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A Meta-Analysis of Research on Inoculation Theory

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A meta-analysis of 54 cases testing the effectiveness of inoculation theory at conferring resistance and examining the mechanisms of the theory was conducted. The analyses revealed inoculation messages to be superior to both supportive messages and no-treatment controls at conferring resistance. Additionally, the results revealed refutational same and refutational different preemptions to be equally effective at reducing attitude change. However, the data were not consistent with some predictions made in narrative reviews of inoculation. No significant increase in resistance as a function of threat or involvement was found. Further, instead of a curvilinear effect for delay on resistance, the point estimates from our meta-analysis revealed equivalent resistance between immediate and moderate delays between inoculation and attack, with a decay in resistance after two weeks.

Keywords: Inoculation; Meta-analysis; Resistance

Research on resistance to persuasion and attitude change is central to fully understanding social influence. In their review of attitude research, Eagly and Chaiken note that, "explaining why people are so often effective at resisting efforts to change their strong attitudes remains one of the core issues of attitude theory" (1993, p. 680). Resistance to persuasive messages and attitude change has been a longstanding topic of interest among scholars of social influence (McGuire, 1961a, 1961b), and examining the effectiveness of various methods of inducing resistance has not diminished in recent years (see, e.g., Tormala, 2008). McGuire's (1961a, 1961b) inoculation theory, in particular, has received renewed attention in the past two decades (Compton & Pfau, 2005; Szabo & Pfau, 2002). Inoculation theory uses a

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biological metaphor to describe an approach for conferring resistance to persuasive messages. Through exposing individuals to messages containing a weakened argument against an attitude they hold, it is possible to "inoculate" the individuals against future attacks on the attitude (McGuire, 1961a,b; McGuire & Papageorgis, 1961).

To date, a relatively substantial amount of research has been conducted on inoculation theory. The mechanisms behind the inoculation process and several nuances of the theory have been identified and tested (Compton & Pfau, 2005; Szabo & Pfau, 2002). Further, scholars have investigated inoculation's potential application in health (Pfau & Van Bockern, 1994; Pfau, Van Bockern, & Kang, 1992), political (An & Pfau, 2004; Pfau & Burgoon, 1988), educational (Compton & Pfau, 2008), and commercial contexts (Burgoon, Pfau, & Birk, 1995; Compton & Pfau, 2004). However, despite two comprehensive narrative reviews of research on inoculation theory (Compton & Pfau, 2005; Szabo & Pfau, 2002), the complete picture of this theory remains unclear.

This manuscript reports a meta-analysis of research on inoculation theory. Meta-analysis is uniquely suited to address many of the unsettled issues related to both the effects of inoculation and underlying mechanisms of the theory. First, although a fair amount of empirical support exists for the theory (e.g., McGuire, 1961a, 1961b, 1962, 1966; McGuire & Papageorgis, 1961, 1962; Papageorgis & McGuire, 1961; Pfau, Holbert, Pasha, & Lin, 2000; Pfau et al., 1997, 2001a, 2003, 2004, 2005; Wood, 2007), there are also a number of challenges to inoculation theory. Several scholars have rejected inoculation as a cause of resistance (e.g. Cronen & LaFleur, 1977; Tannenbaum, 1966; Tannenbaum, Macaulay, & Norris, 1966; Tannenbaum & Norris, 1965), others have found inoculation to only work under specific circumstances (e.g., Compton & Pfau, 2004; Crane, 1962; Pryor & Steinfatt, 1978; Sawyer, 1973), and others reported instances where an inoculation induction was no more effective (or even less effective) than a supportive message induction or a no-message control in promoting resistance (e.g., Adams & Beatty, 1977; Benoit, 1991; Burgoon & Chase, 1973; Burgoon & King, 1974; Farkas & Anderson, 1976; Lessne, 1983; Pashupati, Arpan, & Nikolaev, 2002). Meta-analysis makes it possible to clarify the inconsistent findings in the body of research on inoculation theory. Through computing an aggregate effect size for research testing inoculation theory, it is possible to conduct a more comprehensive evaluation than any single study. Second, research has revealed several potential moderating variables that have been addressed in recent narrative summaries of inoculation theory (Compton & Pfau, 2005; Szabo & Pfau, 2002); yet the overall effects of these moderators are unknown. Specifically, four moderators warrant consideration as they represent core elements of and scope conditions for inoculation theory, including: the optimal amount of the threat used in inoculation messages, the effects of inoculation same versus inoculation different messages, the impact of involvement, and the influence of delay between inoculation messages and attack messages. Examining these potential moderators of the relationship between inoculation and resistance to attitude change makes it possible to determine the conditions under which inoculation theory is most effective.

Inoculation Theory

Background on Inoculation

McGuire's (1961a, 1961b, 1962; McGuire & Papageorgis, 1962; Papageorgis & McGuire, 1961) original conceptualization of inoculation theory suggests that individuals can be inoculated against persuasive attacks on their attitudes in a similar manner to the way individuals can be immunized against a virus. Medical inoculation works by injecting a weakened form of a virus into an individual in order to enable that person to build up resistance to future attacks from that virus. McGuire reasoned that attitudinal resistance can be similarly induced by forewarning an individual of an impending attack on an attitude he or she holds and presenting a weakened argument against the attitude. The weakened argument will, presumably, motivate the individual to develop counterarguments consistent with his or her initial attitude and, thus, strengthen the attitude against future attacks.

Two issues in the evolution of inoculation theory from McGuire's (1961a; McGuire & Papageorgis, 1962) original work to contemporary applications warrant consideration. First, McGuire (1964, p. 201) limited the application of inoculation theory to "cultural truisms," or "beliefs that are so widely shared within the person's social milieu that he would not have heard them attacked, and indeed, would doubt that an attack were possible." Therefore, early inoculation research was conducted on non-controversial issues, such as the use of X-rays to detect tuberculosis, the advantages of the drug penicillin, and tooth brushing. Although the use of cultural truisms was consistent with the biological analogy, it left unanswered whether inoculation would be successful with topics that were less "protected" (Pryor & Steinfatt, 1978; Ullman & Bodaken, 1975). Content is no longer a boundary condition for inoculation research as numerous studies have applied inoculation theory to controversial topics, including (but not limited to): genetically modified food (Wood, 2007); banning handguns, legalizing marijuana, legalizing gambling, restricting television violence (Pfau et al., 1997, 2000, 2001a, 2001b, 2003, 2004, in press); and animal testing (Nabi, 2003).

A second issue in the evolution of inoculation theory involves the procedure for inoculation. In some of McGuire's (e.g., McGuire & Papageorgis, 1961) early work, participants were given a one-sentence counter-attitudinal argument and asked to write a paragraph refuting it. This approach, which he deemed active refutation, placed the onus of defending their attitude solely on the participants. In other research, McGuire (McGuire & Papageorgis, 1962) included refutations along with the attack message. In this passive refutational approach, participants were no longer solely responsible for developing arguments to defend their attitude. Although McGuire initially expected more active participation in the resistance process to result in larger inoculation effects, the active paradigm was typically less effective. One explanation for the superiority of passive refutations was that it provides content and practice in defending one's attitude as well as placing less cognitive demand on participants. This shift away from McGuire's active refutation approach placed more emphasis on designing effective refutation messages and has been the dominant paradigm since as the vast majority of the research in the past two decades has relied on passive refutation techniques. It is noteworthy that recent inoculation experiments (e.g., Pfau et al., 1997, 2001a, 2001b) have revealed support for McGuire's original idea that generating counterarguments increases resistance. As such, characteristics of active inoculation are incorporated to supplement passive refutational procedures; in addition to receiving essays that introduce and refute counter-attitudinal arguments, contemporary inoculation experiments ask participants to counterargue against attack messages.

The Effects of Inoculation on Attitudes

Research on the effects of inoculation theory on attitudes has been reinvigorated in the past two decades. A plethora of experiments have examined inoculation theory in context ranging from politics to health campaigns (for a review, see Compton & Pfau, 2005). The findings from this body of research, however, are somewhat mixed. A number of recent tests of inoculation theory demonstrates the utility of inoculation treatments for conferring resistance to counter-attitudinal attacks. Participants who received an inoculation treatment were more resistant to subsequent attacks on their attitudes than participants in a no-treatment control condition (e.g., Pfau, Holbert, Zubric, Pasha, & Lin, 2000; Pfau et al., 1997, 2001a, 2003, 2004, 2005; Wood, 2007) or supportive treatment condition (e.g., McGuire, 1964; Tannenbaum, 1966; Suedfeld & Borrie, 1978). The supportive treatment involved giving participants a message promoting an attitude they held. Yet, some scholars have found results inconsistent with the theory (e.g. Adams & Beatty, 1977; Benoit, 1991; Burgoon & Chase, 1973; Burgoon & King, 1974; Compton & Pfau, 2004; Crane, 1962; Farkas & Anderson, 1976; Lessne, 1983; Pashupati et al., 2002; Pryor & Steinfatt, 1978; Sawyer, 1973). In these experiments, inoculation treatments have been shown to be ineffective at conferring resistance.

Given the sometimes inconsistent findings in the scholarship on inoculation theory, it is essential to first evaluate the potential for inoculation to make individuals' attitudes resistant to attack. To this end, the influence of inoculation treatments compared with no-treatment controls or supportive treatments on attitudes was assessed. Although a no-treatment control is more widely used in inoculation research, it could be argued that the use of a supportive treatment represents a more conservative test of the theory. That is, as in inoculation treatments, participants in supportive treatments are exposed to attitude bolstering information; in the inoculation condition, however, the attitude bolstering information is presented along with the threat of an impending attack on one's attitude and arguments against an attitude that one holds. For both control conditions we posit that participants in the inoculation conditions should be more resistant to a counter-attitudinal attack than individuals in the control conditions (both supportive and no-treatment conditions). Additionally, we expect supportive treatments to be superior to no-treatment controls. This is consistent with the inoculation metaphor in that taking vitamins (supportive treatment) may not be as effective at preventing the flu as receiving an inoculation, but it is better than nothing. Taken together, the following predictions are offered:

H1: Inoculation treatments will confer more resistance than (a) no-treatment controls, and (b) supportive treatments. Further, (c) supportive treatments will confer more resistance than no-treatment controls.

