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Commitment and Behavior Change: A Meta-Analysis and Critical Review of Commitment-Making Strategies in Environmental Research

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Abstract

Commitment making is commonly regarded as an effective way to promote proenvironmental behaviors. The general idea is that when people commit to a certain behavior, they adhere to their commitment, and this produces long-term behavior change. Although this idea seems promising, the results are mixed. In the current article, the authors investigate whether and why commitment is effective. To do so, the authors first present a meta-analysis of environmental studies containing a commitment manipulation. Then, the authors investigate the psychological constructs that possibly underlie the commitment effect. They conclude that commitment making indeed leads to behavior change in the short- and long term, especially when compared with control conditions. However, a better understanding is needed of the possible underlying mechanisms that guide the commitment effect. The authors see commitment

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making as a potentially useful technique that could be improved by following up on findings from fundamental research. They provide suggestions for future research and recommendations for improving the effectiveness of commitment-making techniques.

Keywords

commitment, meta-analysis, review, attitudes, behavior, environment, norms, self-concept

As threats of environmental degradation loom, there is an increased need to determine how to induce people to adopt more environmentally friendly behaviors. In addition to legal regulations and financial incentives, there is a clear interest in stimulating people to voluntarily change their environmental behaviors. A number of intervention techniques are available to accomplish this (see, for example, Abrahamse, Steg, Vlek, & Rothengatter, 2005). One very popular method is to ask people to make a promise or pledge to do something for the environment (indeed, the term *environmental pledge* yielded 115,000 hits in an April, 2011, Google search). Examples of such “commitment” manipulations abound: for instance, Monash University in Melbourne, Australia, encourages students to pledge to make sustainable lifestyle changes (<http://fsd.monash.edu.au/environmental-sustainability/monash-environmental-pledge>) and children in Northern Ireland can make an online pledge to start living sustainably, As Sustainable As Possible (ASAP; <http://www.baglad-yproductions.org>). In the United States, it is common for communities to hold “challenges” in which citizens sign up and promise to change an environmentally harmful behavior. For example, currently in Utah, the governor and local mayors have initiated a “Clear the Air” challenge to encourage citizens to reduce their automobile driving to improve air quality. What is the appeal of these pledges and challenges, and can they be made more effective if they are designed to activate particular psychological processes? This article examines the psychological literature that appears to support commitment making as a particularly effective behavior change strategy.

One reason for their popularity is that commitments are thought to yield substantial and durable change. By substantial, we mean changes in behavior that are large enough to have an environmental impact, and by durable we mean changes that will last for the long term, without the need for reminders or further interventions (Cialdini, 2001). This article examines the validity of the assumption that commitments are an effective and durable behavior change

technique. A second goal is to explore what psychological processes underlie this possible effect of commitment making on behavior.

The most recent review on commitment strategies in the environmental domain was done by Katzev and Wang in 1994. Consistent with Katzev and Wang's (1994) distinction between measured and manipulated commitment, we focus exclusively on commitment *manipulations* in which "a commitment is brought about by eliciting from individuals a pledge to perform a particular act" (p. 13). The current article extends Katzev's and Wang's article in two ways. First, we provide a meta-analysis of studies containing a commitment manipulation, enabling us to test whether across studies, commitment making truly affects environmental behavior. In addition, whereas their review focused on the effects of commitment, we review and explore psychological processes proposed to underlie commitment effects. Finally, we discuss the implications of this review for empirical research and suggest how commitment interventions can be improved.

Meta-Analysis

Although commitment making and public challenges are popular with the public, a superficial examination of the environmental literature shows that commitment has had mixed results, sometimes being successful in the short- and long term, but other times being no different from other interventions or even control conditions (see Table 1). A meta-analysis can combine this mix of findings and determine whether—on the whole—the treatment has an overall significant effect compared with control and other treatment conditions. We examine two kinds of commitment, commitment only and commitment plus another intervention, and compare these with control conditions in the short- (i.e., during the intervention) and long term (usually after people have been released from their commitment). We also compare these two commitment conditions with other interventions (e.g., feedback). Testing the effectiveness of combined interventions is consistent with the proposal that complex interventions are required to effect durable change in a world where people are distracted by competing demands and new behaviors are easily forgotten (Brown, Werner, & Kim, 2003; Werner, 2003).

Sample of Studies

We searched scientific databases (EBSCO, SAGE, Elsevier, A-informaworld, Web of Science, and Science Direct) using the terms *commitment*, *pledge*, and *behavioral contracting* with a large variety of environmental topics such as

Table 1. Summary of Environmental Studies Using a Commitment Manipulation

Author (date)	Dependent variables (DVs)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
Bachman and Katzev (1982)	Two DVs: 1. Number of bus rides; 2. Percentage who rode at least once.	1. C-only: A nonbinding personal commitment to ride bus twice per week for 4 weeks ($n = 17$); 2. C-plus: Added free tickets ($n = 17$); 3. Incentive only: Free tickets ($n = 21$); 4. Control ($n = 20$).	a. § C-only vs. ctrl, $p < .0016$, $r = .49$; b. § C-only vs. free tickets, $p < .50$, $r = .001$; c. § Free ticket vs. ctrl, $p < .01$	a. § C+ free tickets vs. ctrl, $p < .001$, $r = .51$; b. § C+ free tickets vs. C-only, $p < .50$; c. § C+ free tickets vs. free tickets, $p < .009$, $r = .38$	a. § C-only vs. ctrl, $p < .003$, $r = .45$; b. § C-only vs. free tickets, $p < .18$, $r = .15$; c. § Free ticket vs. ctrl, $p < .08$	a. § C+ free tickets vs. ctrl, $p < .001$, $r = .57$; b. § C+ free tickets vs. C-only, $p < .37$; c. § C+ free tickets vs. free tickets, $p < .02$, $r = .33$
Bryce, Day, and Olney (1997)	Mean number of weeks each group participated in curb-side recycling	1. Ctrl: No C/No request to pay for bin ($n = 107$); 2. C-only: Verbal C/No request to pay for bin ($n = 96$); 3. Request to pay (only, no C; $n = 94$); 4. C+: Verbal C and request to pay for bin ($n = 104$).	a. C-only vs. § ctrl, $p < .50$, $r = .00$	a. § C+ request to pay for bin vs. request to pay for bin, $p < .05$, $r = .12$		

