. In Year 1, the national media buy was estimated to deliver 188 gross rating points (GRPs) per week, 119 of them through television. GRPs are an estimated percentage of the target audience exposed to advertising. GRPs are calculated by multiplying the estimated reach of a medium (e.g., percentage of children likely to see an ad on cartoon shows on Saturday morning) by the number of opportunities to see the ad.

After 1 year of the VERB campaign, positive behavioral effects were found in subgroups of children in the target audience (e.g., children aged 9 to 10 and girls).[17] On the basis of the Year-1 findings, the media buy for Year 2 was adjusted to better reach older children and boys. In Year 2, lower funding reduced the television delivery to an estimate of 106 GRPs per week.

Subjects and Design

The study population is a nationally representative cohort of children and their parents, interviewed annually by using the Youth Media Campaign Longitudinal Survey (YMCLS). The procedures for sampling and random-digit-dialing methodology were reported previously.[17] The institutional review board of the Centers for Disease Control and Prevention approved this study.

A baseline survey was conducted during April through June 2002, before any VERB advertising was done. Eligibility screening was completed with 60.5% of contacted households. Eighty-seven percent of parents in eligible households and 81% of their children completed an interview. Thus, the baseline response rate was 43.2%. At the Year-1 follow-up in 2003, 71% of the same dyads completed interviews (n=2729), and at the Year-2 follow-up, 83% of those dyads were interviewed (n=2257). The overall response rate taking into consideration the three data collection points was 32%. The sample was weighted to 2002 census population totals for children aged 9 to 13, and adjustments were made for under-coverage and different probabilities of selection at baseline and survey nonresponse each year.

The median item response rate for the YMCLS was over 99%. However, in order to facilitate weighting and analysis, items with missing data were fully imputed using regression modeling for ordinal items and a hot deck procedure for unordered items.[18]

Measures

The YMCLS measures three dimensions of a child's physical activity during nonschool hours: free-time physical activity and organized physical activity in the past 7 days, and physical activity on the day before the interview. Activity levels over the past 7 days were calculated in "sessions." Sessions were determined through a series of questions during the telephone interview in which the children were asked first to name all the nonschool physical activities in which they had engaged during the previous 7 days. For each activity mentioned, children reported whether the activity was done in their free time or with a coach, leader, or supervisor. Children then reported the number of days in the previous 7 on which the activity was performed. Because the distribution of free-time activity data was skewed, the median number of free-time sessions reported for the previous 7 days was used. For physical activity on the previous day, children were asked a dichotomous question whether they had done any physical activities yesterday and to name the activities.

The YMCLS has acceptable reliability and validity for measuring physical activity in children aged 9 to 13 years.[19] One week test–retest reliability coefficients (intracluster cor-

relation coefficient [ICC] values) for the organized and free time activity measures were 0.64 and 0.43, respectively, and these measures were also significantly correlated with data from a detailed activity log (r =0.67 and r =0.46, respectively). The estimated minutes and sessions of physical activity on the previous day were also found to be significantly correlated with temporally matched data from an MTI Actigraph (2004; Fort Walton Beach FL) (r =0.54 and r =0.37, respectively). The moderate reliability coefficients are reasonable considering the inherent variability in physical activity and the challenges associated with measuring this behavior in youth.[20–22] Although the validity coefficients are fairly modest, they are as high as (or higher than) values reported for other similar 7-day recall instruments,[23,24] and are comparable with some of the commonly used 1-day recall instruments.[25,26]

The YMCLS included three scales that assessed psychosocial dimensions of physical activity: (1) outcome expectations—child's beliefs about the benefits of participating in physical activities, (2) self-efficacy—child's confidence to overcome barriers to engaging in physical activities, and (3) social influences—influences of family and peers. The scales were based on the literature on physical activity in children and were aligned with messages about physical activity that were expected to be in VERB advertising. The items assessing self-efficacy and social influences were added to YMCLS in 2003; thus, there was no baseline measure for these scales. Each scale used a factor score with a mean of 10 and a standard deviation of 1. The internal consistency (Cronbach's α) of the scales was 0.71, 0.68, and 0.75, respectively, similar to psychosocial scales reported elsewhere.[27,28] Test–retest reliability (ICC values) for 1 week repeated measurements were 0.80, 0.75, and 0.68, respectively.