Mechanisms of Inoculation Theory

Recent research on inoculation theory has made several contributions to the basic inoculation model and detailed additional mechanisms responsible for building resistance to persuasion (Compton & Pfau, 2005; Szabo & Pfau, 2002). In particular, threat, delay, refutational preemption, and involvement have all been identified as key elements related to the process and/or outcomes of inoculation theory. In the following paragraphs, the implications of each of these four factors are explicated.

Threat. From the beginning, McGuire (McGuire, 1961a; McGuire & Papageorgis, 1961) believed that perceived threat was a central element for creating resistance to persuasive communication. It was assumed that for the inoculation process to be effective, receivers must perceive a threat in order to motivate them to strengthen their current attitudes. The threat component of an inoculation treatment forewarns of an impending persuasive attack, and thus motivates resistance by making salient the potential vulnerability of one's current beliefs to change. Since McGuire's initial inoculation research, additional scholarship has confirmed the indispensable nature of perceived threat. In their review of inoculation research, Compton and Pfau (2005) argued "inoculation is impossible without threat" (pp. 100–101).

Although perceptions of threat are believed to be essential to the inoculation process, the optimal amount of perceived threat desired for inoculation treatments remains one of the unresolved issues in the literature. Although threat has not been a frequently manipulated message variable in experiments of inoculation, scholars have suggested that greater message threat should facilitate more resistance by inducing more perceived threat in receivers. Recently, Pfau et al. (2010) conducted an experiment examining the effects traditional and "enhanced" levels of threat on inoculation outcomes. Enhanced threat messages included wording which suggested greater seriousness, relevance, certainty, and immediacy of a potential counter-attitudinal attack. They argued that enhanced threat should increase perceived threat and engage danger control processes and therefore increase resistance. Following this line of thinking, it is proposed:

H2: Higher levels of perceived threat confer more resistance than lower levels of perceived threat.

Refutational preemption. In addition to threat, the second indispensable element of inoculation messages is the refutational preemption. As specific types of passive refutational approaches, refutational preemptions "provide specific content that receivers can employ to strengthen attitudes against subsequent change" (Pfau et al., 1997, p. 188). Refutational preemptions assist the inoculation process by providing arguments and/or evidence that can be used to refute arguments presented in attitudinal attacks, as well as by giving individuals practice at defending their beliefs through counterarguing (Insko, 1967; Compton & Pfau, 2005; Wyer, 1974).

Scholars studying inoculation theory have examined the counterarguing content contained in refutational preemptions, distinguishing between refutational treatments that address either arguments present or not present in subsequent attack messages, labeled refutational same and refutational different treatments respectively.

Research on inoculation theory has demonstrated the utility of both refutational same and refutational different preemptions. However, several researchers have concluded that inoculation works better at promoting resistance when individuals face the same arguments in attack messages as opposed to novel attack arguments (e.g., Anderson & McGuire, 1965; McGuire, 1961a, 1961b; McGuire & Papageorgis 1962; Pfau & Burgoon, 1988; Pryor & Steinfatt, 1978), others have reached the opposite conclusion (e.g., Pfau, 1992; Pfau & Burgoon, 1988), and others have found no significant difference between novel and expected attacks (e.g., Pfau, Kenski, Nitz, & Sorenson, 1990; Wan & Pfau, 2004). Understanding whether inoculation confers more resistance to novel or expected attack arguments has important implications. For example, knowing that refutation different can generate resistance to novel attacks greatly increases the utility of inoculation as a strategy for conferring resistance; preparing individuals to refute a small number of counterarguments could protect them from a wide range of other counterarguments. Accordingly, the following hypothesis is proposed:

> H3: The resistance to persuasion conferred by inoculation treatments will generalize beyond the arguments refuted in those treatments.

Delay between inoculation and attack. A crucial issue for scholars of inoculation theory is the optimal amount of delay between inoculation treatments and subsequent attitude attacks. Initially, McGuire (1964) suggested that a delay was necessary between the inoculation treatment and the attack message in order to provide an individual time to generate arguments to defend their attitude. The necessity of delay is conceptually consistent with the biological analogy as medical inoculations require time for the human body to build up resistance. Several scholars have found support for McGuire's idea that delay enhances resistance (Freedman & Sears, 1965; Hass & Grady, 1975; McGuire, 1964; Petty & Cacioppo, 1979, 1986).

Although some scholars found support for the benefits of delay, other researchers have documented that inoculation treatments decay, or lose their effectiveness over time (McGuire, 1962; Pfau, 1997; Pfau et al., 1990; Pryor & Steinfatt, 1978). This effect has been explained by changes in motivation to defend one's attitudes over the course of time (Insko, 1967). After receiving the threat component of an inoculation treatment, individuals experience heightened motivation to produce attitude-bolstering material and engage in counterarguing, which enhances resistance. However, over time this motivation declines and individuals become susceptible to counterattitudinal attacks.

In the search for the optimal time interval between inoculation treatments and attacks, scholars have successfully conferred resistance with a wide range of delays. Researchers have examined the influence of inoculation messages immediately after administration (e.g., Nabi, 2003), after a few days (e.g., McGuire, 1966), or even weeks afterward (e.g., Pfau & Burgoon, 1988). The ability of inoculation treatments to confer resistance for weeks, and, in some cases, months (Pfau & Van Bockern, 1994) speaks to the robustness of inoculation theory, but it does little to help answer the question of the most advantageous time period to inoculate attitudes. Although there is no consensus on the optimal time interval between treatment and attack, Compton and Pfau's (2004) argument about the tradeoff between motivation and decay suggests a solution. They claim that a curvilinear relationship is likely to exist involving the interval between inoculation treatments and subsequent attacks and the ability of an inoculation message to confer resistance. To examine this issue, the following hypothesis is proposed:

> H4: There will be a curvilinear relationship between the time interval from treatment to attack and resistance. Inoculation will be more effective at moderate and less effective at shorter or longer time delays between the inoculation treatment and subsequent attack.

Issue involvement. Issue involvement, or "the importance or salience of an attitude object for a receiver" (Pfau et al., 1997, p. 190), has been argued to play an important role in the inoculation process (Compton & Pfau, 2005). Pfau et al. (1997) examined low, moderate, and high involving issues, and found that inoculation messages conferred maximum resistance with moderately involving issues. They linked issue involvement with threat and argued that involvement dictates whether inoculation treatments can generate sufficient threat. Pfau et al. (1997) reasoned that if involvement is too low, people are unlikely to perceive their attitudes are vulnerable to attack or, even if they did, are unlikely to care. Conversely, if involvement is too high, people are fully aware that attitudes are susceptible to attack and, in all likelihood, have previously thought about specific challenges to their attitudes and possible refutations of those arguments. In either case, it would be difficult for inoculation treatments to elicit additional threat, and hence motivate individuals to resist attack messages. Accordingly, Pfau et al. (1997) proposed a curvilinear relationship between involvement and threat in which inoculation should confer the greatest amounts of resistance among those individuals who are moderately involved in the topic or issue. To formally test this notion, the following hypothesis is posited:

> H5: There will be a curvilinear relationship between issue involvement and resistance. Inoculation will be more effective with moderately involved individuals than with individuals who have lower or higher levels of involvement.

Method

A fixed-effects model meta-analysis (Hedges & Vevea, 1998) was conducted to test the preceding hypotheses.[1] Meta-analysis is an approach for aggregating the results from a body of research (Hedges & Olkin, 1985; Hunter, Schmidt, & Jackson, 1982; Lipsey & Wilson, 2001). Meta-analysis serves two important functions by making it possible to (a) compute a weighted mean effect size from a sample of cases, and (b) test moderating variables that may explain inconsistent findings in a body of research. All effects in this manuscript are reported in the form of *d,* which represents the difference between the inoculation treatment and control group means in standard score form.

Literature Search

A literature search was conducted to identify empirical research related to inoculation theory. First, the EBSCO database was used to search Academic Search Complete, Business Source Complete, Communication and Mass Media Complete, ERIC, PsycArticles, PsycCritiques, and PsychInfo for journal articles and conference papers. The WorldCat, JSTOR, and Proquest databases were also searched. Proquest is a database of doctoral dissertations and masters theses. Unpublished research was included this meta-analysis to help mitigate publication bias and the possibility of inflated effects (Rothstein, Sutton, & Borenstein, 2005). In conducting the searches, the following search terms related to inoculation theory were used: "inoculation theory," "resistance to persuasion and inoculation," and "attitude immunization." To ensure that all studies relevant to inoculation were collected, search terms related to message sidedness were also used, including: "message sidedness," and "two-sided message." Second, reviews of scholarship on inoculation theory (Compton & Pfau, 2005; Szabo & Pfau, 2002) and message sidedness (Allen, 1991; Eisend, 2006; O'Keefe, 1993) were consulted. The reference sections from these publications were reviewed to identify additional tests relevant to inoculation theory.

Two criteria were used to include cases in the sample for the meta-analysis. First, all cases in the sample included a quantitative measure of the impact of (a) inoculation on attitudes in comparison with a no-treatment control, (b) inoculation in comparison with a supportive treatment, or (c) a supportive treatment in comparison with a no-treatment control. In order to compute an effect size for a particular case, means and standard deviations, an *F* or *t* value, or an *r* coefficient for the variables of interest must have been reported in the study.

