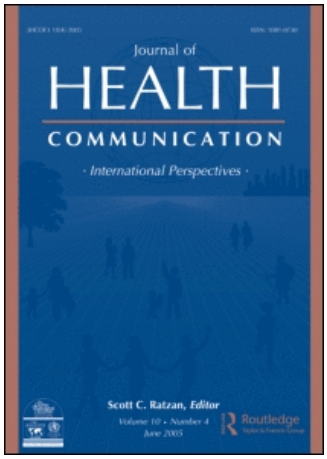

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The Relative Persuasiveness of Gain-Framed and Loss-Framed Messages for Encouraging Disease Prevention Behaviors: A Meta-Analytic Review

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A meta-analytic review of 93 studies ($N = 21{,}656$) finds that in disease prevention messages, gain-framed appeals, which emphasize the advantages of compliance with the communicator's recommendation, are statistically significantly more persuasive than loss-framed appeals, which emphasize the disadvantages of noncompliance. This difference is quite small (corresponding to $r = .03$), however, and appears attributable to a relatively large (and statistically significant) effect for messages advocating dental hygiene behaviors. Despite very good statistical power, the analysis finds no statistically significant differences in persuasiveness between gain- and loss-framed messages concerning other preventive actions such as safer-sex behaviors, skin cancer prevention behaviors, or diet and nutrition behaviors.

Recent estimates suggest that roughly half of all deaths in the United States are attributable to largely preventable causes (Mokdad, Marks, Stroup, & Gerberding, 2004). As a result, disease prevention is an increasingly important focus of modern public health policy. For example, prevention is the key component of both *Healthy People 2010* and the *Steps to a HealthierUS* initiative (U.S. Department of Health and Human Services, 2000, 2004).

Among the kinds of persuasive messages that might be used to encourage disease prevention behaviors, gain-framed appeals often have been suggested to be especially effective. A gain-framed persuasive appeal emphasizes the advantages of compliance with the communicator's recommendation or viewpoint, as contrasted with loss-framed appeals, which emphasize the disadvantages of noncompliance. Previous primary research (e.g., Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999) and reviews and theoretical analyses (e.g., Edwards, Elwyn, Covey, Matthews, & Pill, 2001; Kuhberger, 1998; Rothman & Salovey, 1997; Salovey, Schneider, & Apanovitch, 2002; Wilson, Purdon, & Wallston, 1988) have suggested that gain-framed appeals will

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enjoy a significant persuasive advantage in this domain. The most common explanatory framework invokes prospect-theoretic reasoning to suggest that potential losses are more motivating than potential gains when risky actions are contemplated, but gains are more motivating than losses for low-risk behaviors (Kahneman & Tversky, 1979). The apparent implication is that for relatively low-risk actions such as preventive health behaviors, gain-framed messages should be more persuasive than loss-framed messages (see e.g., Salovey et al., 2002).

But previous review discussions of this question generally have not been comprehensive, and no review has focused on the effects of gain–loss message variations specifically for disease prevention behaviors. Thus the general research question motivating the current review was whether gain-framed and loss-framed appeals significantly differ in persuasiveness concerning disease prevention actions.

The current review also examined whether the relative persuasiveness of gain- and loss-framed appeals varies depending on the particular prevention behavior being advocated. Such behavior-specific analyses have considerable practical importance, because the best evidence of whether gain-framed appeals are especially persuasive for encouraging (say) skin cancer prevention behaviors comes from studies specifically concerning those behaviors. To date no systematic review has addressed this question. In an earlier review, we examined gain–loss framing persuasion research generally, including disease prevention studies as a broad category, but space limitations prevented distinguishing effects for different specific prevention behaviors (O'Keefe & Jensen, 2006). In the interval between the completion of that earlier, broader review and the current one, recent studies were added to the analysis (the earlier review analyzed 74 disease prevention studies; the current review analyzes 93). The current review thus offers both a more extensive and a more detailed examination of framing effects for disease prevention behaviors.

We also examined variation in the realization of the gain-framed and loss-framed messages. As pointed out by several commentators (e.g., Dillard & Marshall, 2003; Rothman & Salovey, 1997; Wilson et al., 1988), gain- and loss-framed appeals can each take two forms, with the resulting four possibilities represented in a 2×2 array in which the contrasts are (a) whether the outcome described is a desirable or an undesirable one and (b) whether the outcome is described as one that is attained (acquired, achieved, made more likely) or avoided (averted, not realized, made less likely). That is, a gain-framed appeal might take the form "If you perform the advocated action, desirable outcome X will be obtained" or the form "If you perform the advocated action, undesirable outcome Y will be avoided." A loss-framed appeal might take the form "If you do not perform the advocated action, desirable outcome X will be avoided" or the form "If you do not perform the advocated action, undesirable outcome Y will be obtained."

One way of describing this variation is to say that appeals can differ in their linguistic representation of the kernel state of the consequence under discussion. The kernel state is the basic, root state mentioned in the message's description of the consequence. For example, in an appeal such as, "If you exercise regularly, you will reduce your risk of heart disease," the kernel state is "heart disease," which is plainly an undesirable state; that is, this appeal emphasizes the desirable consequences of compliance by discussing an undesirable kernel state ("heart disease") that will be avoided. By comparison, "If you exercise regularly, you will increase your chances of having a healthy heart" is an appeal describing a desirable kernel state ("healthy heart") that will be attained by compliance. The potential importance

of such variations can perhaps be seen by considering that it would be possible for a gain-framed appeal to be phrased entirely in terms of undesirable outcomes that would be avoided (''heart disease,'' ''skin cancer,'' ''premature death,'' and so forth) and for a loss-framed appeal to be phrased entirely in terms of desirable outcomes that would be foregone (''healthy heart,'' ''attractive skin,'' ''long life,'' and so forth).