(continued)

Table 1. (continued)

Author (date)	Dependent variables (DVs)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
Burn and Oskamp (1986)	DV: Percentage of households recycling	Boy scout project; asked resident to sign pledge card; reminder sticker given in both commitment conditions: 1. C-only ($n = 62$); 2. C+ a persuasive message ($n = 62$); 3. Persuasive message only ($n = 77$); 4. Control ($n = 132$).	a. § C-only vs. ctrl, $p < .05$, $r = .12$; b. § C-only vs. persuasive message C-only, $p < .50$; only, $p < .50$., c. § C+ persuasive message vs. persuasive message only, $p < .50$, $r = .00$; c. § Persuasive message only vs. ctrl, $p < .05$.	a. § C+ persuasive message vs. ctrl, $p < .05$, $r = .12$; b. § C+ persuasive message vs. C-only, $p < .50$; c. § C+ persuasive message vs. persuasive message only, $p < .50$, $r = .00$	Commitment only	Commitment plus
Coburn, Porter, Leeming, and Dwyer (1995)	DV: Number of bags of grass recycled	Personal request. Signed card to grass cycle for 4 weeks; commitment public to research team. 70% in C-only agreed; 80% in C+ agreed; data presented for all. 1. C-only ($n = 40$); 2. C+ a block leader ($n = 40$); 3. Control ($n = 40$).	a. § C-only vs. ctrl, $p < .50$, $r = .00$. a. § C+ block leader vs. ctrl, $p < .05$, $r = .18$; b. § C+ block leader vs. C-only, $p < .05$, $r = .00$	a. § C+ block leader vs. ctrl, $p < .05$, $r = .05$; a. § C-only vs. ctrl, $p < .50$, $r = .00$	Immediate follow-up: a. § C plus block leader vs. ctrl, $p < .05$, $r = .18$; b. § C+ block leader vs. C-only, $p < .05$	Immediate follow-up: a. § C plus block leader vs. ctrl, $p < .05$, $r = .18$; b. § C+ block leader vs. C-only, $p < .05$

(continued)

80 Table 1. (continued)

Author (date)	Dependent variables (DV's)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
DeLeon and Fuqua (1995)	DV: Weight of recycled goods	Mailed request, P signed form and mailed back; names to be published in newsletter; C+ added group performance feedback. Signed commitment from 55% (C-only) and 75% (C+); data presented for all.	a. § C-only: baseline vs. intervention, $p < .50$, $r = .00$; b. § Feedback: baseline vs. intervention, $p < .14$; c. § Ctrl: baseline vs. intervention, $p < .50$	a. § C+ group feedback: baseline vs. intervention, $p < .02$, $r = .47$		
Dickerson, Thibodeau, Aronson, and Miller (1992)	Two DV's: 1. Total shower time; 2. Proportion who turned off water while showering	1. C-only ($n = 20$); 2. C+ group feedback ($n = 19$); 3. Group feedback, no commitment ($n = 19$); 4. Control ($n = 18$). Commitment: signed pledge that would be made public; Hypocrisy (C+); Commitment plus prior waste made salient 1. C-only ($n = 20$); 2. C+ waste salient (hypocrisy; $n = 20$); 3. Waste salient only ($n = 20$); 4. Control ($n = 20$).	a. § C-only vs. ctrl, $p < .17$, $r = .15$; b. § C-only vs. waste salient only, $p < .50$, $r = .00$; c. § Waste salient only vs. ctrl, $p < .17$	a. § C+ waste salient (hypocrisy), vs. ctrl, $p < .04$, $r = .28$; b. § C+ waste salient (hypocrisy) vs. C-only, $p < .50$; c. § C+ waste salient (hypocrisy) vs. waste salient only, $p < .50$, $r = .00$.		

(continued)

Table 1. (continued)

Author (date)	Dependent variables (DVs)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
Gonzales, Aronson, and Costanzo (1988)	Two DVs: 1. Make changes recommended in home audit; 2. Take loan to make changes	Commitment: energy auditors "involved" homeowners in audit and asked for verbal commitment to make changes by target date. 1. Commitment plus vivid message and negative frame ($n = 123$); 2. Control (audit without intervention; $n = 122$).	a. § C+ token vs. negative frame vs. ctrl, $p < .02$, $r = .13$.			
Katzev and Pardini (1987-1988)	Two DVs: 1. Frequency of recycling; 2. Weight of recycled newspapers	Undergraduate experimenter; resident signed form making a 5-week recycling commitment; both experimenter and resident kept copy of form 1. C-only ($n = 15$); 2. C+ token ($n = 15$); 3. Token only ($n = 14$); 4. Control ($n = 15$).	a. § C-only vs. ctrl, $p < .003$, $r = .50$; b. § C-only vs. token, $p < .50$, $r = .00$; c. § Token vs. ctrl, $p < .05$	a. § C+ token vs. ctrl, $p < .01$, $r = .43$; b. C+ token vs. C-only, $p < .50$; c. § C+ token vs. token only, $p < .50$, $r = .00$.	3-week follow-up: a. § C-only vs. ctrl, $p < .50$, $r = .00$; b. § C-only vs. token, $p < .50$, $r = .00$; c. § Token vs. ctrl, $p < .50$.	3-week follow-up: a. § C+ token vs. ctrl, $p < .30$, $r = .18$; b. § C+ token vs. C-only, $p < .50$; c. § C+ token vs. C-only, $p < .50$; vs. token only, $p < .12$, $r = .22$.