Second, cases had to meet some minimum requirements to be considered a test or application of inoculation theory. All cases included in the sample included some form of initial inoculation treatment, and a second, distinct attack message. An inoculation treatment was operationalized as a message that identifies and refutes counter-arguments (or asks participants to construct refutations) to an attitude one holds. An attack message was operationalized as a message that lists counterarguments against an attitude one holds in an attempt to get one to change the attitude. It should be noted that the presence of a threat statement was not used as a criterion for including cases in the sample. Although Pfau and his colleagues (Compton & Pfau, 2005; Szabo & Pfau, 2002) have noted that an explicit statement warning that one's attitude could be threatened is central to inoculation theory, threat was not used as an inclusion criterion for two reasons: First, it is plausible that, in formally presenting counterarguments against an attitude that one might hold, researchers are—at least, to some degree—communicating a threat. In considering counterarguments against one's attitude, the notion that one's attitude may come under attack is implicit. Second, in practical terms, excluding studies based on this criterion would unnecessarily reduce the sample for this meta-analysis and potentially bias the results. A cursory review of the current sample indicates that many of the older inoculation studies (i.e., pre 1990) are much less likely than more recent ones to address whether or not threat was explicitly communicated to participants.

A total of 54 cases met the preceding criteria. All cases included in the analyses are detailed in Table 1. Unpublished works, such as dissertations and conference papers, that were subsequently published (e.g., An, 2003; An & Pfau, 2004; Easley, 1989; Easley, Bearden, & Teel, 1995; Pfau & Burgoon, 1988) were treated as a single case. Finally, a full list of cases that were related to inoculation theory but excluded from the analyses is available from the authors. In general, cases were excluded because they did not include sufficient information to compute effects (e.g., Anderson & McGuire, 1965; Benoit, 1991; Lumsdaine & Janis, 1953; McGuire, 1961a, 1961b, 1962; McGuire & Papageorgis, 1961; Papageorgis & McGuire, 1961; Quereshi & Strauss, 1980; Tannenbaum & Norris, 1965), lacked a separate attack message (e.g., Bohner, Einwiller, Erb, & Siebler, 2003; Godbold & Pfau, 2000; Kamins & Assael, 1987; Pfau & Van Bockern, 1994; Pfau, Van Bockern, & Kang, 1992), and/or included other persuasive strategies in tandem with an inoculation component (e.g., Banerjee & Greene, 2007; Duryea, 1984; Rosenberg, 2004).

Coding for Moderators

The cases in the sample were coded for the four moderators corresponding to Hypotheses 2–5. Perceived threat and perceived involvement were treated as continuous variables and the type of refutational preemption message and time were treated as categorical. Table 1 includes details about the four moderators for each of the cases in the sample.

Perceived threat was operationalized as the amount of threat perceived by participants in the inoculation condition in comparison with the threat experienced by those in the control group. An effect size was computed for each of the 20 cases that reported a quantitative measure of threat, comparing perceived threat in the inoculation and control conditions. The effect sizes, which were corrected for measurement error in threat, ranged from $d = .17$ to $d = .70$ ($M = .37$, $SD = .14$). Perceived involvement in the issue or topic of the inoculation treatment was defined as interest in or the relevance of the topic, message, or outcome. Fifteen-point estimates of involvement were identified from the 13 cases in which involvement was measured and/or manipulated. To standardize involvement measures across the cases in the sample, the proportion of perceived involvement relative to possible involvement in each study were computed. The mean value of involvement reported for each case was divided by the maximum value possible on the respective involvement measure. Relative perceived involvement ranged from .48 to .87 ($M = .67$, $SD = .10$).

Cases were coded by the kind of refutational preemption provided by the inoculation treatment. Cases were classified as using a "same-arguments" preemption when the inoculation treatment refuted the exact counterarguments that were

Table 1 Description of Key Variables for Each Case in the Sample

Author(s)	Final *N*	Retention rate	Topic(s)	Refutational preemption	Threat corrected *d* (raw *d*)	Delay	Involvement
Abramson (1977)	120	–	Corporate advertising	Same	–	Immediate	–
Adams & Beatty (1977)	60	92%	Politics—senatorial responsibility	–	–	–	–
An (2003)*	508	76%	Politics—elections	Same	.46 (.44)	–	–
An & Pfau (2004)	86	83%	Politics—elections	Same & different	.43 (.43)	–	–
Bernard et al. (2003) Study 1	75	–	Values—equality	–	–	Immediate	–
Bither et al. (1971)	109	–	Social issues	–	–	–	–
Burgoon & Chase (1973)	114	–	University admissions	Different	–	Two days	–
Burgoon & Miller (1990)	162	–	Campus parking	Same	–	Immediate	–
Burgoon et al. (1995)	829	–	Corporate issue advocacy	Same & different	–	Two weeks or more	–
Compton (2004)*	367	80%	Politics—late-night television comedies	–	.41 (.40)	–	–
Compton & Pfau (2004)	116	–	Credit card marketing	Same	.70 (.68)	Two weeks	.61
Compton & Pfau (2008)	225	–	Plagiarism	–	.22 (.21)	Two weeks	.66
Davis (1965) Study 1*	96		Cultural truism & social issues	–	–	2 days	–
Davis (1965) Study 2*	96		Cultural truism & social issues	–	–	2 days	–
Easley (1989)*	239	80%	Corporate advertising	Manipulated	–	Manipulated (immediate, 2 days, 7 days)	–
Goldstein (1982)*	181	–	Corporate advertising	Manipulated	–	Manipulated (immediate, 2 days, 7 days)	–
Hunt (1972)*	198	–	Corporate advertising	Same	–	Immediate	–

Table 1 (*Continued*)

Author(s)	Final *N*	Retention rate	Topic(s)	Refutational preemption	Threat corrected *d* (raw *d*)	Delay	Involvement
Infante (1975)	95	–	Minimum annual income	Same	–	Immediate	–
Insko (1965) Study 1	160	–	Legal proceeding	Same	–	Immediate	–
Insko (1965) Study 2	160	–	Legal proceeding	Same	–	Immediate	–
Isaacs & Atkins (1972)*	–	–	Cultural truisms	–	–	Immediate	–
Ivanov (2006)*	433	–	Corporate advertising	Manipulated	–	Two weeks or more	.87
Kamins & Assael (1987) Study 2	106	80%	Consumer good—ballpoint pen	–	–	Immediate	–
Koehler (1968)*	480	–	Social issues	–	–	Immediate	–
Lee (1997)*	639	93%	Social issues	Same & different	.20 (.19)	3–18 days	–
Lessne (1983)*	109	–	Corporate advertising	Manipulated	–	2 days	–
Lim & Ki (2007)	113	85%	Corporate public relations	–	–	1 week	–
Lin & Pfau (2007)	206	84%	Politics—Taiwan's political future with China	Same & different	.39 (.38)	1–2 months	–
MacDougall (2001)*	240	–	Politics	–	–	Immediate	–
Manis (1965) Study 1	24	–	Cultural truisms	Same	–	Manipulated (immediate, 2 days)	–
Nabi (2003)	127	–	Animal rights	Same	–	Immediate	–
Pashupati et al. (2002)	132	–	Corporate advertising	Different	–	Immediate	–
Pfau (1992)	262	82%	Corporate advertising	Manipulated	–	9–25 days	.54
Pfau & Burgoon (1988)	733	64.3%	Politics—elections	Manipulated	–	1–3 weeks	–
Pfau, Compton et al. (2003)*	452	77.1%	Social issues	Same & Different	.59 (.58)	–	

Table 1 (*Continued*)

Author(s)	Final N	Retention rate	Topic(s)	Refutational preemption	Threat corrected d (raw d)	Delay	Involvement
Pfau, Haigh, Fifrick, et al. (2006)	181	–	Journalism—Iraq war	Different	–	1 week	–
Pfau, Haigh, Shannon, et al. (2008)	200	97%	Journalism—Iraq war	–	.40 (.38)	1 week	.74
Pfau, Haigh, Sims, et al. (2007)	204	92%	Corporate public relations	Different	.25 (.24)	1 week	.72
Pfau, Holbert et al. (2000)	638	95%	Social issues	Same & different	.29 (.28)	29–41 days	.67
Pfau, Ivanov et al. (2005)	298	87%	Social issues	Same & different	.48 (.47)	18–25 days	.72
Pfau, Kenski et al. (1990)	314	59%	Politics—election	Manipulated	.38 (.35)	12–24 days	–
Pfau, Roskos-Ewoldsen, et al. (2003)	333	–	Social issues	Same & different	.24 (.24)	5–33 days	–
Pfau, Semmler et al. (2009)	281	98%	Social issues	Same & different	.17 (.17)	12–23 days	.69
Pfau, Szabo et al. (2001a)	597	95%	Social issues	Same & different	.26 (.25)	27–42 days	–
Pfau, Tusing et al. (1997)	790	–	Social issues	–	.33 (.32)	1–23 days	Manipulated
Pryor & Steinfatt (1978)	390	–	Automobile safety	Manipulated	–	Manipulated (immediate & one week)	–
Roberts (1977)*	120	–	Cultural truisms	Same	–	2 days	–
Rosnow (1968)	215	–	Social fraternities	–	–	Immediate	–
Shapiro (1978)*	262	–	Cultural truism & social issues	Same	–	Immediate	–
Szybillo & Heslin (1973)	272	–	Automobile safety	Manipulated	–	Manipulated (immediate & 3 days)	–

Table 1 (*Continued*)

Author(s)	Final *N*	Retention rate	Topic(s)	Refutational preemption	Threat corrected *d* (raw *d*)	Delay	Involvement
Wan & Pfau (2004)	367	79%	Corporate public relations	Manipulated		2 weeks	–
Wigley (2007)*	287	85%	Corporate public relations	Same & different	.53 (.51)	4–30 days	–
Wood (2006)*	558	86%	Environment	Same	.23 (.23)	1–13 days	.59
Yin (2003)*	361	90%	Social issues	Manipulated	.39 (.38)	19–62 days	.75

*Denotes an unpublished study (i.e., conference paper, dissertation, or thesis).