Method

Identification of Relevant Investigations

Literature Search. Relevant research reports were located through personal knowledge of the literature, examination of previous reviews and textbooks, and inspection of reference lists in previously located reports. Reports also were identified through computerized database searches through at least August 2006 of ABI-INFORM, CINAHL (Cumulative Index of Nursing and Allied Health Literature), Current Contents, Dissertation Abstracts, EBSCO, ERIC (Educational Resources Information Center), Linguistics and Language Behavior Abstracts, MEDLINE, and PsycINFO, using various appropriate combinations of terms such as *framing*, *framed*, *frame*, *appeal*, *message*, *persuasion*, *persuasive*, *gain*, *positive*, *positively*, *benefit*, *loss*, *negative*, *negatively*, *threat*, and *valence*.

Inclusion Criteria. Studies selected had to meet three criteria. First, the study had to compare gain-framed and loss-framed persuasive messages. A gain-framed message emphasizes the desirable consequences of compliance with the advocated view; a loss-framed message emphasizes the undesirable consequences of noncompliance. Excluded by this criterion were studies that compared a gain-framed appeal with a combined gain-and-loss frame (Treiber, 1986; Wilson, Wallston, & King, 1990) and studies in which participants chose between differently described alternatives without any particular alternative being advocated (e.g., Tversky & Kahneman, 1981).

In general, this criterion was applied so as to exclude imperfect realizations of the message contrast of interest, such as manipulations that did not straightforwardly involve descriptions of the consequences of performing or not performing the recommended action. For instance, Blanton, Stuart, and VandenEijnden (2001) contrasted a ''negatively framed communication that emphasized the undesirable attributes of people who made unhealthy decisions'' and a ''positively framed communication that emphasized the desirable attributes of people who made healthy decisions'' (p. 848; similarly, see Blanton, VandenEijnden et al., 2001; Stuart & Blanton, 2003). For examples of other (excluded) imperfect realizations, see Cameron and Leventhal (1995), Christophersen and Gyulay (1981), Melvin (1995), and Van Den Heuvel (1982).

Second, the messages had to advocate disease prevention behaviors (e.g., safer-sex behaviors such as condom use, dental hygiene behaviors such as regular flossing, and so forth). Studies in which the messages advocated other behaviors, such as disease detection behaviors (e.g., Block & Keller, 1995, Study 2 skin exam condition), were excluded. As noted by Salovey and Wegener (2003, p. 61), some health-related behaviors, such as Pap tests and colonoscopies, plausibly might be described as either (or both) a disease-detection behavior or a disease-prevention behavior. Correspondingly, persuaders might employ appeals emphasizing either disease-detection or

disease-prevention aspects of the behavior. One potentially useful way of analyzing such "dual-function" behaviors would be to distinguish cases based on whether the appeals used to underwrite the recommended action stressed detection or prevention. As it happens, we could locate only two message framing studies whose messages advocated a dual-function behavior (both concerned Pap tests: Rivers, Salovey, Pizarro, Pizzaro, & Schneider, 2005; Wilkin, 2004), and only one of these contained a condition in which the appeals emphasized disease prevention (Rivers et al., 2005). In the interest of focusing on clear-cut studies of disease prevention behaviors, this case was not included in the current analysis. Following similar reasoning, studies in which a message advocated both prevention behaviors and detection behaviors were excluded (Block & Keller, 1995, Study 1).

Third, appropriate quantitative data relevant to persuasive effects (e.g., attitude change, intention, or behavior) had to be available; where it was not provided in the report, we made efforts to obtain information from authors. Excluded by this criterion were studies of effects on other outcome variables, including judgments of expected persuasiveness (Montazeri & McEwen, 1997; Ohme, 2001; Tasso, Monaci, Trentin, & Rosabianca, 2005) and perceived vulnerability (e. g., Meyer & Delhomme, 2000), and studies for which appropriate quantitative information could not be obtained (e.g., Burroughs, 1997; Devos-Comby, McCarthy, Ferris, & Salovey, 2002; Giles, 2002; Horgen & Brownell, 2002; Mann, Sherman, & Updegraff, 2004; Martinez, 1999; Merrill, 2003; Rothman, Salovey, Antone, Keough, & Martin, 1993; Salmon, Loken, & Finnegan, 1985; Siu, 2004).

Outcome Variable and Effect Size Measure

Outcome Variable. The outcome variable was persuasion, as assessed through attitude change, postcommunication agreement, behavioral intention, behavior, and the like. When multiple indices of persuasion (e.g., assessments of attitude and of intention) were available, we averaged the effects to yield a single summary. Most studies reported only immediate (short-term) effects; where both immediate and delayed effect size information were available (e.g., Jones, Sinclair, & Courneya, 2003), only immediate effects were included to maximize comparability across studies.

Effect Size Measure. Every comparison between a gain-framed message and its loss-framed counterpart was summarized using r as the effect size measure. When not reported as correlations, results were converted to r using formulas provided by Johnson (1993) and Rosenthal (1991). Differences indicating greater persuasion with gain-framed messages were given a positive sign. When correlations were averaged (e.g., across several indices of persuasive effect), we computed the average using the r-to-z-to-r transformation procedure, weighted by n. Wherever possible, multiple-factor designs were analyzed by reconstituting the analysis such that individual-difference factors (but not, e.g., other experimental manipulations) were put back into the error term (following the suggestion of Johnson, 1989, p. 16).

Moderating Factors

Advocated Behavior. Cases were classified by the kind of preventive behavior advocated, with eight broad categories distinguished: diet/nutrition behaviors (e.g., folic acid intake), safer-sex behaviors (e.g., condom use), skin cancer prevention behaviors

(e.g., using sunscreen), dental hygiene behaviors (e.g., flossing), exercise behaviors, smoking cessation or noninitiation, inoculation (vaccination), and other (or multiple different) prevention behaviors (e.g., behaviors aimed at minimizing hearing loss).