(continued)

Table 1. (continued)

Author (date)	Dependent variables (DV's)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
Lokhorst, van Dijk, Staats, van Dijk, and De Snoo (2010)	Four DVs: 1. Attitude toward conservation; 2. Desire to conserve; 3. Area of seminatural habitat 4. Time spent on conservation	Commitment plus feedback re: Nature conservation; commitment made in group of farmer friends 1. C Commitment plus feedback ($n = 16$); 2. Feedback only ($n = 18$); 3. Control ($n = 24$).				a. After 1 year, C+ feedback had made more changes than ctrl, $p < .20$, $r = .15$
Matthies, Klöckner, and Preißner (2006)	DV: Use of alternative transportation	Personal request; written commitment, public to research team. All committed but only 38/191 participants chose to commit to transit. 1. C-only ($n = 61$); 2. C+ "thaw"; thaw = free ticket during Phase I (introductory period; $n = 130$); 3. No intervention control ($n = 53$). Measured personal norm to reduce auto use for all groups	a. Covarying personal norm, predicts trying transit, mean across three phases, $p < .057$, $r = .09$; b. C by personal norm interaction (i.e., C+ high personal norm), Phase 3, $p < .03$, $r = .11$.	a. C+ prior free ticket, mean across three phases, $p < .057$, $r = .09$; b. C by personal norm interaction (i.e., C+ high personal norm), Phase 3, $p < .03$, $r = .11$.	Follow-up (Week 25): a. C+ prior free ticket, $p < .50$, $r = .00$; b. C by personal norm, predicts trying transit, $p < .05$, $r = .12$	Follow-up (Week 25): a. C+ prior free ticket, $p < .50$, $r = .00$; b. C by personal norm, predicts trying transit, $p < .05$, $r = .12$

(continued)

Table 1. (continued)

Author (date)	Dependent variables (DVs)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
Pallak, Cook, and Sullivan (1980)	Two DVs: 1. Meter reading for natural gas; 2. Meter reading for electricity.	Signed consent form. "C+ public" understood names would be in paper as "public spirited fuel-conserving citizens."	a. § C-private vs. ctrl, $p < .50$, $r = .00$	a. § C+ public vs. ctrl, $p < .005$, $r = .24$; b. § C+ public vs. C-private, $p < .005$;	12-month follow-up (6-month high-use periods only)	12-month follow-up (6-month high-use period only)
Pallak and Cummings (1976)	For short-term effects of self-monitoring	Both public and private commitment groups heard 20 min message about effective ways to save energy. Sample n s for natural gas/electricity: 1. C-private ($n = 19/33$); 2. C+ public ($n = 22/33$); 3. Control ($n = 24/40$); 4. C-private plus self-monitoring, electricity only ($n = 0/36$).	c. § C-private plus self-monitoring vs. ctrl, $p < .05$, $r = .19$;	a. § C-private vs. ctrl, $p < .50$, $r = .00$	a. § C+ public vs. ctrl, $p < .01$, $r = .21$; b. § C+ public vs. C-private, $p < .01$;	a. § C+ public vs. ctrl, $p < .01$, $r = .21$; b. § C+ public vs. C-private, $p < .01$;
			d. C-private plus self-monitoring vs. § C+ public, $p < .50$;	c. § C-private plus self-monitoring vs. § C+ public, $p < .05$;	c. § C-private plus self-monitoring vs. ctrl, $p < .05$, $r = .19$;	c. § C-private plus self-monitoring vs. ctrl, $p < .05$, $r = .19$;
			e. § C-private plus self-monitoring vs. C-private, $p < .05$		d. C-private plus self-monitoring vs. § C+ public,	d. C-private plus self-monitoring vs. § C+ public,

(continued)

Table 1. (continued)

Author (date)	Dependent variables (DVs)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
Pardini and Katzev (1983-1984)	Two DVs: 1. Frequency of recycling; 2. Weight of recycled goods.	1. Commitment weak (C-weak): Face to face verbal commitment ($n = 9$); 2. Commitment strong (C-strong): Face to face signed commitment ($n = 9$); 3. Control: Information only ($n = 9$).	a. § C-weak vs. ctrl, $p < .057$, $r = .37$; b. § C-strong vs. ctrl, $p < .02$, $r = .48$; c. § C-strong vs. C-weak, $p < .50$	Weeks 3 and 4: a. C-weak vs. § ctrl, $p < .50$, $r = .00$; b. § C-strong vs. ctrl, $p < .05$, $r = .39$; c. § C-strong vs. C-weak, $p < .03$	$p < .50$, $r = .00$; e. § C-private plus self-monitoring vs. C-private, $p < .05$	
Shippee and Gregory (1982)	DV: Meter reading	1. Mild commitment: Newspaper ad thanking for conserving, listing names of firms in program ($n = 6$); 2. Strong commitment: Newspaper ad thanking for conserving and	a. § C-mild vs. ctrl, $p < .03$, $r = .57$ b. § C-strong vs. § C-mild, $p < .03$	a. § C-strong vs. ctrl, $p < .03$, $r = .59$; b. C-strong vs. § C-mild, $p < .03$		

(continued)

Table 1. (continued)

Author (date)	Dependent variables (DVs)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
Wang and Katzev (1990)	DV: Weight of recycled paper	listing amount conserved by each firm ($n = 5$); 3. Control: No newspaper ad ($n = 5$)				
Wang and Katzev (1990)	Experiment 1 Two DVs: 1. Frequency of recycling; 2. Weight of recycled goods	Retirement home ABA design; Group meeting; 17 of 22 signed group commitment College dorms 1. Commit as group (C-group); Two group meetings, then signed group form (I refused; $n = 10$ rooms). 2. C-individual: One contact, signed individual form (I refused; $n = 14$ rooms); 3. Incentive: Coupons to local stores for recycling ($n = 12$ rooms); 4. Control: Information only ($n = 14$ rooms).	a. § C-only vs. baseline, $p < .003$, $r = .41$ a. § C-group vs. ctrl, $p < .06$, $r = .32$; b. § C-individual vs. ctrl, $p < .12$, $r = .22$; c. § C-individual vs. C-group, $p < .20$; d. § Incentive vs. ctrl, $p < .06$	4-week follow-up a. § C vs. baseline, $p < .004$, $r = .40$ 4-week follow-up a. § C-group vs. ctrl, $p < .36$, $r = .07$; b. § C-individual vs. ctrl, $p < .12$, $r = .22$; c. § C-individual vs. C-group, $p < .50$; d. § Incentive vs. ctrl, $p < .36$		

(continued)

Table 1. (continued)