Note. A dash indicates that the respective study either did not address the issue or did not provide data relevant to the issue. For example, a dash in the threat column indicates that the study did not address the threat perceived by participants or (if it was addressed) did not report enough data for this variable to be assessed in the meta-analysis. Final *N* refers to the number of participants who completed all phases of the study. Retention rate was computed for studies with some form of delay by comparing the number of participants who completed the first phase of the study with the number who completed the final phase. For refutational preemption, "same and different" refers to studies in which participants in the inoculation condition received both refutation same and refutation different messages; "manipulated" refers to instances where this variable was manipulated in the study. The threat variable represents the effect size (in the form of *d*) for the amount of threat induced in the inoculation condition in comparison with the no-treatment control condition. The involvement variable represents the relative level of involvement with the topic reported by study participants (in all conditions); involvement scores were computed by dividing the mean level of involvement by the upper limit of the involvement measure for each respective study.

presented in the attack message. Cases were classified as using a "different-arguments" preemption when the inoculation treatment refuted arguments that were different from the arguments in the attack message. Delay was operationalized as the range of days between inoculation and attack. The minimum and maximum numbers of days that may have elapsed between receiving the inoculation and attack messages were identified. Although McGuire (1964) argues that the ideal delay between inoculation and attack is two to seven days, only five cases comparing an inoculation message with a no-treatment control included a delay that was clearly within this range. Accordingly, delay was trichotimized to form three groups that represent relatively shorter, longer, or no delay. Groups were created for those cases in which: (a) the attack message immediately followed the inoculation message; (b) there was a one to 13 day delay in the time between inoculation and attack; and (c) the time between inoculation and attack was 14 days or greater. Several cases included a delay that ranged across multiple categories and were thus excluded from the analysis (e.g., Lee, 1997; Pfau et al., 1997).

Computing Weighted Mean Effect Estimates and Testing for Moderating Variables

The meta-analysis was conducted using the following procedure. First, the formulae offered by Hedges and Olkin (1985) were used to compute the effects and weights for each case. Effects were computed in the form of g and then, to account for the small sample bias in g, converted to d. The effect estimate d represents the difference between the inoculation treatment and control condition in standard deviation units. Second, the effects and weights were corrected for measurement error in the dependent measure (i.e., attitudes) using the formulae specified by Hedges and Olkin (1985, p. 136). In instances where the reliability of the attitude measure was not reported, the Spearman–Brown formula (Hunter & Schmidt, 2004, p. 332) was used to compute the reliability coefficient based on the number of items included in the measure. The mean reliability for a single item in the sample was .74. Third, the corrected d coefficients and weights for each case were input into SPSS (Statistical Package for the Social Sciences). The macro created by Lipsey and Wilson (2001) for SPSS was used to compute the weighted mean effect size and confidence interval for the cases in the sample. Finally, tests of the moderators were conducted. The macros provided by Lipsey and Wilson (2001) for SPSS were used, where appropriate, to conduct meta-regression and compute differences between groups. The significance level for all tests was set at $p = .05$.

Results

Studies Included in the Sample

Forty-three cases were identified that tested the influence of an inoculation treatment in comparison with a no-message control on attitudes. Twenty cases tested the influence of an inoculation treatment on attitudes in comparison with a supportive message, and 10 cases examined the influence of a supportive message in comparison with a no-message control condition. A majority of the cases in the sample used undergraduate, high school, or grammar school students as participants. The topics addressed in the cases ranged from politics ($k = 8$) and corporate advertising or public relations ($k = 14$) to social issues ($k = 14$) (e.g., the legalization of marijuana) and automobile safety ($k = 2$). Details for all cases included in the analyses are reported in Table 1.

Testing Inoculation Theory

Hypothesis 1a predicted that inoculated participants would be less susceptible to an attack on their attitude than those who did not receive an inoculation message. Prior to testing this hypothesis, it was necessary to address two outliers. The effect sizes for the comparison of the inoculation and no-inoculation control condition reported by Pashupati et al. (2002), $d = -.69$, and Wan and Pfau (2004), $d = 1.32$, exceeded the unweighted mean effect for the sample by more than 2.5 standard deviations. Lipsey and Wilson (2001) advocate excluding effects such as these, noting that a meta-analysis "is not usually served well by the inclusion of extreme effect size values that are notably discrepant from the preponderance of those found in the research of interest" (p. 107). Accordingly, Pashupati et al.'s (2002) and Wan and Pfau's (2004) research was excluded, resulting in a sample of 41 cases that was used in the analyses.

As illustrated in Table 2, the mean effect size for the 41 cases ($N = 10{,}660$) from the meta-analysis was $d = .43$. The 95% confidence interval ranged from .39 to .48, proving support for the notion that inoculated participants were more resistant to an attack than those in the no-inoculation condition. This outcome is consistent with Hypothesis 1a.

Hypothesis 1b predicted that inoculated participants would be less susceptible to an attack than those who received a supportive treatment. The effect size reported by Wan and Pfau (2004) exceeded the unweighted mean effect by 2.5 standard deviations and was excluded from the analysis. The mean effect size for the remaining 19 cases ($N = 2{,}035$) in meta-analysis was $d = .22$. The 95% confidence interval did not include zero, ranging from .12 to .32. These findings, which are illustrated in Table 3, provide support for Hypothesis 1b.

Hypothesis 1c predicted that supportive messages will be more effective at promoting resistance than no message at all. Table 4 illustrates the mean effect size for each of the 10 cases ($N = 789$) in the analysis. The mean effect size for this sample was $d = .34$ and the confidence interval did not include zero, ranging from .18 to .51. These findings support Hypothesis 1c.

Testing Potential Moderators of the Relationship between Inoculation and Resistance

The tests for moderators focused on the sample of cases that compared the inoculation condition with a no-treatment control group. The no-inoculation control group has historically represented a baseline from which the effects of inoculation can be understood. Additionally, the studies comparing inoculation treatments with no-treatment controls provided a substantially larger data set from which to test the potential effects of the moderators. It would be difficult to effectively test moderators from the sample of 20 cases that have compared an inoculation induction with a

Table 2 Post-Attack Differences in Attitudes between the Inoculation Treatment and No-Inoculation Control Condition

Authors	*N*	Raw *d*	Number of items in attitude measure	Reported α	Estimated α	Corrected *d*
Abramson (1977)*	23	.07	1		.74	.08
An (2003)* Study 1	346	.57	6	.98		.57
An & Pfau (2004)	86	.43	6	.97		.44
Bernard et al. (2003) Study 1	50	.36	13	.78		.41
Bither et al. (1971)	109	.71	1		.74	.82
Burgoon & Miller (1990)	142	.56	1		.74	.65
Burgoon et al. (1995)	822	.14	5	.84		.15
Compton (2004)*	186	.05	2	.97		.05
Compton & Pfau (2004)	143	.03	6	.93		.03
Compton & Pfau (2008)	236	−.09	6	.94		−.09
Easley (1989)*	164	.46	1		.74	.53
Goldstein (1982)*	68	.03	1		.74	.03
Hunt (1972)*	88	.38	1		.74	.44
Infante (1975)	38	.49	5		.93	.50
Isaacs & Atkins (1972)*	90	.13	1		.74	.15
Ivanov (2006)*	219	.66	6	.94		.68
Lee (1997)*	639	.46	6	.97		.47
Lessne (1983)*	78	−.10	4		.94	−.10
Lim & Ki (2007)	113	.78	6		.96	.79
Lin & Pfau (2007)	199	.36	6	.90		.38
MacDougall (2001)*	240	.02	8	.92		.02
Manis (1965)	24	−.06	4		.92	−.06
Nabi (2003)	123	.15	6	.95		.15
Pfau (1992)	325	.47	6	.94		.48
Pfau & Burgoon (1988)	733	.39	6	.89		.41
Pfau, Compton et al. (2003)	443	.99	6	.97		1.00
Pfau, Haigh, Fifrick et al. (2006)	122	.11	6	.98		.11
Pfau, Haigh, Shannon et al. (2008)	152	.05	6	.97		.05
Pfau, Haigh, Sims et al. (2007)	203	.26	6	.96		.26
Pfau, Holbert et al. (2000)	597	.53	6	.96		.54

Table 2 (*Continued*)

Authors	N	Raw d	Number of items in attitude measure	Reported α	Estimated α	Corrected d
Pfau, Ivanov et al. (2005)	298	.38	4	.97		.39
Pfau, Kenski et al. (1990)	253	.82	6	.95		.84
Pfau, Roskos-Ewoldsen et al. (2003)	333	.54	6	.95		.56
Pfau, Semmler et al. (2009)	281	.72	6	.94		.74
Pfau, Szabo et al. (2001a)	597	.49	6	.90		.51
Pfau, Tusing et al. (1997)	790	.43	6	.94		.44
Pryor & Steinfatt (1978)	195	1.02	4		.92	1.06
Szybillo & Heslin (1973)	180	.78	2		.85	.84
Wigley (2007)*	86	.32	6	.97		.32
Wood (2006)*	558	.46	6	.97		.47
Yin (2003)*	288	.35	6	.92		.37
Overall	10,660					.43

*Denotes an unpublished study (i.e., conference paper, dissertation, or thesis).
Note. Raw d refers to the uncorrected effect for each study. Corrected d values have been corrected for measurement error. The overall d value refers to the weighted mean d value for the sample.