Kernel State Phrasing. The kernel states in each appeal were identified; as discussed above, a kernel state is the basic, root state mentioned in the message's description of the consequence under discussion. We coded each appeal as containing exclusively desirable kernel states (e.g., "healthy heart," "attractive skin"), exclusively undesirable kernel states (e.g., "heart disease," "skin cancer"), a combination of desirable and undesirable kernel states, or as indeterminate with respect to kernel-state phrasing (as when insufficient detail was available about the messages).

Coding Reliabilities. Codings for these moderator variables were completed independently by the authors for a sample of 25 cases. Intercoder reliabilities (percent agreement and Cohen's kappa, respectively) were .96 and .95 for advocated behavior, .92 and .89 for kernel state phrasing in gain appeals, and .92 and .88 for kernel state phrasing in loss appeals. Discrepancies were resolved by discussion. The first author coded the remaining cases.

Unit of Analysis

The unit of analysis was the message pair, that is, the pair composed of a gain-framed message and its loss-framed counterpart. We recorded an effect size for each distinguishable message pair found in the body of studies. Usually, a given message pair was used only in a single investigation, so only one effect size estimate was associated with the pair. But some message pairs were used in more than one study, with the result that several effect size estimates could be associated with that message pair. These multiple estimates were averaged to yield a single summary estimate before inclusion in the analysis. Specifically, data from Broemer (2002, Study 1) and Broemer (2004, Study 1) were combined and reported as Broemer (2004) Study 1 combined; data from Experiments 1, 4 A, and 5 in Lee and Aaker (2004) were combined and reported as Lee and Aaker (2004) grape juice promotion and grape juice prevention; and data from Study 1 and Study 2 in Zhao (2005) were combined and reported as Zhao (2005).

Whenever a study included more than one message pair and reported data separately for each pair, each pair was treated as providing a separate effect size estimate (e.g., van Assema, Martens, Ruiter, & Brug, 2001). Some studies included more than one message pair but did not report results in ways that permitted computing separate effect sizes for each pair (e.g., Hessling, 1996; Steward, Schneider, Pizarro, & Salovey, 2003); we computed a single effect size in such cases, with the consequence that the current analysis underrepresents the amount of message-to-message effect variability in these data.

In some cases, the same primary data served as the basis for multiple reports (e.g., both a dissertation and a subsequent publication). When a given investigation was reported in more than one outlet, it was treated as a single study and analyzed accordingly.

Meta-Analytic Procedures

The individual correlations (effect sizes) initially were transformed to Fisher's *z*s; the *z*s were analyzed using random-effects procedures (specifically, those of Borenstein & Rothstein, 2005; see also Hedges & Vevea, 1998; Shadish & Haddock, 1994), with results

then transformed back to r. A random-effects analysis was employed in preference to a fixed-effects analysis because of an interest in generalizing across messages (for some discussion, see Erez, Bloom, & Wells, 1996; Hedges & Vevea, 1998; Jackson, 1992).

Results

Overall Effects

Effect sizes were available for 93 cases, with a total of 21,656 participants. Details for each included case are contained in Table 1. Across all 93 cases, the random-effects weighted mean correlation was .032. The limits of the 95% confidence interval for this mean were .006 and .058, indicating a significant persuasive advantage for gain-framed appeals ($p = .015$); $Q(92) = 239.7$, $p < .001$.

These effect sizes are, overwhelmingly, statistically independent (with no overlap of participants between effect size estimates). But because the unit of analysis was the message pair, three studies yielded effect sizes that were not entirely independent. Goodall's (2005) design had one loss-framed message and two gain-framed messages, thus providing two message pairs and so two effect sizes, but obviously there was some overlap in the participants contributing to the two effect sizes. Sheer's (1995) design had two message pairs (and so two effect sizes) in a within-subjects design, and hence the effect sizes were based on the same participants. Zhao's (2005) design had two gain-framed messages and two loss-framed messages, thus providing four distinct message pairs and so four effect sizes, but some of these effect sizes had some participants in common. If one computes the appropriate average effect sizes and ns for each of these studies (for Goodall [2005], $r = -.076$, $n = 210$; for Sheer [1995], $r = .136$, $n = 205$; for Zhao [2005], $r = .006$, $n = 877$), the resulting set of 88 cases produces results virtually identical to that from the 93-case analysis just reported: mean $r = .033$, 95% CI limits of .007 and .058, $p = .012$; $Q(87) = 200.0$, $p < .001$.

Moderating Factors

Specific Prevention Behaviors. As Table 2 indicates, for most categories of prevention behaviors, gain- and loss-framed appeals did not significantly differ in persuasiveness. A dependable advantage for gain-framed appeals was apparent for dental hygiene behaviors (mean $r = .154$), but not for any other specific prevention behavior. Excluding dental-hygiene cases, across the remaining 84 cases gain- and loss-framed appeals did not significantly differ: mean $r = .022$, 95% CI limits of $-.003$ and .048, $p = .087$; $Q(83) = 197.5$, $p < .001$. With 84 cases, a typical study sample size of 247 (the mean study sample size across these 84 cases), and large heterogeneity (using the conventional v value of Hedges & Pigott, 2001), the power for detecting a population effect size of $r = .10$ (with .05 alpha, a two-tailed test, and a random-effects analysis) exceeds .999 (Hedges & Pigott, 2001). (A population effect size of $r = .10$ is an appropriate figure; it is the effect size conventionally labeled "small" [Cohen, 1988], and it is characteristic of the effect magnitudes observed in persuasion effects research.)