Questions about VERB awareness and self-reported frequency of exposure to ads followed the physical activity and psychosocial items, placed deliberately to reduce social desirability bias. Awareness was assessed by asking unprompted, and then prompted recall of the campaign. All children were asked, "Have you seen, read, or heard any messages or advertising for getting kids active?" Children who answered in the affirmative were asked the name of the campaign. Those who responded "VERB" were categorized as having **unprompted awareness**. Children who could not recall the campaign name unaided were asked whether they had heard of VERB. Children who affirmed they had heard of VERB were categorized as having **prompted awareness**. Children who could not recall the campaign even after being prompted had **no awareness**. A measure of children's understanding of the VERB message followed the awareness questions by having children with awareness respond to the open-ended question, "What is VERB all about?" and "What ideas does VERB give you?" Children who reported being aware of VERB, unprompted or prompted, were then asked how often they usually saw or heard a message or ad about VERB on television or radio. This measure of self-reported frequency of exposure used a 4-point scale ranging from less than once a week to about every day.

To assess the validity of the awareness measures, the mean exposure score for children in selected communities who received a higher dose of VERB advertising was compared with a sample who received the national dose of advertising. This analysis showed a mean score of 2.315 (confidence interval, CI=2.226–2.404) for "high-dose" children and 2.086 (CI=1.982–2.190) for comparison children, a difference of 0.229 (CI=0.113–03.46), significant at $p<0.05$.[29]

The YMCLS also collected individual and household demographic information. Variables for children included age, gender, race and ethnicity, and the number of minutes of television watched. Household characteristics included household income and educational attainment of the responding parent.

Analysis

This study examined the effect of VERB on children's behaviors and attitudes. To conclude that VERB affected a given outcome, two conditions were required. First, after adjustment for pre-campaign differences, a statistically significant **dose–response relationship** was required between self-reported frequency of exposure to VERB and the outcome. For this analysis, the gamma (γ) statistic[30] was used to test for ordinal associations between outcome scores and self-reported frequency of exposure to VERB. Second, a positive, statistically significant difference in the outcome between the children in 2004 who were aware of VERB (unprompted or prompted recall of the campaign) and that of those who were unaware was required. This is called the **awareness effect**. This combination set a high standard, requiring that ads be effective in a narrow sense, that is, more viewing yielded more result, and in a broad sense, that is, those who were aware were significantly different from those unaware. The correlation coefficient r was used to calculate the effect sizes of awareness of VERB on behavior.[31] This method was used in a recent meta-analysis of health communication campaign effects.[32]

Children were placed in one of five groups based on self-reports of frequency of exposure to VERB. Logistic regression was used to identify confounding variables—baseline measures that were associated with both frequency of exposure to VERB and physical activity outcomes.

Approximately 315 variables, including all critical outcome variables, were permitted to enter the model. A forward stepwise selection procedure produced an initial model, after which first-order interactions and squared terms were introduced. Further stepwise selections maintained only variables with p values less than 0.05; preference was given to main effects over interactions involving main effects. The final model, including socioeconomic status, minutes of television watched, and baseline physical activity, contained 39 variables. These covariates were controlled using propensity scoring,[33,34] a statistical technique used in the evaluation of other media campaigns.[13]

Propensity scoring produced weights that statistically adjusted all observed covariates so that after adjustment there was no association between children's 2002 outcomes and their awareness level in 2004. To test that such freedom of association, called "balance," had been achieved, children were grouped by the five 2004 awareness levels, and then compared on 2002 (i.e., pre-campaign) point estimates for each outcome. Because the campaign did not exist in 2002, groups formed by 2004 awareness should have no dose–response relationship to 2002 outcome estimates. If no relationship is found, balance is said to be achieved, and all observed confounders can be considered controlled. The

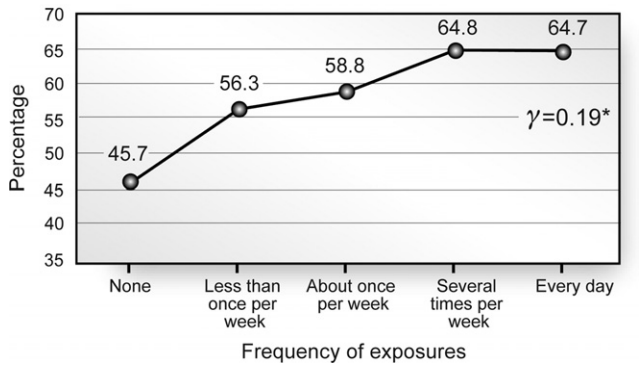

Figure 1. Percentage of children aged 9 to 13 years physically active on previous day, by frequency of exposure to VERB, 2004. *$p<0.05$.