Author (date)	Dependent variables (DVs)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
Werner et al. (1995)	DV: Frequency of recycling	1. Signed commitment ($n = 53$) vs. information via flyer ($n = 136$), 2. telephone ($n = 78$), or 3. face to face ($n = 52$). Random assignment not retained; households placed into groups by treatment received			4-month follow-up a. § Signed commitment vs. flyer; $p < .05$, $r = .12$; b. § Signed commitment vs. telephone, $p < .05$, $r = .14$; c. § Signed commitment vs. face to face, $p < .50$, $r = .00$	
Winnett et al. (1982), Experiment 1	Two DVs: 1. Mean house temperature at three times of the day; 2. Electricity use from meter	Commitment: Participants signed commitment form to obtain energy use feedback. Information: No feedback/ no commitment. 1. Commitment and feedback plus discussion video ($n = 16$); 2. Commitment and feedback plus modeling video ($n = 17$); 3. Information plus discussion video ($n = 14$).	a. § C+ Feedback and modeling vs. ctrl, $p < .01$, $r = .38$; b. § C+ Feedback and discussion vs. ctrl, $p < .01$, $r = .39$; c. § Information and modeling vs. ctrl, $p < .01$	a. § C+ Feedback and modeling vs. ctrl, $p < .01$, $r = .38$; b. § C+ Feedback and discussion vs. ctrl, $p < .12$; $r = .20$; c. § Information and modeling vs. ctrl, vs. ctrl,		

(continued)

Table 1. (continued)

Author (date)	Dependent variables (DVs)	Commitment manipulation	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
			Commitment only	Commitment plus	Commitment only	Commitment plus
Winett, Love, Stahl, Chinn, and Leckliter (1983)	DV: Meter reading of electricity use; See Note re: temperature data.	<p>4. Information plus modeling video ($n = 16$)</p> <p>5. Control ($n = 20$)</p> <p>Presentation w/ video by experimenter; some in group setting, some alone at home. "Commitment" included discussion.</p> <p>1. Modeling/video/ group/ commitment ($n = 14$);</p> <p>2. Modeling/video/group/No commitment ($n = 9$);</p> <p>3. Modeling/video/at home/ commitment ($n = 13$);</p> <p>4. Modeling/video/at home/ no commitment ($n = 13$);</p> <p>5. Ctrl (volunteered to participate but not given treatment; $n = 31$).</p>	<p>Across warm and cool summer days:</p> <p>1. § Modeling/video/ group/ commitment vs. ctrl, $p < .01$, $r = .35$;</p> <p>2. § Modeling/video/at home/ commitment vs. ctrl, $p < .01$, $r = .35$;</p> <p>3. § Modeling/video/ group/no commitment vs. ctrl, $p < .01$;</p> <p>4. § Modeling/video/ at home/no commitment vs. ctrl, $p < .01$;</p> <p>5. § Modeling/video/ group/</p>	<p>Commitment plus</p>	<p>Commitment only</p>	<p>$p < .03$</p>

(continued)

Table 1. (continued)

Author (date)	Dependent variables (DVs)	Commitment effective: Short term (treatment in place)		Commitment effective: Long term (treatment ended)	
		Commitment only	Commitment plus	Commitment only	Commitment plus
	Random assignment not retained; households placed into groups by treatment received		commitment vs. Modeling video/group/no commitment, $p < .50$, $r = .00$; 6. § Modeling/video/at home/commitment vs. Modeling/video/at home/no commitment, $p < .50$, $r = .00$.		

Note: Articles are listed in alphabetical order. C-only = commitment only; C+ = commitment plus another intervention; C-private = commitment private; C+ public = commitment public; ctrl = control; ME = main effect; ABA = within-subjects design; r = index of effect size, and presence of this statistic indicates that this comparison was included in meta-analyses shown in Table 2. Comparisons without effect sizes are included for the interested reader. Significance levels are indicated. Regardless of significance, an “§” marks which of the two groups being compared improved the most. We use “improved” rather than “increased” or “decreased” because whether an increase or decrease is desired varies with the study (e.g., for water and electricity, a reduction in use is desired, whereas for recycling, an increase is desired). Additional commitment studies not included in this review: DeYoung et al. (1995). Recycling study. Unclear how many residents had been contacted with commitment request. McCaul and Kopp (1982). Recycling study. Did not include a control condition. Reams and Ray (1992-1993). Recycling study, comparing Information only, Indirect commitment (left form for residents to sign); Direct commitment (face to face request for signed commitment). Did not provide separate comparisons. Winnett et al. (1982). Second experiment, not clear if commitment manipulation was included. Winnett et al. (1983). Comparison group reduced to less than half for temperature data, therefore we did not include temperature data.

“recycling,” “conservation,” “reduction,” and “toxic products.” Studies included in the meta-analysis were published between 1976 and 2010 and had sufficient statistical information to code and transform into effect sizes. Five additional studies were found but data were not available for the meta-analysis (see note to Table 1). In total, 19 studies were included in the analyses. We used all dependent measures that represented environmental behavior change (e.g., water or power use, recycling, transit use, etc.), using z scores to average the values (Rosenthal, 1984). We did not include measures that might be considered mediators of the commitment to behavior relationship.

Variables Coded From Each Study

We used standard meta-analysis procedures to find, code, and analyze the data from each study and provided the following information¹ in Table 1: (a) year of publication, (b) sample size and level of analysis, (c) period of observation (during intervention or at follow-up), (d) type of commitment manipulation (commitment only or commitment plus an additional intervention), and (e) statistical comparisons, usually reported as post hoc tests; “not significant” was entered as $p = .50$, as recommended by Rosenthal (1984) and Mullen (1989). Average significance levels and corresponding z values, estimated effect sizes (r values),² and tests of diffusion were then calculated, using *Advanced BASIC Meta-Analysis* software (Mullen, 1989). To overcome the “file drawer problem”—the possibility that unpublished studies might exist whose results do not support the effects that the published articles show—a fail-safe number was calculated. This number indicates the number of unpublished studies with nonsignificant results that would be required to overturn the results of the meta-analysis.

It is important to note that the level of analysis varied across studies. Although some studies focused on individual commitments and behavior change, others addressed household or even firmwide interventions. This information is presented in the table as well, although it is not an analyzed factor because no articles provided details about participation rates within the groups.