Table 3 Post-Attack Differences in Attitudes between the Inoculation and Supportive Conditions

Authors	*N*	Raw *d*	Number of items in attitude measure	Reported α	Estimated α	Corrected *d*
Abramson (1977)*	26	.23	1		.74	.27
Adams & Beatty (1977)	40	.35	4		.94	.36
Bernard et al. (2003) Study 1	50	.06	13	.78		.07
Burgoon & Chase (1973)	44	−.21	6		.92	−.22
Davis (1965) Study 1*	96	.04	1		.74	.05
Davis (1965) Study 2*	96	.08	1		.74	.09
Easley (1989)*	212	.07	1		.74	.09
Goldstein (1982)*	68	.03	1		.74	.04
Hunt (1972)*	88	.06	1		.74	.07
Insko (1962) Study 1	40	.58	1		.74	.68
Insko (1962) Study 2	40	.28	1		.74	.33
Ivanov (2006)*	234	.56	6	.94		.58
Kamins & Assael (1987)	69	.57	1		.74	.66
Koehler (1968)*	180	.12	6		.96	.12
Pryor & Steinfatt (1978)	234	.28	4		.92	.29
Roberts (1977)*	120	−.29	1		.74	−.33
Shapiro (1978)*	130	.30	1		.74	.34
Szybillo & Heslin (1973)	181	.39	2		.85	.43
Wigley (2007)*	87	.17	6	.97		.17
Overall	2,035					.22

*Denotes an unpublished study (i.e., conference paper, dissertation, or thesis).
Note. Raw *d* refers to the uncorrected effect for each study. Corrected *d* values have been corrected for measurement error. The overall *d* value refers to the weighted mean *d* value for the sample.

Table 4 Post-Attack Differences in Attitudes between the Supportive and Control Conditions

Authors	*N*	Raw *d*	Number of items in attitude measure	Reported α	Estimated α	Corrected *d*
Abramson (1977)*	23	−0.15	1		.74	−.17
Bernard et al. (2003) Study 1	50	0.34	13	.78		.38
Easley (1989)*	102	0.32	1		.74	.38
Goldstein (1982)	33	−.03	1		.74	−.04
Hunt (1972)*	120	0.33	1		.74	.38
Ivanov (2006)*	101	0.13	6	.94		.14
Pryor & Steinfatt (1978)	117	0.85	4		.92	.89
Rosnow (1968)	105	−0.46	1		.74	−.54
Szybillo & Heslin (1973)	119	0.37	2		.85	.40
Wan & Pfau (2004)	19	1.15	6	.93		1.19
Overall	789					.34

*Denotes an unpublished study (i.e., conference paper, dissertation, or thesis).
Note. Raw *d* refers to the uncorrected effect for each study. Corrected *d* values have been corrected for measurement error. The overall *d* value refers to the weighted mean *d* value for the sample.

supportive message control condition or the 10 cases that compared a supportive treatment with a no-treatment control.

In instances where tests of the moderators were not significant, an "after-the-fact" power analysis (O'Keefe, 2007, p. 294) was conducted following the procedures specified by Hedges and Pigott (2004). Unlike a post hoc power test, where the observed moderator value is used to assess power, after-the-fact power analysis is conducted using a population value of interest for a moderator. A moderator value is pre-selected and a power analysis is conducted to determine the amount of power available to detect that value. The value of $b = .3$ was used to assess power of the tests evaluating the relationships between threat and involvement and the resistance conferred by inoculation. The values of $d = .25$, $d = .125$, and $d = 0$ were selected to assess the power associated with the test of delay as a moderator.

The first moderator examined was the amount of threat experienced by participants receiving the inoculation treatment. Hypothesis 2 forwarded that inoculation would be more effective among participants who felt greater levels of threat. A modified form of weighted least squares regression was conducted, using the macro provided by Lipsey and Wilson (2001) for SPSS, to test this hypothesis among the 20 cases that included a measure of perceived threat. The effect estimates representing the influence of inoculation on attitudes was regressed on the measure of perceived threat (i.e., the effect estimate for the difference in perceived threat between the inoculation and control conditions). Although the valence of the unstandardized beta coefficient for threat was in the predicted direction, it was not statistically significant, $b = .26$, $SE = .24$, $p = .29$. Hypothesis 2 was not supported. The power to detect an unstandardized beta coefficient of .30, which reflects a .30 increase in the effect for inoculation associated with a one unit increase in the effect for perceived threat, was .24.

The second moderator examined resistance as a function of the kind of refuational preemption employed, that is, whether or not the inoculation treatment addressed the same arguments presented in the attack message. Hypothesis 3 posited that the resistance to persuasion conferred by inoculation treatments generalizes beyond the arguments refuted in those treatments. In essence, this hypothesis predicted that there are *no* differences between the two types of inoculation treatments—i.e., the effects in the two groups are the same. Accordingly, a test of equivalence (Wellek, 2002), which assess whether or not groups are the same, was used to test this hypothesis following the simultaneous one-sided *t*-test procedure detailed by Stegner, Bostrom, and Greenfield (1996). The formulae for the tests were adapted for meta-analysis by using the mean number of participants per case in the inoculation same and different groups as the sample size for each respective group. The equivalence threshold (i.e., the acceptable amount that the population mean for one group may deviate from the other group) was set at 20%. The null hypothesis for a test of equivalence posits that the mean effect in one group exceeds the mean effect in the other group; thus, a significant *t*-value indicates that the scores in the two groups are equivalent. The point estimate of the mean effect size for the 19 ($n = 3{,}238$) cases that used a same-arguments preemption was $d = .49$, $SE = .04$; the point estimate for the 11 cases ($n = 1{,}715$) that used a different-arguments preemption was $d = .48$, $SE = .06$.

The results of the one-tailed *t*-tests indicate that mean effects are equivalent; the mean for the cases in the different-arguments preemption group is not more than 20% greater, $t\,(326) = 2.27$, $p < .05$, or smaller, $t\,(326) = -2.78$, $p < .05$, than the mean for cases in the same-arguments preemption group. Hence, Hypothesis 3 was supported.

The third moderator we examined was the time between inoculation and attack. Hypothesis 4 predicted a curvilinear relationship such that a moderate delay between inoculation and attack would be more effective in inoculating participants than studies with no delay or a relatively long delay. The point estimates for the three groups were not consistent with Hypothesis 4. The point estimates reflect a decay in resistance in the long term group ($k = 9$, $n = 3{,}399$), $d = .35$, $SE = .04$, in comparison with the moderate delay ($k = 11$, $n = 1{,}590$), $d = .42$, $SE = .05$, and no delay ($k = 13$, $n = 971$), $d = .42$, $SE = .07$, groups. Given that the point estimates were inconsistent with the curvilinear relationship predicted in Hypothesis 4, an omnibus test of the differences between the three groups was conducted. The macros provided by Lipsey and Wilson (2001) for SPSS were used to compute differences between the three groups in an approach analogous to one-way Analysis of Variance (ANOVA). The difference between the three groups was not significant, Q_B ($df = 2$) $= 1.41$, $p = .49$. The power associated with the omnibus test to detect a difference between the effects of $d = 0$, $d = .25$, and $d = .125$ for the three groups was .92.

Involvement was the fourth moderator tested. Hypothesis 5 predicted that inoculation would be more effective among moderately involved individuals than low or highly involved individuals. A modified form of weighted least squares regression was used to test this hypothesis. Given that Hypothesis 5 predicts a curvilinear relationship, the procedure for testing a curvilinear relationship using regression outlined by Aiken and West (1991) was followed. The measure of involvement was first mean centered: this variable represents the linear trend. Then, a second variable was created by squaring the mean-centered measure of involvement: this variable represents the quadratic trend. The mean-centered (the linear trend) and squared mean-centered (the quadratic trend) measures of involvement were entered into the first block of the regression model. The effect estimate representing the difference in attitudes between the inoculation treatment and control condition served as the outcome variable. The unstandardized beta coefficients representing the linear, $b = .16$, $SE = .40$, $p = .70$, and quadratic trends, $b = -.45$, $SE = 3.09$, $p = .88$, were in the predicted directions, but not statistically significant. These results indicate that there is no relationship between involvement and the resistance conferred by inoculation. No support was found for Hypothesis 5. The power to detect an unstandardized beta coefficient of .30 for the linear trend, which would reflect a .30 increase in the effect for inoculation associated with a one unit increase involvement, was .12.

Discussion

This study used meta-analysis to examine the effectiveness of inoculation treatments at conferring resistance as well as the potential moderators of inoculation effects.

Unlike other theories of resistance that address why people might resist persuasive messages (e.g., psychological reactance), inoculation theory addresses how best to intentionally confer resistance. Due to its emphasis on strategically counteracting persuasive communication, inoculation theory is one of the fundamental theories of resistance (Eagly & Chaiken, 1993), and learning about the overall effectiveness of inoculation as well as how certain moderating variables influence the process are of crucial importance.

Overall Inoculation Effects

The findings of the meta-analysis provide evidence of the effectiveness of inoculation when compared with control conditions, including both supportive treatments and no-treatment controls. These results help clarify the body of research on inoculation. Although a number of researchers found that inoculation can confer resistance to persuasion (e.g., McGuire, 1961a, 1961b, 1962, 1964, 1966; McGuire & Papageorgis, 1961, 1962; Papageorgis & McGuire, 1961; Pfau et al., 2000; Pfau et al., 1997, 2001a, 2003, 2004, 2005; Wood, 2007), several published (e.g., Adams & Beatty, 1977; Benoit, 1991; Burgoon & Chase, 1973; Burgoon & King, 1974; Crane, 1962; Pashupati et al., 2002; Pryor & Steinfatt, 1978; Sawyer, 1973) and unpublished (e.g., Lessne, 1983) studies have documented results that failed to support the theory or failed to support specific predictions of inoculation theory. The results of this meta-analysis suggest that, across a sample of 41 published and unpublished research reports involving over 10,000 participants, inoculation treatments are more effective than no-treatment controls or supportive treatments in fostering resistance to attitude change. Further, the weighted mean effect size comparing inoculation treatments to no-treatment controls is informative. The effect size of $d = .43$ is what Cohen (1988) considers a small magnitude effect; medium-sized effects, according to Cohen, range between $d = .50$ and $d = .79$. Despite being small in magnitude, the consistency of the outcomes associated with inoculation has both theoretical and practical import. Pfau, Haigh, Sims, and Wigley (2007) argued that in "the context of resistance research . . . small effect sizes are common *and* are meaningful" (p. 212, emphasis in original). In the context of health campaigns directed at young adults, for example, even a small increase in the likelihood that individuals will resist a persuasion attempt to engage in unhealthy behavior is of great value (e.g., Godbold & Pfau, 2000; Pfau & Van Bockern, 1994; Pfau et al., 1992; Szabo & Pfau, 2001). As a final consideration of the methods for inducing resistance, supportive treatments were compared to no-treatment controls. In contrast to the "paper tiger" effect forwarded by McGuire (1961a, 1961b), the data indicate that supportive treatments produce more resistance than no-treatment controls.