analysis employed a statistical technique called "raking" to achieve balance.[35] Simulation analysis has demonstrated this procedure to be a valid alternative to the standard methodology.[36] Balance was achieved for all outcomes before the actual analysis was conducted by seeking dose–response relationships between 2004 point estimates and 2004 awareness. This approach permitted variations in physical activity and attitudinal outcomes to be attributed to levels of exposure to VERB. The process of analysis extended from fall 2004 into early winter 2005.

Results

Outcomes were examined for the total study population, and for demographic and physical activity–related subgroups. Multiple population-level effects were found, but few outcome differences were detected among the subpopulations examined.

The percentages of children in the five categories of self-reported exposure to VERB were (1) no exposure or no understanding of the campaign, 19%; (2) exposure less than once a week, 16%; (3) exposure about once a week, 22%; (4) exposure several times a week, 25%; and (5) exposure every day, 17%. Among exposed children, 96% reported understanding of at least one key campaign message.

Physical Activity Outcomes

There was a statistically significant (γ=0.19, CI=0.11–0.26, $p<0.05$) dose–response effect of exposure to VERB on the children reporting physical activity on the day before the interview (Figure 1), and on the median number of weekly sessions of physical activity during free time that were reported (γ=0.09, CI=0.04–0.13, $p<0.05$) (Figure 2). Thus, as the self-reported frequency of exposure to VERB increased, so did these two indicators of physical activity.

An awareness effect of VERB on physical activity was also detected. Among children aware of VERB, 61.2% (CI=58.3–64.0) reported physical activity on the previous day in 2004, while 45.7% (CI=38.9–52.5) of children unaware of the campaign reported previous-day physical activity (d=15.4, CI=8.1–22.8, $p<0.05$). Children who reported being aware of VERB engaged in 3.9 (CI=3.5–4.2) weekly sessions of free-time activity in 2004, whereas children with no VERB awareness reported 3.0 (CI=2.4–3.7) sessions, a 22% difference between VERB aware and VERB unaware.

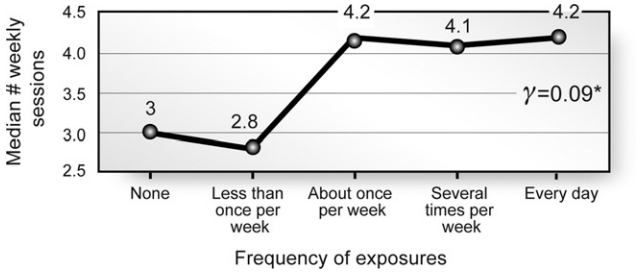

Figure 2. Median number of free-time physical activity sessions among children aged 9 to 13 years in past 7 days, by frequency of exposure to VERB, 2004. *$p<0.05$.

Children who were aware of VERB engaged in more organized physical activity, but there was no dose–response effect; thus, the evidence for effect on organized activity was insufficient.

Effect sizes for the awareness effect on behavior were r =0.07 for median number of weekly sessions of free-time physical activity, r =0.12 for physical activity on the day before the interview, and r =0.06 for organized physical activity.

Psychosocial Outcomes

The VERB campaign had a dose–response effect on outcome expectations—beliefs about the benefits of participating in physical activities (Figure 3), as well as an awareness effect: children who were aware of VERB averaged a scale score of 10.07 (CI=10.04–10.11) compared with a score of 9.71 (CI=9.56–9.85) among children who were unaware of VERB. Positive campaign effects were detected on the two remaining psychosocial scales, social influences (influences of

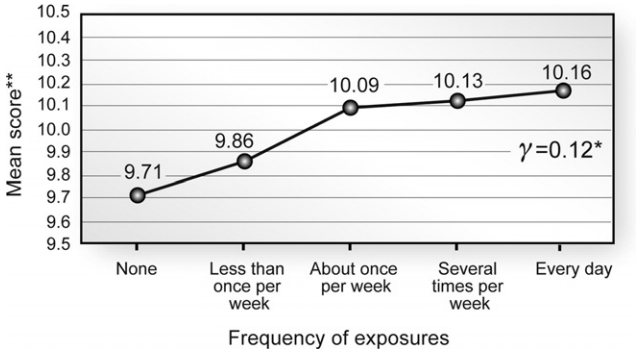

Figure 3. Scale of scores for outcome expectations, by frequency of exposure to VERB, 2004. *$p<0.05$. **Standardized scale: mean=10, standard deviation=1.