In addition, it should be noted that in most studies, not all participants in the commitment conditions agreed to commit. Researchers can then choose to either exclude them from further analysis or include them. When considered as a policy tool, one should include refusals in the overall effect. As a psychological researcher, one might be mainly interested in the effects for those who actually make the commitment. Not all studies were clear in how they dealt with refusals, although some were explicit in mentioning either exclusion (Lokhorst, van Dijk, Staats, van Dijk, & De Snoo, 2010; Shippee &

Gregory, 1982) or inclusion (DeLeon & Fuqua, 1995; Winett, Love, Stahl, Chinn, & Leckliter, 1983). Where possible, we provide information on inclusion and exclusion in Table 1; however, this variable is not evaluated in the meta-analysis.

Results

Is Commitment Making Effective?

Intervention period. The first question is whether either kind of commitment (commitment only or commitment plus another treatment) yields consistently reliable effects during the intervention period. Meta-analysis results for intervention periods are displayed in the left half of Table 2 and show that commitment alone (row 4) and commitment plus another treatment (e.g., feedback, incentives, persuasive messages, row 5) were significantly more effective than control groups. The average effect sizes were similar ($r = .27$ for commitment only and $r = .31$ for commitment plus another treatment), and the fail-safe N 's were fairly robust (124 and 360, respectively), especially given the small number of studies in the meta-analysis. The overall pattern of results suggests that during the intervention period, both commitment alone and in combination with another treatment yield moderate and reliable effects relative to control conditions.

Follow-up period. The second question is whether commitment or commitment plus another intervention led to long-term behavior change, relative to control conditions. Results in the right half of Table 2 show that both commitment only and commitment plus another treatment yielded sustained behavior change. The average effect sizes were moderate ($r = .18$ for commitment only, $r = .26$ for commitment plus another treatment), whereas the fail-safe N 's were smaller than during the intervention (18 and 92, respectively), in part because of the small number of studies providing follow-up data.

Is Commitment More Effective Than Other Interventions?

Intervention period. Obtaining commitments from participants takes extra time and effort, and occasionally people even refuse to make the commitment. Is it worth the effort, compared with other interventions? As shown in the lower part of Table 2, few studies have compared commitment with other treatments, so the results in Table 2 are very tentative. Comparing commitment only and commitment plus with other interventions shows that during the intervention period (rows 7 and 8, left side of Table 2), these comparisons yielded mixed results, with only commitment plus yielding favorable average statistics and even those being very small (overall z for significance levels = 1.98, $p < .02$, an estimated r of .08, and a very small fail-safe N).

Table 2. Meta-Analyses of Commitment Research Showing Unweighted and Weighted Estimates (in Parentheses)

	Intervention period				Follow-up period				
	<i>n</i>	Mean significance level (<i>p</i> <)	Mean z for significance level	Fail-safe N	Mean estimated effect size (<i>r</i>)	Mean significance level (<i>p</i> <)	Mean z for significance level	Fail-safe N	Mean estimated effect size (<i>r</i>)
Commitment vs. control									
Commitment only	14	.00 (.01)	5.16 (2.51)	124	.27 (.14)	.00 (.04)	2.86 (1.79)	18	.18 (.13)
Commitment plus another treatment	15	.00 (.00)	8.23 (5.64)	360	.31 (.20)	.00 (.00)	5.50 (3.72)	92	.26 (.18)
Commitment vs. other treatment condition									
Commitment only	5	.20 (.05)	0.83 (1.65)	0	.02 (.06)	.01 (.00)	2.39 (2.74)	7	.09 (.10)
Commitment plus another treatment	8	.02 (.01)	1.98 (2.27)	4	.08 (.08)	.03 (.35)	1.86 (0.37)	0	.19 (.05)

Note: *n* = number of comparisons in meta-analysis. Fail-safe N's are the same for weighted and unweighted analyses.

Follow-up period. In contrast, when examining long-term effects, both commitment only and commitment plus another treatment yielded somewhat stronger results compared with other interventions (right side of Table 2), with small but reliable significance levels and average *r*s but very small buffers against unpublished nonsignificant findings.

Presence of moderators. Diffuse comparisons, or tests of heterogeneity, were conducted to see whether we could detect the presence of moderators in these analyses. That is, when significance levels or effect sizes are highly variable, it may be possible to break the set of studies into subgroups according to moderating factors, such as types of behaviors (e.g., recycling vs. conservation) or geographic area of the research (e.g., rural vs. urban). The Bonferroni adjusted alpha for our 16 meta-analyses (weighted/unweighted by intervention/follow-up by commitment only/commitment plus by control/other) is .03, and none of our tests of diffusion was significant (all but three *p* values were > .20). Naturally, these tests are limited by the small number of commitment studies; it is possible that as more studies are conducted, researchers will be able to identify moderating factors.

Summary. Meta-analysis results showed that—compared with control conditions—commitment only and commitment plus are more effective both during the intervention and after people had been released from their commitments. Results are more complex when commitment is compared with other treatments. During intervention phases, commitment-plus conditions were more effective than other conditions. However, during follow-up periods, both commitment-only and commitment-plus conditions yielded more durable change when compared with other typical interventions. These latter results are tentative as they are based on a small number of studies. However, using commitment in combination with other interventions is consistent with the idea that in applying psychology to natural settings, it may require more than one intervention to effect consistent behavioral change (Werner, 2003).

Theoretical Underpinnings: What Processes Underlie Commitment Effects?

Although the meta-analysis was able to show us that commitment making is an effective instrument for altering environmental behaviors, it could not demonstrate *why* it is effective. To explore the possible psychological processes underlying this effect, we now turn to a review of the commitment literature.

Current views on commitment processes are strongly influenced by the work of Cialdini (2001). His seminal book on social influence devotes a chapter to explaining commitment processes and emphasizes that for commitment

interventions to be successful, the act of committing needs to lead to fundamental changes in the individual. The individual needs to change his or her self-concept to be in line with the new behavior, and/or the individual needs to change cognitions, values, and attitudes, to be more favorable toward the new behavior. It is these internalized changes that sustain the behavior over the long term. Others have suggested that social norms guide people to adhere to their commitments (Abrahamse et al., 2005), whereas a different line of research examined the idea that commitment can lead the individual to develop a personal norm that would support engaging in the behavior (Kerr, Garst, Lewandoski, & Harris, 1997). Although these processes—self-concept, attitudes, and social and personal norms—possibly overlap or may complement each other, each operates a little differently, and we review each in turn.