Theoretical Moderators of Inoculation Effectiveness

In this study, four moderators that have been posited to facilitate or mitigate the effectiveness of inoculation were examined. The first moderator tested in the meta-analysis was the impact of perceived threat on resistance. It was hypothesized that greater levels of perceived threat would confer more resistance than lower levels of perceived threat. Although the point estimate for threat was in the predicted direction, it was not statistically significant. It is noteworthy, however, that the power for this test was quite low. Given that the analysis was conducted with 20 cases, it would be prudent for scholars to continuing examining the role of threat in inoculation. In particular, it would be worthwhile to pursue studies that manipulate the amount of threat perceived by participants. Manipulating threat would make it possible to conduct a more direct test of this factor.

The second moderator examined in this study was the effectiveness of inoculation to produce resistance to novel attack arguments. It was predicted that inoculation treatments would generalize beyond the arguments refuted in those treatments. The results indicated that inoculations do confer resistance even to attacks that were not addressed in inoculation treatment and, furthermore, the effects of inoculation in research reports using novel and expected attacks are equivalent. The practical implication of this result is that practitioners can feel reasonably confident that inoculation treatments can produce resistance not only to those attack arguments specifically refuted, but also to novel attacks—thus, greatly increasing the value of inoculation as a communication strategy. As Pfau and Kenski (1990) argued, "If the construct were limited to preemptive refutation, it would afford limited utility since communicators would need to prepare specific preemptive messages corresponding to each and every anticipated attack" (p. 75). Because this meta-analysis demonstrates inoculation works equally well against novel and expected attacks, future inoculation research should explore the boundaries of this "blanket of protection" (Compton & Pfau, 2005, p. 105). The question of how inoculation against one position creates inoculation against other related positions remains unanswered in the inoculation literature.

A third moderator tested in the present meta-analysis of inoculation theory was the time delay between inoculation and attack. The research literature suggests that moderate time delays between the inoculation treatment and the attack message are most effective when compared to longer delays or no delay at all. A moderate delay is thought to allow individuals enough time to fully develop and refine counterarguments. The data did not support the predicted curvilinear relationship. Further, although the point estimates suggest decay in resistance when the delay between inoculation and attack exceeds 13 days, the difference between the three groups was not statistically significant. This finding suggests that more research about the inoculation decay process is needed. Currently, scholars (Compton & Pfau, 2005; Insko, 1967) favor the idea that there is a curvilinear relationship involving the time delay between inoculation and subsequent attack message. The meta-analysis is inconsistent with this notion, creating an opportunity for scholars to refocus attention on the elusive issue of the role of time in resistance. It may be that the relationship between time and the resistance conferred by inoculation is curvilinear such that the amount of resistance conferred by inoculation is consistent, but relatively short-lived. That is, after remaining relatively stable, a noticeable decay in resistance occurs around the two week mark after an inoculation treatment.

The final moderator examined in this study was issue involvement. It was predicted that inoculation would be more effective with those moderately involved with an issue when compared to those of higher or lower involvement. The results are inconsistent with this prediction. Although the unstandardized beta coefficients were in the predicted direction, neither the linear nor curvilinear relationship between involvement and resistance to persuasion fostered by inoculation were statistically significant. One explanation for this outcome is the lack of power associated with the test of involvement. It may be that that the effects associated involvement are small and there was not enough power for them to be detected. A second explanation for the lack of a relationship involves the way that inoculation has been manipulated in previous research. Involvement is often embedded in the topic instead of manipulated in messages. Researchers choose topics in which participants are more or less likely to be involved. Perhaps future research could experimentally manipulate, and thus isolate the effects of, issue involvement. Manipulating involvement would also allow inoculation scholars to explore how different types of involvement influence inoculation processes. Johnson and Eagly (1989) argue that there are three conceptually and empirically distinct types of involvement (value-relevant, outcome-relevant, and impression-relevant). Recent communication research (e.g. Cho & Boster, 2005; Park, Levine, Kingsley Westerman, Orfgen, & Foregger, 2007) revealed how different types of involvement moderate persuasive outcomes; perhaps inoculation scholarship could similarly benefit from examining involvement type.

Limitations

It is important to address potential limitations of this meta-analysis. First, as with any meta-analysis, one potential limitation is the studies that were excluded. It is indeed unfortunate that this meta-analysis of inoculation research does not include the original work of McGuire (1961a, 1961b; McGuire & Papageorgis, 1961) due to incomplete reporting of necessary statistical information. Although it is regrettable that the McGuire and his colleagues' original research could not be included, there is little reason to believe that those studies would have substantially changed the results. First, the conclusions reached in this meta-analysis are largely commensurate with classic research; McGuire consistently found that inoculation confers more resistance than control or supportive treatments. Second, the present meta-analysis includes data from 41 published and unpublished studies involving over 10,000 participants to test the effects of an inoculation treatment on resistance (in comparison with a no treatment control condition). As such, readers can be confident that the weighted mean effect size representing the resistance conferred by inoculation is relatively stable.

A second potential issue that warrants consideration is that a substantial number of research reports in the sample were produced by or in collaboration with a single scholar. Including those studies in which he is the lead author, co-author, dissertation advisor, or dissertation committee member, Professor Pfau is at least minimally involved in 24 of the 41 total cases in the sample that compared the inoculation and no-treatment control conditions. Professor Pfau's substantial efforts to advance research on inoculation theory are laudable. However, one could argue that the results of this meta-analysis could be an artifact of the work from one scholar. To test for the potential of a "Pfau effect," the effects for those 24 cases examining the influence of inoculation on attitudes in which Pfau was at least minimally involved were compared with those 17 studies in which he, presumably, had no involvement. The point estimates for the studies in which Professor Pfau was involved, $d = .43$, and not involved, $d = .45$, are similar, and the difference between the groups was not significant, Q_B $(df = 1) = 0.19$, $p = .66$. Readers can be confident that the findings from this study are not an artifact of any single author's works.

Conclusion

Overall, this meta-analysis both confirms the effectiveness of inoculation theory and challenges some of the previously held notions identified in narrative reviews of the theory (Compton & Pfau, 2005; Szabo & Pfau, 2002). Even with a concerted effort to avoid publication bias and the possibility of inflated effects, the data revealed inoculation treatments are superior at conferring resistance when compared to both no-treatment control and supportive treatments. Also consistent with narrative reviews of inoculation theory, the present meta-analysis indicated that the resistance conferred by inoculation treatments generalizes beyond the counterarguments refuted in those treatments, and the resistance conferred is of equivalent strength. However, the central inoculation variables of threat, time delay, and involvement did not conform to predictions made in narrative reviews of inoculation.

The purpose of a meta-analysis is to compute a weighted mean effect size from a sample of studies and test moderating variables that may explain inconsistent findings in a body of research. Although those issues were addressed in this meta-analysis, hopefully future research directions were also illuminated. Clearly inoculation is an effective method for instilling resistance to attitude change; however, more work is needed to clarify the various "nuances" of the process of inoculation.

Note

[1] Fixed-effects models "treat the effect-size parameters as fixed but unknown constants to be estimated," whereas random-effects models "treat the effect-size parameters as if they were a random sample from a population of effect parameters and estimate hyperparameters (usually just the mean and variance) describing this population of effect parameters" (Hedges & Vevea, 1998, p. 486). Tests of Hypotheses 1, 2, 4, and 5 were also conducted using random-effects model meta-analysis (or, where appropriate, random (mixed)-effects models). The results are consistent with the omnibus outcomes of the fixed-effects meta-analyses reported in this study. It was not possible to test Hypothesis 3 using a random (mixed)-effects model. Please contact the authors for the results of the random-effects model meta-analyses.