Phrasing of Kernel States in Gain-Framed Appeals. As indicated in Table 2, gain- and loss-framed appeals dependably differed in persuasiveness when the gain-framed

Table 1. Cases analyzed

Study	*r*	*N*	Codings[a]
Arora & Arora (2004)	.088	267	1/2/4
Bannon & Schwartz (2006)	.016	32	1/1/2
Benz Scott & Curbow (2006) immediate	−.067	194	8/3/3
Benz Scott & Curbow (2006) future	.011	193	8/3/3
Block & Keller (1995) Study 2 sun exposure	.174	58	2/2/1
Bono Santos & Rodriguez Torronteras (1991)	.067	86	6/1/1
Broemer (2002) Study 2	−.079	120	8/3/3
Broemer (2002) Study 3	−.036	80	3/2/1
Broemer (2004) Study 1 combined	−.104	140	8/2/1
Broemer (2004) Study 3	.196	144	7/2/1
Brondino (1997)	.040	98	3/3/1
Brug, Ruiter, & van Assema (2003) Study 2	.039	149	1/4/4
Brug et al. (2003) Study 3	−.061	92	1/4/4
Cesario, Grant, & Higgins (2004) prevention	−.169	53	1/1/2
Cesario et al. (2004) promotion	.115	53	1/1/2
C. Chang (2006)	.056	410	6/4/4
C.-T. Chang (2003) mouthrinse	.302	51	4/4/4
C.-T. Chang (2003) rinse tablets	.620	49	4/4/4
Cox, Cox, & Zimet (2006) Study 1 prevention	.013	139	2/3/3
Cox et al. (2006) Study 2	−.056	213	7/3/3
Detweiler, Bedell, Salovey, Pronin, & Rothman (1999)	.115	217	2/3/3
Evans, Rozelle, Lasater, Dembroski, & Allen (1970)	.239	234	4/1/1
Ferguson, Bibby, Leaviss, & Weyman (2003) Study 4	.295	65	8/3/3
Ferguson et al. (2003) Study 5 noise	.009	188	8/3/3
Ferguson et al. (2003) Study 5 handling	.000	263	8/3/3
Ferguson et al. (2003) Study 6 consequences	−.161	49	8/3/3
Ferguson et al. (2003) Study 6 solutions	−.066	49	8/3/3
Fischer & Nabi (2001) sunscreen	−.191	79	2/3/1
Goodall (2005) level 1	−.092	140	6/2/1
Goodall (2005) level 2	−.059	140	6/1/1
Greenlee (1997)	.107	134	3/3/3
Hashimoto (2002)	−.013	166	1/2/1
Hessling (1996)	.121	273	3/2/3
Hoffner & Ye (2004)	.000	154	2/1/1
Homer & Yoon (1992)	.034	239	4/1/3
Hsiao (2002) exercise prevention	.546	49	5/3/3
Hsiao (2002) exercise detection	−.378	51	5/3/3
Jayanti (2001)	.007	69	1/4/4
Jones, Sinclair, & Courneya (2003)	.048	192	5/3/3
Jones, Sinclair, Rhodes, & Courneya (2004)	.020	413	5/3/3
Knapp (1991) health	.046	38	4/3/1
Knapp (1991) social	−.084	40	4/1/1
Kroll (2004)	.063	192	5/3/3
Lawatsch (1990)	.071	72	1/1/3

(*Continued*)

Table 1. Continued

Study	*r*	*N*	Codings[a]
A. Lee & Aaker (2004) Experiment 2 promotion	.055	85	2/1/2
A. Lee & Aaker (2004) Experiment 2 prevention	−.173	78	2/3/3
A. Lee & Aaker (2004) Experiment 3 high risk	−.312	45	1/3/3
A. Lee & Aaker (2004) Experiment 3 low risk	.382	36	1/3/3
C. Lee, Brown, & Blood (2000) sunscreen/clothing	.119	132	2/2/1
Lemieux, Hale, & Mongeau (1994) vivid high fear	.039	51	2/4/4
Lemieux et al. (1994) pallid high fear	.132	50	2/4/4
Lemieux et al. (1994) vivid low fear	.070	50	2/4/4
Lemieux et al. (1994) pallid low fear	.019	50	2/4/4
Levin, Gaeth, Evangelista, Albaum, & Schreiber (2001)	−.127	224	1/2/1
Levin, Gaeth, Schreiber, & Lauriola (2002)	.021	102	1/2/1
Looker & Shannon (1984)	.006	227	1/1/1
Lowenherz (1991)	.006	83	3/4/4
Lucidi, Russo, Mallia, Devoto, Lauriola, & Violani (2006)	−.049	695	8/4/4
McCall & Ginis (2004)	.311	29	5/3/3
McCaul, Johnson, & Rothman (2002)	−.012	6,522	7/2/1
McKee, O'Malley, Steward, Neveu, Land, & Salovey (2004)	.067	271	6/3/3
Meyers-Levy & Maheswaran (2004)	.270	147	1/3/3
Millar & Millar (2000)	.079	277	8/3/3
Pedley (1986)	−.309	20	6/3/3
Ramirez (1977)	.030	116	4/4/4
Richardson, Milam, McCutchan, Stoyanoff, Bolan, Weiss, et al. (2004)	−.233	382	3/4/4
Robberson & Rogers (1988) health	−.190	24	5/3/3
Robberson & Rogers (1988) self-esteem	.537	24	5/1/3
Robertson & Welbourne (2000) positive scenario	−.024	80	8/4/4
Robertson & Welbourne (2000) negative scenario	.001	80	8/4/4
Rothman, Martino, Bedell, Detweiler, & Salovey (1999) Experiment 1 prevention	.052	40	7/3/3
Rothman et al. (1999) Experiment 2 prevention	.182	60	4/2/1
Schneider, Salovey, Pallonen, Mundorf, Smith, & Steward (2001)	.186	437	6/4/3
Shannon & Rowan (1987)	.031	138	8/4/4
Sheer (1995) threat-L	.093	205	3/3/2
Sheer (1995) threat-S	.178	205	3/3/2
Shen (2005)	.038	837	8/3/1
Sherman, Mann, & Updegraff (2006)	−.042	67	4/4/4
Simmering (1993) nonsocial	−.030	78	8/3/1
Simmering (1993) social	.027	77	8/1/3
Steward, Schneider, Pizarro, & Salovey (2003)	.013	853	6/3/3
van Assema, Martens, Ruiter, & Brug (2001) low-fat	.035	75	1/3/1
van Assema et al. (2001) fruit & vegetable	.068	66	1/3/1