Self-Concept and Consistency

One theme in Cialdini's (2001) explanations for commitment's effectiveness is that in many societies, people have been socialized to be consistent, so when people commit and follow-through on a behavior, they bring their self-concept in line with the behavior. Consistent with Bem's (1972) work on self-perception theory, this means that if people freely choose to perform a behavior, they believe they must have wanted to: They must believe in the cause or expect to enjoy the behavior. When people view their behaviors as voluntary and not coerced, they conclude that they have come to these decisions by themselves and that their behaviors reflect their true motivations, their internal self, or self-concept. One can think of this as a change in self-concept or as a change in the salience of some aspect of the self (e.g., see Rhodewalt & Agustsdottir, 1986, on salience and the malleable self). Either way, this belief should cause the behavior to continue in the future. It is important to note that such a process does not imply mindless compliance to whatever previously made commitment but rather a change in how people think about themselves due to what they have committed to.

This process has been studied in a technique that closely resembles commitment making, called Foot In The Door (FITD). In this technique, participants are first asked to commit to a small request and then within a few weeks are asked to commit to a much larger request (the actual target request); a great deal of evidence has been found for changes in self-perception as a mediator for this phenomenon (Burger, 1999).

Direct evidence for commitment leading to a changed self-concept comes from a study that induced commitment and then collected related personality measures (Burger & Caldwell, 2003). Compared with a control group, those

who had complied with a small request to support the homeless (signed a petition and wrote a brief essay), described themselves as (a) more compassionate and (b) more willing to provide support for the homeless, and, shortly thereafter, (c) were more likely to comply with a request to volunteer for a food drive. Mediation analysis showed that the change in self-concept mediated the relationship between commitment and follow-through. Similar changes in self-concept were obtained in another study (Burger & Guadagno, 2003), and both add weight to claims that making a commitment can actually change one's self-concept.

The importance of a need for consistency in these processes is underscored by research showing that people who favor consistency are *more* likely whereas people who favor *inconsistency and spontaneity* are *less* likely to confirm commitment hypotheses, especially when their initial behaviors are made salient (Burger & Guadagno, 2003; Cialdini, Trost, & Newsom, 1995). This personality-based qualifier also suggests that commitment effects will not be universal and depend on participants' needs for consistency.

Attitudinal Approach

A related approach to understanding the effect of commitment on behavior change is offered by a cognitive attitudinal approach. Cialdini (2003) alluded to these processes without giving details, but there is an extensive literature on how attitudes are changed through self-persuasion and cognitive elaboration (i.e., people generating reasons for embracing a new attitude; e.g., Chaiken's, 1987, Heuristic Systematic Model or HSM; Greenwald's, 1968, Cognitive Elaboration; and Petty & Cacioppo's, 1986, Elaboration Likelihood Model or ELM). There is considerable evidence that people bring their attitudes in line with their behavior, whether because of self-perception (Bem, 1972) or dissonance (Aronson, 1999) processes. Both of these processes require that people feel they made their commitment voluntarily. The cognitive elaboration literature complements these processes by suggesting a mechanism by which people transform short-term commitment into long-term self-directed behavior, that is, that people persuade themselves the commitment and new behavior are worthwhile. In this model, attitude change takes time, as people think about the issue and their commitment and generate reasons and favorable attitudes. In theory, over time, the net effect is to integrate multiple favorable cognitions into a single attitude, thereby strengthening and solidifying their commitment to the new behavior.

A consequence of elaboration is that people create "strong," accessible attitudes that guide behavior (Fazio, 1990, 1995; Holland, Verplanken, & Van

Knippenberg, 2002). “Attitude strength” is a multifaceted construct that emphasizes that the attitude is accessible, durable, resists efforts to change it, and predicts behavior (Petty, Haugtvedt, & Smith, 1995). If making a commitment keeps the issue at hand salient and activates cognitive elaboration, the process of this elaboration enables the individual to develop a strong and accessible attitude that serves both to remind and motivate the individual to engage in the behavior. As Pardini and Katzev (1983-1984) argued, making a commitment to recycle may lead participants to “find their own reasons for recycling, to begin to even like doing so, and, as a result, to continue to perform these behaviors on their own (p. 253).”

Although the commitment-elaboration-attitude change model is appealing, Werner et al. (1995) reviewed a number of studies showing that commitment did not lead to attitude change, although it did lead to behavioral maintenance. Werner et al. suggested that previous research had not allowed sufficient time for attitudes to change. They used a 4-month period with weekly observations and found that although participants began their study with similar recycling behaviors (and presumably similar recycling attitudes), those who recycled for the 4 months had final attitudes significantly more favorable than those who did not recycle. These results did not support the idea that commitment is better than other interventions at leading to attitude change, because all conditions, not just commitment, showed this increase. Thus, although cognitive elaboration provides a potential mechanism for connecting an initial commitment to long-term behaviors, further research is needed to determine how elaboration might be encouraged in relation to commitment.

Norms

Another explanation that could account for commitment effects is based on a normative approach or concerns about what others do and think. Cialdini (2001) provided extensive examples of social pressures (ridicule, criticism) brought to bear on those who renege on their commitments as well as examples of people who explained their behavioral consistency by pointing to their fear of others’ scorn. Thus, a commitment made in public leads to adherence because of the possible negative social sanctions that would follow for breaking it (Abrahamse et al., 2005). This view emphasizes the importance of others’ opinions and suggests that a commitment is primarily effective if others witness or might learn about the commitment and could possibly enforce it, even if only through social sanctions.³

Although the impact of public surveillance (or fears about others’ reactions) on adherence seems plausible, this process has not been demonstrated in

commitment literature. However, it has been complemented by research on commitment and internalized norms. This is particularly important because social pressure is an external motivator, and durable behavior change is more likely if the pressure is internal and self-directed. Theory and research on values and norms suggests that when people perceive a problem, a need for action can be activated by their moral values, which produces feelings of moral obligation to perform or refrain from certain behaviors (Schwartz & Howard, 1984). These feelings of moral obligation are personal, internalized norms. In their research on commitment, Kerr et al. (1997) specifically pitted the social norm explanation against the alternative explanation of a personal norm. In two experiments, Kerr and his colleagues showed that even when no one would know whether participants adhered to their commitments, they still kept the promises they made to their groups. Kerr et al. concluded that their studies offered support for the personal norm explanation (see also Kerr & Kaufman-Gililand, 1994).