References

*Denotes a case included in the meta-analysis.
*Abramson, J. (1977). *Comparative advertising, inoculation theory, and the prevention of attitude change among brand loyal consumers: A laboratory experiment*. Unpublished doctoral dissertation, Louisiana State University, Baton Rouge, LA.
*Adams, W. C., & Beatty, M. J. (1977). Dogmatism, need for social approval, and resistance to persuasion. *Communication Monographs*, *44*, 321–325.
Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage.
Allen, M. (1991). Meta-analysis comparing the persuasiveness of one-sided and two-sided messages. *Western Journal of Communication*, *55*, 390–404.
*An, C. (2003). *Efficacy of inoculation strategies in promoting resistance to political attack messages: Source credibility perspective*. Unpublished doctoral dissertation, University of Oklahoma.
*An, C., & Pfau, M. (2004). The efficacy of inoculation in televised political debates. *Journal of Communication*, *54*, 421–436.
Anderson, L. R., & McGuire, W. J. (1965). Prior reassurance of group consensus as a factor in producing resistance to persuasion. *Sociometry*, *28*, 44–56.
Banerjee, S. C., & Greene, K. (2007). Antismoking initiatives: Effects of analysis versus production of media literacy interventions on smoking-related attitude, norm, and behavioral intention. *Health Communication*, *22*, 37–48.
Benoit, W. L. (1991). Two tests of the mechanism of inoculation theory. *The Southern Communication Journal*, *56*, 219–229.
*Bernard, M. M., Maio, G. R., & Olson, J. M. (2003). The vulnerability of values to attacks: Inoculation of values and value-relevant attitudes. *Personality and Social Psychology Bulletin*, *29*, 63–75.
*Bither, S. W., Dolich, I. J., & Nell, E. B. (1971). The application of attitude immunization techniques in marketing. *Journal of Marketing Research*, *8*, 56–61.
Bohner, G., Einwiller, S., Erb, H.-P., & Siebler, F. (2003). When small means comfortable: Relations between product attributes in two-sided advertising. *Journal of Consumer Psychology*, *13*, 454–463.
*Burgoon, M., & Chase, L. J. (1973). The effects of differential linguistic patterns in messages attempting to induce resistance to persuasion. *Speech Monographs*, *40*, 1–7.
Burgoon, M., & King, L. B. (1974). The mediation of resistance to persuasion strategies by language variables and active-passive participation. *Human Communication Research*, *1*, 30–41.
*Burgoon, M., & Miller, M. D. (1990). Overcoming resistance to persuasion via contiguous reinforcement and repetition of message. *Psychological Reports*, *66*, 1011–1022.
*Burgoon, M., Pfau, M., & Birk, T. (1995). An inoculation theory explanation for the effects of corporate issue/advocacy advertising. *Communication Research*, *22*, 485–505.
Cho, H., & Boster, F. J. (2005). Development and validation of value-, outcome-, and impression-relevant involvement scales. *Communication Research*, *32*, 235–264.
Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.
*Compton, J. A. (2004). *Late night political comedy, candidate image, and inoculation: A unique test of inoculation theory*. Unpublished doctoral dissertation, University of Oklahoma.
*Compton, J., & Pfau, M. (2004). Use of inoculation to foster resistance to credit card marketing targeting college students. *Journal of Applied Communication Research*, *32*, 343–364.
Compton, J., & Pfau, M. (2005). Inoculation theory of resistance to influence at maturity: Recent progress in theory development and application and suggestions for future research. In P. Kalbfleisch (Ed.), *Communication yearbook 29* (pp. 97–145). Newbury Park, CA: Sage.
*Compton, J., & Pfau, M. (2008). Inoculating against pro-plagiarism justifications: Rational and affective strategies. *Journal of Applied Communication Research*, *36*, 98–119.

Crane, E. (1962). Immunization—with and without use of counterarguments. *Journalism Quarterly, 39*, 445–450.

Cronen, V. E., & LaFleur, G. (1977). Inoculation against attacks: A test of alternative explanations. *Journal of Social Psychology, 102*, 255–265.

*Davis, C. M. (1965). *An experimental analysis of propaganda-resistance-conferring techniques for controversial and non-controversial issues*. Unpublished doctoral dissertation, University of Iowa.

Duryea, E. J. (1984). An application of inoculation theory to preventive alcohol education. *Health Education, 15*, 4–7.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Orlando, FL: Harcourt Brace Jovanovich.

*Easley, R. W. (1989). *An experimental investigation of attitude immunization techniques*. Unpublished doctoral dissertation, University of South Carolina.

Easley, R. W., Bearden, W. O., & Teel, J. E. (1995). Testing predictions derived from inoculation theory and the effectiveness of self-disclosure communications strategies. *Journal of Business Research, 34*, 93–105.

Eisend, M. (2006). Two-sided advertising: A meta-analysis. *International Journal of Marketing Research, 23*, 187–198.

Farkas, A. J., & Anderson, N. H. (1976). Integration theory and inoculation theory as explanations of the "paper tiger" effect. *The Journal of Social Psychology, 98*, 253–268.

Freedman, J. L., & Sears, D. O. (1965). Warning, distraction, and resistance to influence. *Journal of Personality and Social Psychology, 1*, 262–266.

Godbold, L. C., & Pfau, M. (2000). Conferring resistance to peer pressure among adolescents: Using inoculation theory to discourage alcohol use. *Communication Research, 27*, 411–437.

*Goldstein, L. S. (1982). *Inducing resistance to persuasion: An attempt to extend inoculation theory to a marketing context*. Unpublished doctoral dissertation, City University of New York.

Hass, R. G., & Grady, K. (1975). Temporal delay, type of forewarning, and resistance to influence. *Journal of Experimental Social Psychology, 11*, 459–469.

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. Orlando, FL: Academic Press.

Hedges, L. V., & Pigott, T. D. (2004). The power of statistical tests for moderators in meta-analysis. *Psychological Methods, 9*(4), 426–445.

Hedges, L. V., & Vevea, J. L. (1998). Fixed- and random-effects models in meta-analysis. *Psychological Methods, 3*(4), 486–504.

*Hunt, H. K. (1972). *Deception, inoculation, attack: Implications for inoculation theory, public policy, and advertising strategy*. Unpublished doctoral dissertation, Northwestern University.

Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: Correcting error and bias in research findings* (2nd ed.).Thousand Oaks, CA: Sage.

Hunter, J. E., Schmidt, F. L., & Jackson, G. B. (1982). *Meta-analysis: Cumulating research findings across studies*. Beverly Hills, CA: Sage.

*Infante, D. A. (1975). Effects of opinionated language on communicator image and in conferring resistance to persuasion. *Western Speech Communication, 39*, 112–119.

Insko, C. A. (1962). One-sided versus two-sided communications and countercommunications. *The Journal of Abnormal and Social Psychology, 65*, 203–206.

*Insko, C. A. (1965). One-sided versus two-sided communications and countercommunications. *Journal of Abnormal and Social Psychology, 65*, 203–206.

Insko, C. A. (1967). *Theories of attitude change*. New York: Appleton-Century-Crofts.

*Isaacs, M., & Atkins, A. (1972). Effect of using truisms of different involvement levels on results predicted from inoculation theory. *Proceedings of the 88th Annual Convention of the American Psychological Association.*

*Ivanov, B. (2006). *The process of inoculation and its potential in promoting resistance to the effectiveness of multiple competitive attacks on the country of origin concept*. Unpublished doctoral dissertation, University of Oklahoma.

Johnson, B. T., & Eagly, A. H. (1989). The effects of involvement on persuasion: A meta-analysis. *Psychological Bulletin*, *106*, 290–314.

*Kamins, M. A., & Assael, H. (1987). Two-sided versus one-sided appeals: A cognitive perspective on argumentation, source derogation, and the effect of disconfirming trial on belief change. *Journal of Marketing Research*, *24*, 29–39.

*Koehler, J. W. (1968). *Effects on audience opinion of one-sided and two-sided speeches supporting and opposing a proposition, examining opinions on speaker's ethos, the topic and the "open mindedness" of listeners*. Unpublished doctoral dissertation, Pennsylvania State University.

*Lee, W.-P. (1997). *The effects of cognitive and affective inoculation appeals in conferring resistance against cognitive and affective attacks*. Unpublished doctoral dissertation, University of Wisconsin at Madison.

*Lessne, G. J. (1983). *Inoculation theory and resistance to persuasion in marketing*. Unpublished doctoral dissertation, University of North Carolina at Chapel Hill.

*Lim, J. S., & Ki, E.-J. (2007). Resistance to ethically suspicious parody video on youTube: A test of inoculation theory. *Journalism & Mass Communication Quarterly*, *84*, 713–728.

*Lin, W.-K., & Pfau, M. (2007). Can inoculation work against the spiral of silence? A study of public opinion on the future of Taiwan. *International Journal of Public Opinion Research*, *19*, 155–172.

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Thousand Oaks, CA: Sage.

Lumsdaine, A. A., & Janis, I. L. (1953). Resistance to "counterpropaganda" produced by one-sided and two-sided "propaganda" presentations. *Public Opinion Quarterly*, *17*, 311–318.

*MacDougall, B. L. (2001). *The role of attitude bases and argument type in the inoculation effect*. Unpublished Master's thesis, Queen's University.

*Manis, M. (1965). Immunization, delay, and the interpretation of persuasive messages. *Journal of Personality and Social Psychology*, *1*, 541–550.

McGuire, W. J. (1961a). The effectiveness of supportive and refutational defenses in immunizing and restoring beliefs against persuasion. *Sociometry*, *24*, 184–197.

McGuire, W. J. (1961b). Resistance to persuasion conferred by active and passive prior refutation of the same and alternative counterarguments. *Journal of Abnormal and Social Psychology*, *63*, 326–332.

McGuire, W. J. (1962). Persistence of the resistance to persuasion induced by various types of prior belief defenses. *Journal of Abnormal and Social Psychology*, *64*, 241–248.

McGuire, W. J. (1964). Inducing resistance to persuasion: Some contemporary approaches. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 1, pp. 191–229). New York, NY: Academic Press.

McGuire, W. J. (1966). Persistence of the resistance to persuasion induced by various types of prior belief defenses. In C. W. Backman & P. F. Secord (Eds.), *Problems in social psychology* (pp. 128–135). New York: McGraw-Hill.

McGuire, W. J., & Papageorgis, D. (1961). The relative efficacy of various types of prior belief-defense in producing immunity against persuasion. *Journal of Abnormal Social Psychology*, *62*, 327–337.

McGuire, W. J., & Papageorgis, D. (1962). Effectiveness of forewarning in developing resistance to persuasion. *Public Opinion Quarterly*, *26*, 24–34.

*Nabi, R. L. (2003). "Feeling" resistance: Exploring the role of emotionally evocative visuals in inducing inoculation. *Media Psychology*, *5*, 199–223.

O'Keefe, D. J. (1993). The persuasive effects of message sidedness variations: A cautionary note regarding Allen's (1991) meta-analysis. *Western Journal of Communication*, *57*, 87–97.

O'Keefe, D. J. (2007). Post hoc power, observed power, a priori power, retrospective power, prospective power, achieved power: Sorting out appropriate uses of statistical power analyses. *Communication Methods and Measures*, *1*, 291–299.