(*Continued*)

Table 1. Continued

Study	*r*	*N*	Codings[a]
Vasilias (1999)	−.007	270	3/3/1
Weiner (2004) female-give	−.091	93	3/3/3
Weiner (2004) female-receive	−.071	101	3/3/3
Weiner (2004) male-give	−.067	77	3/3/3
Weiner (2004) male-receive	.046	100	3/3/3
Wilkin (2004) condom	.150	118	3/4/4
Zhao (2005) benefit-positive benefit-negative	.199	438	6/1/2
Zhao (2005) benefit-positive cost-negative	.006	438	6/1/1
Zhao (2005) cost-positive benefit-negative	.016	438	6/2/2
Zhao (2005) cost-positive cost-negative	−.198	438	6/2/1

[a] The coding judgments, in order, follow: specific prevention behavior (1 = diet/nutrition, 2 = skin cancer prevention, 3 = safer-sex behavior, 4 = dental hygiene behavior, 5 = exercise behavior, 6 = smoking, 7 = inoculation/vaccination, 8 = other prevention behaviors); gain kernel-state language (1 = desirable states, 2 = undesirable states, 3 = both desirable and undesirable states, 4 = indeterminate); loss kernel-state language (1 = undesirable states, 2 = desirable states, 3 = both desirable and undesirable states, 4 = indeterminate).

Table 2. Summary of results

	k	*N*	mean *r*	95% CI	power[a]	*Q* (*df*)
All cases	93	21,656	.032	.006, .058	–	239.7 (92)***
Prevention behavior						
diet/nutrition	17	1,875	.026	−.040, .091	.85	28.7 (16)*
safer sex	14	2,219	.018	−.058, .094	.91	39.7 (13)***
skin cancer	12	1,143	.037	−.025, .098	.65	11.7 (11)
smoking	12	4,109	.020	−.053, .092	.99	53.4 (11)***
dental hygiene	9	894	.154	.020, .283	–	25.7 (7)***
exercise	8	974	.110	−.056, .270	.59	34.0 (7)***
inoculation/vaccination	4	6,919	.024	−.072, .121	.99	6.7 (3)
other	17	3,523	−.001	−.034, .032	.99	15.2 (16)
Gain appeal kernel language						
desirable	15	2,339	.072	.009, .135	–	27.5 (14)*
undesirable	15	9,184	.006	−.049, .061	.99	41.1 (14)***
both	43	6,916	.024	−.013, .061	.99	82.6 (42)***
indeterminate	20	3,217	.053	−.022, .128	.98	72.0 (19)***
Loss appeal kernel language						
undesirable	27	11,066	.002	−.037, .042	.99	54.9 (26)**
desirable	7	1,456	.110	.041, .178	–	9.0 (6)
both	39	6,087	.037	−.007, .080	.99	91.8 (38)***
indeterminate	20	3,047	.044	−.027, .114	.97	59.9 (19)***

*$p < .05$. **$p < .01$. ***$p < .001$.

[a] These are power figures for detecting a population effect size of $r = .10$, assuming large heterogeneity, with a random-effects analysis, .05 alpha, and a two-tailed test (Hedges & Pigott, 2001).

appeal was phrased in terms of desirable kernel states (mean $r = .072$), but not when it was phrased in terms of undesirable kernel states (mean $r = .006$) or a combination of desirable and undesirable kernel states (mean $r = .024$). The confidence intervals for these three means overlap substantially, however, indicating that the relative persuasiveness of gain- and loss-framed appeals does not dependably vary as a consequence of the phrasing of the kernel states in gain-framed appeals.

Phrasing of Kernel States in Loss-Framed Appeals. As indicated in Table 2, gain- and loss-framed appeals dependably differed in persuasiveness when the loss-framed appeal was phrased in terms of desirable kernel states (mean $r = .110$), but not when it was phrased in terms of undesirable kernel states (mean $r = .002$) or a combination of desirable and undesirable kernel states (mean $r = .037$). The advantage of gain-framed appeals was significantly ($p < .05$; Payton, Greenstone, & Schenker, 2003) greater when the corresponding loss-framed appeals were phrased with desirable kernel states (mean $r = .110$) than when those appeals were phrased with undesirable kernel states (mean $r = .002$). The advantage of gain-framed appeals over loss-framed appeals with desirable kernel states (mean $r = .110$) did not differ significantly from their advantage over loss-framed appeals invoking both desirable and undesirable states (mean $r = .037$).