family and peers) and self-efficacy (confidence to overcome barriers to engaging in physical activities). Because the items in these scales had not been measured at baseline, propensity scoring could not be used to achieve statistical balance as was done with other outcomes; thus outcome expectations were reported as showing significant effects, but not social influences nor self-efficacy.

Discussion

After 2 years of the VERB campaign, there was a positive relationship between the frequency with which children reported seeing the campaign and their cognitive and behavioral outcomes related to physical activity. In 2004, the more children saw the campaign, the more active they were and the more positive were their attitudes toward physical activity. The results provide important information about the impact of health marketing on the 21 million youth in the campaign's targeted age range. This study revealed that 81% of U.S. children aged 9 to 13 years were aware of VERB and engaged in about one more session of free-time physical activity in a typical week in 2004 compared to those who were not aware of the campaign. Campaign planners hypothesize that children aware of VERB received additional cues and motivation to engage in physical activity; organized activity levels did not change because the campaign did not target organized sports, but rather encouraged playing "anywhere, anytime" and "by your own rules."

The effects of the campaign over 2 years were considerably stronger than the effects found after Year 1. After 1 year, evidence of the effects was restricted to free-time physical activity during the previous week among subpopulations, notably children aged 9 to 10 years and girls. The expansion of effects after 2 years to the entire target population on three outcomes—free-time physical activity during the past week, physical activity on the day before the interview, and expectations about participating in physical activity—suggests that the second year of advertising was critical to sustaining the momentum of Year 1 and producing more widespread behavioral effects.

Effect size permits comparison of effects free from the influence of sample size. The effect sizes on behavior for VERB were comparable to or better than those reported in a meta-analysis of data on health communications campaigns[32] (average effect size was 0.09). Enforcement campaigns, such as a threat of ticketing for nonuse of seat belts, averaged an effect size of 0.17; campaigns using persuasion messages, as VERB does, had an average effect size of 0.05. While these effects sizes are small in absolute terms, the effects of VERB were produced on a national scale, resulting in a low cost per child for producing behavioral changes that contribute to the societal mission of increasing physical activity among children.

This study had limitations. All the data were self-reported. Because the intervention was national in scope, an experimental design was not feasible. However, propensity scoring provided satisfactory control of confounders, which reduced vulnerability to the limitation of a nonexperimental design. The breadth of the baseline questionnaire and the control of potential confounders increase our confidence that the results constitute meaningful evidence about the effectiveness of this media-based promotion of physical activity. Reverse causation (i.e., physically active children notice the VERB advertising more than nonactive children) is a potential problem for evaluations of media campaigns. The longitudinal design of the VERB evaluation permitted adjustment for baseline physical activity levels to reduce this threat to validity. Although the overall response rate after 2 years was 32%, it is comparable to other large-scale telephone surveys. Corrections for nonresponder bias and adjustments for under-coverage were made.

Working to achieve a nation of children who are physically active at recommended levels is a national imperative. VERB seeks to make the decision to do something active the easy, appealing choice for children and to improve social norms about physical activity. Campaign planners are well aware of the irony of using a media-based approach to reducing sedentary behavior; however, changing normative behaviors requires reaching children where they are being influenced by other lifestyle messages and necessitates the breadth of intervention that only a large-scale media campaign can provide. This evaluation shows that a national campaign can have a positive impact on the physical activity levels of millions of young people by surrounding them with engaging messages and by promoting opportunities to incorporate physical activity in their daily lives. With adequate investment, health marketing shows promise to affect the attitudes and behavior of children.

The authors gratefully acknowledge the guidance of Robert Hornik in the data analysis and interpretation of results, the assistance of Mary Jo Nolin in data collection and analysis, and the direction of Stephen Banspach and Howell Wechsler in reviewing the manuscript.

Required disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the views of Centers for Disease Control and Prevention.

No financial conflict of interest was reported by the authors of this paper.

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