Papageorgis, D., & McGuire, W. J. (1961). The generality of immunity to persuasion produced by pre-exposure to weakened counterarguments. *Journal of Abnormal and Social Psychology*, *62*, 475–481.

Park, H. S., Levine, T. R., Kingsley Westerman, C. Y., Orfgen, T., & Foregger, S. (2007). The effects of argument quality and involvement type on attitude formation and attitude change: A test of dual-process and social judgment predictions. *Human Communication Research*, *33*, 81–102.

*Pashupati, K., Arpan, L., & Nikolaev, A. (2002). Corporate advertising as inoculation against negative news: An experimental investigation of efficacy and presentation of order effects. *Journal of Current Issues and Research in Advertising*, *24*, 1–15.

Petty, R. E., & Cacioppo, J. T. (1979). Issue involvement can increase or decrease persuasion by enhancing message-relevant cognitive responses. *Journal of Personality and Social Psychology*, *37*, 1915–1926.

Petty, R. E., & Cacioppo, J. T. (1986). *Communication and persuasion: Central and peripheral routes to attitude change*. New York, NY: Springer-Verlag.

*Pfau, M. (1992). The potential of inoculation in promoting resistance to the effectiveness of comparative advertising messages. *Communication Quarterly*, *40*, 26–44.

Pfau, M. (1997). The inoculation model of resistance to influence. In G. A. Barnett & F. J. Boster (Eds.), *Progress in communication sciences: Advances in persuasion* (Vol. 13, pp. 133–171). Greenwich, CT: Ablex.

Pfau, M., Banas, J. A., Semmler, S. M., Deatrick, L., Lane, L., Mason, A., Nisbett, G., Craig, E., & Underhill, J. (2010). Role and impact of involvement and enhanced threat in resistance. *Communication Quarterly*, *58*, 1–18.

*Pfau, M., & Burgoon, M. (1988). Inoculation in political campaign communication. *Human Communication Research*, *15*, 91–111.

*Pfau, M., Compton, J., Parker, K. Wittenberg, E., An, C., Ferguson, M. et al. (2003). *Inoculation, mental processing, and time: The short- and long-term influence of associative networks in the process of resistance to counterattitudinal influence*. Paper presented at the annual meeting of the International Communication Association, San Diego, CA.

Pfau, M., Compton, J., Parker, K. A., An, C., Wittenberg, E. M., Ferguson, M., Horton, H., & Malyshev, Y. (2006). The conundrum of the timing of counterarguing effects in resistance: Strategies to boost the persistence of counterarguing output. *Communication Quarterly*, *54*, 143–156.

*Pfau, M., Haigh, M., Fifrick, A., Holl, D., Tedesco, A., Cope, J., et al. (2006). The effects of print news photographs of the casualties of war. *Journalism & Mass Communication Quarterly*, *83*, 150–168.

*Pfau, M., Haigh, M., Shannon, T., Tones, T., Mercurio, D., Williams, R. et al. (2008). The influence of television news depictions of the images of war on viewers. *Journal of Broadcast and Electronic Media*.

*Pfau, M., Haigh, M. M., Sims, J., & Wigley, S. (2007). The influence of corporate front-group stealth campaigns. *Communication Research*, *34*, 73–99.

*Pfau, M., Holbert, R. L., Zubric, S. J., Pasha, N. H., & Lin, W.-K. (2000). Role and influence of communication modality in the process of resistance to persuasion. *Media Psychology*, *2*, 1–33.

*Pfau, M., Ivanov, B., Houston, B., Haigh, M., Sims, J., Gilchrist, E., Russell, J., Wigley, S., Eckstein, J., & Richert, N. (2005). Inoculation and mental processing: The instrumental role of associative networks in the process of resistance to counterattitudinal influence. *Communication Monographs*, *72*, 414–441.

Pfau, M., & Kenski, H. C. (1990). *Attack politics: Strategy and defense*. New York: Praeger.

*Pfau, M., Kenski, H. C., Nitz, M., & Sorenson, J. (1990). Efficacy of inoculation strategies in promoting resistance to political attack messages: Application to direct mail. *Communication Monographs*, *57*, 25–43.

*Pfau, M., Roskos-Ewoldsen, D., Wood, M., Yin, S., Cho, J., Lu, K.-H., & Shen, L. (2003). Attitude accessibility as an alternative explanation for how inoculation confers resistance. *Communication Monographs*, *70*, 39–51.

*Pfau, M., Semmler, S. M., Deatrick, L., Lane, L., Mason, A., Nisbett, G., Craig, E., Cornelius, J., & Banas, J. A. (2009). Nuances about the role and impact of affect and enhanced threat in inoculation. *Communication Monographs*.

*Pfau, M., Szabo, E. A., Anderson, J., Morrill, J., Zubric, J., & Wan, H.-H. (2001). The role and impact of affect in the process of resistance to persuasion. *Human Communication Research*, *27*, 216–252.

*Pfau, M., Tusing, K. J., Koerner, A. F., Lee, W., Goldbold, L. C., Penaloza, L., et al. (1997). Enriching the inoculation construct: The role of critical components in the process of resistence. *Human Communication Research*, *24*, 187–215.

Pfau, M., & Van Bockern, S. (1994). The persistence of inoculation in conferring resistance to smoking initiation among adolescents: The second year. *Human Communication Research*, *20*, 413–430.

Pfau, M., Van Bockern, S., & Kang, J. G. (1992). Use of inoculation to promote resistance to smoking initiation among adolescents. *Communication Monographs*, *59*, 213–230.

*Pryor, B., & Steinfatt, T. M. (1978). The effects of initial belief level on inoculation theory and its proposed mechanisms. *Human Communication Research*, *4*, 217–230.

Quereshi, M. Y., & Strauss, L. A. (1980). Immunization of a controverted belief through group discussion. *Social Behavior and Personality*, *8*, 229–232.

*Roberts, M. S. (1977). *An extension of McGuire's inoculation theory to controversial topics.* Unpublished Master's thesis, Indiana State University.

Rosenberg, S. (2004). Inoculation effect in prevention of increased verbal aggression in schools. *Psychological Reports*, *95*, 1219–1226.

*Rosnow, R. L. (1968). One-sided versus two-sided communication under indirect awareness of persuasive intent. *The Public Opinion Quarterly*, *32*, 95–101.

Rothstein, H. R., Sutton, A. J., & Borenstein, M. (Eds.). (2005). *Publication bias in meta-analysis: Prevention, assessment and adjustments*. New York, NY: Wiley.

Sawyer, A. G. (1973). The effects of repetition of refutational and supportive advertising appeals. *Journal of Marketing Research*, *10*, 23–33.

*Shapiro, M. E. (1978). *The effect of belief type, pretreatment strategy, and language intensity on the induction of resistance to persuasion*. Unpublished doctoral dissertation, Florida State University.

Stegner, B. L., Bostrom, A. G., & Greenfield, T. K. (1996). Equivalence testing for use in psychological and services research: An introduction with examples. *Evaluation and Program Planning*, *19*, 193–198.

Suedfeld, P., & Borrie, R. A. (1978). Sensory deprivation, attitude change, and defense against persuasion. *Canadian Journal of Behavioral Science*, *10*, 16–27.

*Syzbillo, G. J., & Heslin, R. (1973). Resistance to persuasion: Inoculation theory in a marketing context. *Journal of Marketing Research*, *10*, 396–403.

Szabo, E. A., & Pfau, M. (2001, November). *Reactance as a response to antismoking messages*. Paper presented at the annual meeting of the National Communication Association, Atlanta, GA.

Szabo, E. A., & Pfau, M. (2002). Nuances in inoculation: Theory and applications. In J. P. Dillard & M. Pfau (Eds.), *The persuasion handbook: Theory and practice* (pp. 233–258). Thousand Oaks, CA: Sage.

Tannenbaum, P. H. (1966). Mediated generalization of attitude change via the principle of congruity. *Journal of Personality and Social Psychology*, *3*, 493–499.

Tannenbaum, P. H., Macaulay, J. R., & Norris, E. L. (1966). Principle of congruity and reduction of persuasion. *Journal of Personality and Social Psychology*, *3*, 233–238.

Tannenbaum, P. H., & Norris, E. L. (1965). Effects of combining congruity principle strategies for the reduction of persuasion. *Sociometry*, *28*, 145–157.

Tormala, Z. L. (2008). A new framework for resistance to persuasion: The resistance appraisals hypothesis. In W. D. Crano & R. Prislin (Eds.), *Attitudes and Attitude Change* (pp. 213–234). New York, NY: Psychology Press.

Ullman, W. R., & Bodaken, E. M. (1975). Inducing resistance to persuasive attack: A test of two strategies of communication. *Western Speech Communication*, *39*, 240–248.

*Wan, H.-H., & Pfau, M. (2004). The relative effectiveness of inoculation, bolstering, and combined approaches in crisis communication. *Journal of Public Relations Research*, *16*, 301–328.

Wellek, S. (2002). *Testing statistical hypotheses of equivalence*. Boca Raton, FL: Chapman & Hal/CRC.

*Wigley, S. L. (2007). *Relative effectiveness of bolstering and inoculation approaches in crisis communication*. Unpublished doctoral dissertation, University of Oklahoma.

*Wood, M. L. M. (2006). *Expertise and prior attitude: Exploring new moderators in the context of inoculation research*. Unpublished doctoral dissertation, University of Wisconsin at Madison.

Wood, M. L. M. (2007). Rethinking the inoculation analogy: Effects on subjects with differing preexisting attitudes. *Human Communication Research*, *33*, 357–378.

Wyer, R. S., Jr. (1974). *Cognitive organization and change: An information processing approach*. New York: Wiley.

*Yin, S. (2003). *Priming in the inoculation process: An alternative route of resistance to persuasion*. Unpublished doctoral dissertation, University of Wisconsin at Madison.