Age. A reader wondered about one other possible moderating factor (beyond the preventive-behavior category and kernel-state phrasing), namely, recipient age. There is not much variability in age between most of these studies, but it is possible to compare effects involving children and those involving older adults. Five cases had (sub-high-school) children as participants (Bannon & Schwartz, 2006; Evans, Roselle, Lasater, Dembroski, & Allen, 1970; Knapp, 1991 health; Knapp, 1991 social; Lawatsch, 1990). The random-effects mean r across these five cases is .115, $p = .076$, 95% CI limits of $-.012$ and .239; $Q(4) = 5.4$, $p = .25$. Two cases had noticeably older participants: McCall and Ginis's (2004) study of cardiac rehabilitation patients and McCaul, Johnson, and Rothman's (2002) study of Medicare recipients. The random-effects mean r across these two cases is .097, $p = .534$, 95% CI limits of $-.207$ and .384; $Q(1) = 2.9$, $p = .09$. The 95% confidence intervals for these two effects overlap substantially (indeed, the former is entirely contained in the latter), giving little reason to suppose that the relative advantage of gain- and loss-framed appeals varies as a consequence of recipient age.

Discussion

Gain-Framed and Loss-Framed Appeals

Kernel State Phrasing. Several observers have noticed that the relative persuasiveness of gain- and loss-framed appeals potentially might vary depending on the specific phrasing of the appeals—for instance, whether the gain-framed appeals refer to obtaining desirable outcomes or to avoiding undesirable outcomes (e.g., Wilson et al., 1988). The current review indicates that, at least in the realm of messages concerning disease prevention, effects do not vary dependably across such phrasing variations of the gain-framed appeal. Effects do vary dependably as a function of whether the loss-framed appeal is expressed as a matter of noncompliance avoiding desirable states or noncompliance yielding undesirable states; the former phrasing depresses the persuasiveness of the loss-framed appeal relative to

gain-framed appeals. But given that nothing in the current results endorses the use of loss-framed appeals, one need not be detained by considerations of which particular loss-framed phrasings make for a greater or lesser disadvantage compared with gain-framed appeals.

Overall Gain-Loss Framing Differences. For encouraging disease prevention behaviors, gain- and loss-framed appeals significantly differ in persuasiveness, with gain-framed appeals more persuasive than their loss-framed counterparts. But this conclusion is misleading, for two reasons.

First, the advantage of gain-framed appeals is quite small, corresponding to a correlation of .03. The 95% confidence interval for this effect ranges from .01 to .06, so population values outside this range are not plausible. Thus a population effect of .00 is not plausible (that is, the effect is significantly different from zero)—but a population effect as large as .07 is also not plausible. To be sure, a small effect size is not necessarily unimportant or trivial. As Abelson (1985, p. 133) has made clear, even quite small effects (e.g., a percent-of-variance-explained figure of one third of 1%, or .003) sometimes can be very important, as when "potentially cumulative processes" are at work, such as repeated at-bats in baseball or—relevant to the current circumstance—repeated exposures to persuasive messages. But even by such standards, the percent-of-variance-explained figure for the observed overall mean effect ($r = .032$) is extraordinarily small (.001).

Second, the apparent persuasive advantage of gain-framed appeals appears to be the result of a relatively large (and statistically significant) effect in a subset of cases, namely, messages advocating dental hygiene behaviors. Two considerations underwrite this conclusion. The first is that, combined across all other (i.e., nondental) prevention behaviors, there was no significant difference in effect between differently framed appeals—even though the current analysis had excellent statistical power (.999) for detecting even small differences (corresponding to $r = .10$). The actual population effect size is of course unlikely to be literally zero (a correlation of .00000000 . . .). But the failure of this review to detect a statistically significant effect across these cases, given excellent statistical power, should give confidence that if gain-framed appeals do have some advantage over loss-framed appeals for encouraging such prevention behaviors, that advantage is vanishingly small; indeed, the 95% confidence interval for these (nondental) cases excludes a population value as small as $r = .05$.

The other consideration is that for specific kinds of other (nondental) prevention behavior, no significant differences were found, even though the analyses commonly had very good statistical power. As indicated in Table 2, for most other categories of prevention behavior, the current review had excellent power (of .85 and above) for detecting a population effect equivalent to a correlation of .10. For example, in the realm of safer-sex behaviors, if gain-framed appeals actually enjoy a persuasive advantage corresponding to a correlation of .10, the current analysis very likely was to have returned a statistically significant result (power of .91). The lack of such a result makes it unlikely that any such population effect exists.

At best, one might cling to the belief that gain-framed appeals perhaps could be dependably more persuasive than loss-framed appeals for encouraging exercise behavior (a nonsignificant result with power of .59) and skin cancer prevention measures (a nonsignificant result with power of .65)—but even that belief requires acknowledging that the odds favored the current review's finding a significant effect if the

population effect were as large as .10. Expressed differently, if gain-framed appeals for exercise behavior actually enjoy a persuasive advantage (over loss-framed appeals) corresponding to a correlation of .10, the odds are that the current analysis would have returned a statistically significant result (power of .59). That no such significant result was obtained makes it correspondingly unlikely that the population effect is as large as .10.

In sum: It has become commonplace to assert that for encouraging disease prevention behaviors, gain-framed appeals are more persuasive than loss-framed appeals. That claim is unquestionably well justified for messages aimed at encouraging behaviors that prevent dental problems (e.g., behaviors such as regular flossing). But the claim is not well justified otherwise. The overall advantage of gain-framed appeals, though statistically significant, is exceptionally small and decidedly not general.

It is never encouraging to find that a given factor does not make much difference to the success of persuasive efforts—and it is especially disappointing given the manifest importance of developing effective messages for encouraging disease prevention. But sufficient research evidence has accumulated to make it clear that one cannot expect that using a gain-framed appeal rather than a loss-framed appeal will make much difference to the success of such messages—and we do a disservice both to message designers and to theoretical analysts to suppose otherwise.

Dental Hygiene Behaviors

Gain-framed appeals do enjoy a relatively large dependable persuasive advantage for behaviors (such as brushing and flossing) aimed at preventing dental problems. It is not immediately apparent what might explain this effect, but two broad sorts of possibilities suggest themselves.