Summary

In sum, there is considerable evidence that making a commitment can activate psychological processes related to self-concepts, attitudes, and norms and that these processes motivate the individual to maintain the new behavior. Although the processes have been studied independently, it is possible that they can be seen as mutually supportive. Changes in self-concept, attitudes/cognitions, and in personal or social norms all reflect the idea that making a voluntary commitment makes salient one's personal desire for consistency or one's concerns for appearing consistent to others; cognitions can be activated to support attitude-behavior consistency, to strengthen moral norms, and to support a positive view of one's self. Ultimately, internalization can occur, yielding behaviors that are motivated by personal, durable feelings, and beliefs.

Implications

Implications for Future Commitment Research

To the best of our knowledge, this is the first time that a meta-analysis has been performed that shows that commitment making is indeed effective in altering environmental behaviors relative to control conditions. Now that it is clear that commitment making is effective, it is important that we try and understand *why* commitment is effective: what are the mechanisms underlying this effect? We have described three possible underlying processes responsible for the

commitment effect: self-concept and preference for consistency, attitudes and cognitive elaboration, and personal and social norms. Unfortunately, most of the studies we reviewed in our meta-analysis (with the exception of Dickerson, Thibodeau, Aronson, & Miller, 1992; Matthies, Klöckner, & Preissner, 2006; and Werner et al., 1995) do not suggest or include measures of psychological constructs that might mediate the effect of commitment. As a consequence, it is not possible at this point to empirically determine whether the proposed mediators complement each other or whether they are indeed unique, with one or another having the greatest effect on behavior.

What becomes clear is that although we do now know that commitment making is effective, we do not know why it is effective. More specifically, we do not know which psychological processes mediate the effect of commitment making on behavior. We believe that this poses an important direction for future research on commitment and environmental behavior. Studies are needed that include the proposed mediators to clarify how commitment exactly works. Do the possible mediators operate in tandem, or is one most important? How can we design interventions so that they effectively activate these constructs? Further empirical research is clearly needed to answer these questions.

Implications for Practice

Cialdini (2001) identified four critical features of commitment making that would increase chances of long-term behavioral follow-through. Three of these features make it difficult for the individual to deny or reverse the initial behavior and the fourth increases chances the commitment will be internalized. With respect to irreversibility, Cialdini suggested that first, the commitment should be active rather than passive, such as writing a statement or putting one's signature on an official form; second, the commitment should be made in public or have the potential to be publicized; and third, the commitment should be effortful or difficult. With respect to internalization, Cialdini's fourth feature makes it more likely that the individual will accept responsibility for the behavior: The commitment should be perceived by the individual to be voluntary or internally motivated, and therefore indicative of one's true desires.

Table 1 shows that, for the most part, environmental researchers followed or systematically evaluated two of the first three recommendations—that commitments be public and written. Thus, every study included a group that made a public or written commitment—that is, a commitment that would be viewed by the experimenters or would actually be posted in a public place. Most of the time, the public written commitments were most effective. This conclusion is underscored by a study that compared written public commitments with written

anonymous commitments; the anonymous commitment group recycled even less than a no commitment, information-only group (McCaul & Kopp, 1982). Table 1 also suggests that only one study (Bryce, Day, & Olney, 1997) required any particular kind of effortful commitment (request to pay for bin), and this enhanced the effect of commitment. It is likely that effort has not been included because of ethical constraints as well as the difficulty of using high effort commitments outside the laboratory. Overall, the studies support the importance of making the commitment hard for participants to deny.

Second, most of the studies in Table 1 emphasized Cialdini's (2001) fourth point that commitments should be voluntary. Participants were invited to participate or were asked to help the researcher, but were not coerced, pressured, or rewarded in any way. This was not a stated goal of the researchers, but the methodologies do suggest that experimenters were trying to make the commitment voluntary and internally driven.

Examination of Table 1 shows that researchers went beyond Cialdini's (2001) recommendations and explored a variety of ways of strengthening commitment effects. Many of these additions can be viewed as enhancing one or more of the three psychological processes believed to underlie commitment effects. Based on our review, we can now extend Cialdini's work by adding some more recommendations.

Use Commitment in Combination With Other Interventions. Our comparisons suggest that combining commitment with other factors is worth pursuing as a way to increase long-term change. This is consistent with calls for holistic or multilevel interventions. It does not mean that only commitment manipulations benefit from a combined approach, but several studies in Table 1 are particularly intriguing because of the interesting combination treatments that researchers chose to utilize (e.g., Dickerson et al.'s [1992] "hypocrisy"; Bryce et al.'s [1997] "high cost"; DeLeon & Fuqua's [1995] feedback). We encourage more research like these studies (see also Staats, Harland, & Wilke, 2004).

Keep the Commitment Salient. Several of the studies in Table 1 support the idea that the effect of commitment can be enhanced by increasing its salience. Feedback, for instance, as applied in the DeLeon and Fuqua (1995) study on recycling, not only tells people how well they are doing but also reminds them of their commitment. Furthermore, in many cases, the presence of environmental support for the new behavior also serves as a reminder of the commitment. The most obvious example is recycling bins provided by the experimenter, or the presence of neighbors' recycling bins ready for pickup. Even written

instructions that residents keep handy can be a reminder of the commitment and the behavior. All of these physical reminders may serve to make the commitment more salient and thereby set in motion more cognitive elaboration, which in turn leads to stronger, more accessible attitudes and increased likelihood of sustained behavior change.