The Distinctiveness of Framing Realizations in Dental Hygiene Messages. The first potential explanation is that there is something unusual about the way in which the gain–loss appeal variation has been realized in studies of dental hygiene behaviors; the messages used in these studies might differ in some systematic way from the messages used in other gain–loss appeal studies. For instance, the dental hygiene messages could have typically contained a stronger "dose" of the framing manipulation compared with messages on other topics. That is, it might be that on other topics, the gain-framed and loss-framed appeals generally were quite similar (with much message material in common), with the framing manipulation consisting of a comparatively small part of the message, whereas in the dental hygiene messages the gain- and loss-framed messages had very little common message material (and hence might be described as having a stronger "dose" of the framing manipulation).

Unfortunately, identification and exploration of any such systematic variation is impeded by the unavailability of most experimental messages in this research area. Research reports commonly offer brief descriptions of the messages used, but complete versions typically are not available. This reporting practice—unhappily characteristic of persuasion effects research—obviously impairs research progress.

The Distinctiveness of Dental Hygiene Behaviors. The other broad explanatory possibility is that there is some distinctive characteristic of dental hygiene behaviors that make them especially susceptible to gain-framed (rather than loss-framed) appeals. Any such feature must satisfy two conditions. First, it must distinguish

dental hygiene behaviors from all the other kinds of prevention behaviors considered here. Second, the feature must explain why gain-framed appeals are more persuasive than loss-framed appeals for these behaviors. That is, there must be something about the feature that makes gain-framed appeals more persuasive than loss-framed appeals. It is not sufficient to point to something unique about dental hygiene behaviors (the first criterion); that unique feature must somehow make these behaviors more susceptible to influence by gain-framed appeals than by loss-framed appeals (the second criterion).

These two criteria rule out many possible explanations. For example, a reader suggested that dental hygiene is a matter of individual effort, unlike condom use (which requires some negotiation between partners). But many other prevention behaviors seem similarly to be matters of individual effort (e.g., inoculation, exercise). That is, this characteristic does not uniquely distinguish dental hygiene behaviors from other prevention behaviors and hence cannot be the basis of a satisfactory explanation.

A reader also suggested that dental hygiene behaviors are adopted more easily than other prevention behaviors (e.g., smoking cessation, long-term dietary changes). But (a) some other prevention behaviors also seem to be adopted easily, such as one-time (or annual) vaccinations; and (b) a behavior's being easy to adopt might make it more susceptible to being influenced in general (compared with difficult-to-adopt behaviors)—but there is no apparent reason why being easy to adopt should make a behavior specifically more susceptible to gain-framed appeals than to loss-framed appeals.

Another reader suggestion was that maintaining dental hygiene is normative (unlike, for example, using sunscreen) and that dental hygiene is underwritten by a surrounding infrastructure of people (parents, dentists, significant others) who encourage the behavior. But smoking cessation seems equivalently normative and similarly underwritten by the social environment. And while surrounding support (normative or otherwise) might encourage adoption and maintenance of a behavior, there is no apparent reason why such support should make certain framings of persuasive appeals more effective than others; that is, these features do not explain why gain-framed appeals are more persuasive than loss-framed appeals in this domain.

There is, however, one distinctive aspect of dental hygiene behaviors that seems a promising candidate: the perceived certainty of outcomes. The reasoning here arises from prospect theory—though not from the familiar application of prospect theory to gain–loss message variations. The usual prospect-theoretic reasoning about appeal variations is that for relatively low-risk behaviors (such as preventive health behaviors) gain-framed messages should be more persuasive than loss-framed messages, but for riskier behaviors (such as mammography and other disease-detection behaviors) loss-framed appeals should be more persuasive (e.g., Salovey et al., 2002).

The term "risk" is ambiguous, however. Colloquially, a risky behavior is dangerous. But in prospect theory, to say that an action is "risky" is to say that its outcomes are probabilistic, that is, not certain (Kahneman & Tversky, 1979); "risk" refers to the association between action and outcome—not to the desirability or dangerousness of an outcome. So, for example, jumping out of an airplane at 10,000 feet without a parachute is not a "risky" action in prospect theory terms, because the outcome is virtually certain.

Unfortunately, the usual prospect-theory-based reasoning about matching gain–loss appeal variations to disease prevention or detection behaviors often does not

clearly distinguish these two senses of "risk." Consider, for instance, that "Prevention behaviors might not be perceived as risky at all; they are performed to deter the onset or occurrence of a health problem. Thus, choosing to perform prevention behaviors is a risk-averse option; it maintains good health" (Salovey et al., 2002, p. 394; similarly, see Rothman & Salovey, 1997, p. 5). This description treats prevention behaviors as not "risky" because those behaviors are not dangerous.

If one returns to prospect theory's probability-of-outcome sense of risk, however, an intriguing possibility is suggested. There is little reason to suppose that disease prevention behaviors, as a class, are perceived as relatively certain in their consequences (i.e., low risk in prospect-theoretic terms) or as any more certain in their consequences than are disease detection behaviors. Different kinds of preventive behaviors, however, might vary in the perceived certainty of their outcomes. For instance, dental hygiene behaviors may be perceived as relatively more likely to produce protective outcomes than are many other kinds of preventive behaviors. People might well believe brushing and flossing are very likely to prevent dental problems such as tooth decay. By contrast, people easily could think that the connection between exercising and heart attack risk is less secure or that inoculations do not so certainly assure disease protection; indeed, some people have avoided getting a flu shot because they believe that a flu shot can bring on the flu (Bekker, Gough, & Williams, 2003).

Even this reasoning, however, does not quite represent a satisfactory prospect-theoretic explanation. Prospect theory concerns preferences when people must choose between a nonrisky (certain-outcome) option and a risky (uncertain-outcome) option. This preference is said to be affected by the framing of the choice, with gain framing encouraging choice of the nonrisky option and loss framing encouraging choice of the risky option; that is, people are more willing to undertake relatively risky actions (than they are to undertake relatively nonrisky actions) when the consequences are framed as losses than when the consequences are expressed as gains. So, for instance, the classic research paradigm of Tversky and Kahneman (1981) offers participants two alternatives—one relatively risky and one relatively nonrisky—and examines framing as an influence on which option is preferred.

But people do not have to choose between toothbrushing (putatively certain outcome) and exercising (putatively uncertain outcome)—or between disease prevention and disease detection. That is, the relative certainty of outcomes between different kinds of health behavior is not of prospect-theoretic interest (because one does not have to choose between the two kinds of behaviors). Previous discussions of prospect theory's application to gain–loss appeal framing have focused on the perceived riskiness of a behavior (e.g., exercise) or a behavioral category (e.g., disease prevention behaviors) *simpliciter*, but what seems more important is the relative certainty of outcomes between different behavioral *options*. So the appropriate way to derive prospect-theoretic predictions about the effects of gain–loss appeal framing variations appears to be to conceptualize the receiver's choice as between two options—namely, behavioral performance and nonperformance—that might differ in riskiness (certainty of outcomes).

Once the relevant choice is conceptualized as that between performance and nonperformance of a behavior, it should become apparent that the perceived certainty of outcomes for performing a given behavior need not be mirror-image symmetrical with the perceived certainty of outcomes for not performing that behavior. That is, one need not (and should not) assume that the perceived likelihood of the consequences of doing X is symmetrical with the perceived likelihood of the consequences of not

doing X. A person need not always think, "If I do X, it is virtually certain that outcome O will occur, and if I don't do X, then outcome O virtually certainly will *not* occur." Instead, a person might sometimes plausibly think, "If I do X, it is virtually certain that outcome O will occur; and if I don't do X, there's *still* a good chance that O will occur." In short, there can be an asymmetry of the perceived probability of outcomes from action and the perceived probabilities of outcomes from inaction.

So, for example, if performing a given action is perceived to have relatively certain outcomes, whereas not performing the action is seen to have relatively uncertain outcomes, then prospect theory expects that there will be a greater preference for performing the action under gain-framed conditions than under loss-framed conditions (i.e., gain-framed appeals should be more persuasive than loss-framed appeals in encouraging the behavior). Similarly, if performing a given action is perceived to have relatively uncertain outcomes, whereas not performing the action is seen to have relatively certain outcomes, then prospect theory expects that there will be a greater preference for performing the action under loss-framed than under gain-framed conditions (i.e., loss-framed appeals should be more persuasive than gain-framed appeals in encouraging such actions). But if the consequences of doing and not doing the action are equally certain (or equally uncertain), then prospect theory presumably makes no predictions about differential persuasiveness of gain and loss frames.

Thus, if the observed advantage of gain-framed appeals over loss-framed appeals for dental hygiene behaviors (distinctively) is to be explained by prospect theory, the underlying mechanism presumably must be a corresponding distinctive difference in perceived-likelihood-of-outcomes between performing and not performing dental hygiene behaviors. It is not implausible to suppose that such a difference obtains for dental hygiene behaviors ("If I brush my teeth regularly, I'll almost certainly avoid cavities; if I don't brush my teeth regularly, I might avoid cavities—or I might not") and is distinctive, that is, not present for other prevention behaviors (e.g., "If I get a flu shot, I might or might not get the flu; and if I don't get a flu shot, I might or might not get the flu")—and hence gain- and loss-framed appeals differ in persuasiveness for dental hygiene behaviors but not for other preventive actions.

These are empirical questions, of course, and careful assessment of this account will need to await appropriate evidence. But plainly one potential explanation for the current results is that for dental hygiene behaviors, but not for other preventive health behaviors, performing the action is seen to have more certain outcomes than is not performing the action.

Larger Methodological Issues

This review raises two general methodological issues worth considering briefly. First, these results underscore the importance of the distinction between substantive significance and statistical significance. The persuasive advantage for gain-framed appeals is statistically significant, but the effect is so small as to be negligible.

Second, these results make clear the importance of developing better-articulated understandings of, and hypotheses about, the magnitude of expected effects in social-scientific research. Part of the growing recognition of the shortcomings of null hypothesis statistical testing (NHST) and the corresponding growth in awareness of the importance of understanding effect sizes has been concerned with the ways in which hypotheses (and results) are expressed within an NHST framework (e.g., Cohen, 1994). Social-scientific research hypotheses commonly concern the general

direction of effect (e.g., that variables X and Y will be correlated positively, that the experimental condition will have a higher mean than the control condition, and so forth) but leave the *magnitude* of effect unspecified (the size of the correlation between X and Y, the size of the difference between the means of the experimental and control conditions, and so on).

For example, consider the hypothesis that "gain-framed messages are more persuasive [than loss-framed messages] when promoting prevention behaviors" (Salovey et al., 2002, p. 394). This hypothesis does not specify the expected size of the difference—and for good reason: our theoretical apparatuses are not so well articulated as to yield specific predictions about effect magnitudes (either here or in other social-scientific research domains). Surely, the observed difference in persuasiveness—corresponding to a correlation of only .03—ought not be seen as confirmation of this hypothesis, even given the difference's statistical significance. But it remains unclear exactly what effect size might be taken as appropriate support for the hypothesis. This problem is not specific to gain–loss message framing research, of course; social-scientific hypotheses typically do not specify what size of effect is hypothesized. Hence, as the current results illustrate, continuing attention to effect magnitudes will be of some importance.

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