As another example, in the study by Cobern, Porter, Leeming, and Dwyer (1995), participants who committed to both grass recycling and talking to their neighbors about grass recycling showed the greatest behavior change. In this case, persuading others might have helped persuade the self and by doing so increased the salience of the commitment.

Activate Personal Norms. Matthies et al. (2006) showed that commitment is effective in increasing use of alternative modes of transportation for people who have a preexisting personal norm favoring reduced automobile use. In their study, the effect of commitment on behavior was successful primarily for those with a preexisting norm. The researchers may have activated these norms by administering weekly questionnaires containing a question about participants' personal norm toward the target behavior. This work suggests that practitioners can take advantage of existing norms by making them salient, not necessarily with weekly questionnaires but through for instance postcards, reminder signs in public settings, stickers, and so on.

Activate Social Norms. The two experiments performed by Wang and Katzev (1990) may have activated a *group norm*. It appeared that this activation was successful in Experiment 1, where participants who made a group commitment recycled more than participants in the control group. However, in Experiment 2, the group commitment was less successful than the individual commitment. We believe this might have been because of the dynamics of this particular group. Aiming at activating a group norm could very well be successful in a more cohesive group or one in which the cohesiveness was turned toward supporting the requested behavior. Consistent with this, Terry, Hogg, and White (1999) showed that group norms influenced behavior primarily for people who strongly identified with the relevant group. These ideas are consistent with the recommendation given by Werner (2003) that group discussions aimed at behavior change should be held within significant social groups to provide both descriptive and injunctive norms.

Labeling. The use of *labeling* to strengthen commitment was supported by other studies. Pallak and Cummings (1976) showed a strong effect of commitment when they labeled participants as "public-spirited, fuel-conserving citizens,"

a possible strategy for enhancing the shift in self-concept needed for behavior change. The study by Shippee and Gregory (1982) showed the same positive self-labeling effect in the mild commitment condition. Other work suggests that it may be wise to combine the commitment manipulation with labeling the participants as “the kind of people who perform this behavior” rather than more general traits such as “good people” (Cialdini, Eisenberg, Green, Rhoads, & Bator, 1998).

Increasing the Specificity of the Commitment. Commitment researchers may benefit from examining a different style of research, in which participants decide on their own to change their behavior. Gollwitzer (1999) drew on Ajzen’s (1991) attitude–behavior model to refine commitment making so that people specify when, where, and how a desired behavior will occur. By getting participants to focus on the physical and social milieu in which their desired behavior will occur, participants get physical and social cues to remind them of their commitment, thereby increasing chances the commitment will guide behavior. Gollwitzer (1999) interests have typically involved correlational strategies as opposed to manipulations by experimenters and generally indicate strong correlations between people making such specific commitments (or “implementation intentions”) and the subsequent performance of that behavior. A meta-analysis (Gollwitzer & Sheeran, 2006) showed a medium to strong effect size for the relationship between specific goal intentions and actually performing the behavior. Other research showed that there are many circumstances that can undermine this relationship, and these researchers identify and evaluate barriers and how to overcome them (see, for example, Gollwitzer, Sheeran, Michalski, & Siefert, 2009). The success of Gollwitzer’s approach is something that might be of interest to environmental psychologists and practitioners.

Make it Fun. An extensive literature suggests that it is much easier for people to maintain adherence to a commitment if they enjoy the new behavior. In an intriguing article titled “Once a Boring Task, Always a Boring Task?” Sansone and her colleagues proposed that no matter how determined people were to maintain a new behavior, if they could not figure out how to make the behavior interesting, fun, or otherwise meaningful, they would stop engaging in the behavior (Sansone, Weir, Harpster, & Morgan, 1992). Consistent with this, Werner and Makela (1998) found that people who had maintained active recycling for more than 2 years were more likely to have found interesting and fun aspects to recycling (e.g., enjoying their children’s enthusiasm for recycling,

learning about the recycling process, and making noise smashing aluminum cans). Other research shows that students who made a permanent shift to transit were more likely to find ways of increasing their intrinsic motivation by making the trip enjoyable (music), relaxing (private time), or productive (studying, reading; Brown et al., 2003). Thus, simply finding the fun may be an important addition to the cognitive and moral reasons for maintaining behaviors to which one has committed.

Conclusion

The existing literature in the domain of environmental psychology is generally highly positive about commitment making (e.g., De Young, 1993; Dwyer, Leeming, Cobern, Porter, & Jackson, 1993). Often it is presented as one of the most promising techniques to promote behavior change for both short- and long-term programs. In light of this positive and optimistic view, the current review may offer a more nuanced perspective. Yes, commitment making is effective, especially when Cialdini's (2001) recommendations are followed, and more so when combined with other techniques. However, based on the existing research, we were not able to show how commitment is effective in altering environmental behaviors—that is, we do not know what mediates the effect.

If we want commitment making to reach its full potential, it is crucial that we learn why and how commitment is effective. Few studies provided insights about the particular psychological mechanisms activated by commitment; however, these mechanisms can be studied and have been addressed in nonenvironmental research. From the present group of studies, it is hard to draw conclusions about the underlying psychological processes; but interventions that play on norms and self-concepts seem to yield the most robust findings.

Different insights derived from fundamental research are seemingly not very well integrated in the environmental field. We suggest that future commitment research should include the different possible mediators we described, and test which of them is most effective in producing behavior change or whether they operate in tandem. Then, with the knowledge from fundamental research, commitment manipulations can be improved to specifically tap into these psychological processes. At the same time, applied studies can then serve to test the power of these respective processes in actual intervention research. A better understanding of the way commitment works will result in more successful tools that will help both researchers and professionals to stimulate environmentally significant behaviors.

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1. We had hoped to use Cialdini's (2001) criteria to identify weak and strong commitments, but experimenters used a variety of manipulations and it was often difficult to determine whether the commitment was weak or strong according to Cialdini's criteria.
2. We chose to calculate r values instead of d values as both nominal and scale data were used and standard deviations were not always provided for the scale data.
3. Note that this process differs from Gollwitzer, Sheeran, Michalsky, and Seifert's (2009) finding that when others become aware of an individual's self-goal, this reduces actual behavior, in theory because others' awareness substitutes for actual accomplishment; clearly further research is needed to clarify these two perspectives.

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