

Presence of Others and Arousal: An Integration

Brian Mullen and Birgit Bryant
Syracuse University

James E. Driskell
Florida Maxima Corporation

A meta-analytic integration of research evidence revealed that there was, in general, a marginally significant, small tendency for the presence of others to decrease self-reports of arousal and a significant, small tendency for the presence of others to increase electrodermal responses. However, these effects were moderated by the type of situation and the type of others present. Arousal is increased on both measures in neutral situations for both coactor others and audience others; arousal is increased on both measures in aversive situations for audience others. In aversive situations, coactors rendered an increase in arousal on electrodermal responses but a decrease in arousal on self-report responses. Discussion considers theoretical accounts for these effects of the presence of others on arousal.

Hell is alone—T.S. Eliot, 1950
Hell is—other people!—J.P. Sartre, 1944

The beneficial and deleterious effects of the presence of other people are summed up in these two maxims: On the one hand, other people might provide resources necessary for coping with a stressful situation, and the very presence of others might in some ways be arousal-decreasing. On the other hand, other people may contribute to a stressful environment, and the very presence of others might in some ways be arousal-increasing. Two separate lines of social psychological research have pursued these characterizations of what it is like to be in a group, with little or no consideration of the paradox represented by these opposing possibilities. The purpose of our effort is to integrate the evidence regarding this paradox and to consider a plausible resolution of this paradox that specifies the interactive effects of the situation and the types of others present.

Brian Mullen and Birgit Bryant, Department of Psychology, Syracuse University; James E. Driskell, Florida Maxima Corporation, Winter Park, Florida.

This research was supported by Contract MDA 903-90-C-0102 with the Army Research Institute. The article is based, in part, on results presented in April 1993 at the 64th annual meeting of the Eastern Psychological Association, Arlington, Virginia. We express our appreciation to the authors of the original studies, who provided supplementary information needed for inclusion in this integration, and to Jim Blascovich, Don Forsyth, and Blair Johnson for their helpful comments.

Correspondence concerning this article should be addressed to Brian Mullen, Department of Psychology, Syracuse University, Syracuse, New York 13210. Electronic mail may be sent via Internet to bmullen@syr.edu.

Paradox of the Presence of Others and Arousal

Theory and research in social psychology leads to two opposing predictions regarding what it is like to be in a group. On the one hand, Schachter's (1959) classic studies of affiliation stimulated the consideration of the arousal-decreasing effects of the presence of others. Subsequent research has examined the reduction of arousal that can result from affiliation in the face of stressful environments (e.g., Wrightsman, 1960). The underlying mechanism for this arousal decrease might be informational: Other people have the potential to provide useful information about what to expect and how to behave (Epley, 1973; Friedman, 1981). Alternatively, other people may provide social support or a sense of "safety in numbers" (Bovard, 1959; Vaux, 1988). The arousal-decreasing effects of groups have been recognized in a variety of applied contexts, including self-help and psychotherapeutic groups (e.g., Rose, 1993).

On the other hand, Zajonc's (1965) classic formulation of the drive-arousal model of social facilitation stimulated the consideration of the arousal-enhancing effects of the presence of others. Subsequent research has examined the increased arousal that can result from the presence of other people (e.g., Geen, 1973). The underlying mechanism for this arousal increase has been a topic of considerable speculation and debate in the literature. Other people have the potential to require a readiness to accommodate interactions (Zajonc, 1980), stimulate periodic

social monitoring (Guerin & Innes, 1982), engender apprehension about being evaluated (Cottrell, Wack, Sekerak, & Rittle, 1968), or generate attentional conflict (Baron, Moore, & Sanders, 1978; Sanders & Baron, 1975).

A clear summary of the effects of the presence of others on arousal cannot be formulated from a narrative reading of previous research. One line of research suggests that groups may experience a decrease in arousal by virtue of the presence of others; the other line of research suggests that groups may experience an increase in arousal by virtue of the presence of others. This paradox was articulated by Cottrell (1968) and has not been resolved in 30 years of research. Ironically, these two lines of research are part of the staple corpus of social psychology. For example, the decrease in arousal through the presence of others is described in the interpersonal attraction chapter of Baron and Byrne's (1994) popular social psychology text, and the increase in arousal through the presence of others is presented in their chapter on groups. Yet, nowhere in this text is Cottrell's articulation of this paradox cited, and nowhere are these two apparently opposing lines of research brought together. Unfortunately, this pattern is quite common (cf. Deaux & Wrightsman, 1988; Forsyth, 1990).

It is intriguing to note how these two apparently opposing lines of research on reactions to groups have independently contributed to other disciplines. It seems that only one or the other of these lines of research on the effects of the presence of others tend to get cited in other disciplines. For example, the arousal-decreasing effects of the presence of others are cited and discussed in organizational theory texts (e.g., Hersey & Blanchard, 1977; Scott & Mitchell, 1976); however, the possible arousal-increasing effects of others are not mentioned. Alternatively, the arousal-increasing effects of the presence of others are cited and discussed in sport psychology texts (e.g., Butt, 1987; Weinberg & Gould, 1995), but the possible arousal-decreasing effects of others are not mentioned. In addition to the theoretical importance of this long-unresolved paradox, it is imperative to clarify the effects of the presence of others on arousal for the sake of these neighboring disciplines that base their own conceptualizations and applications on one or the other part of this paradox.

A Possible Resolution

This paradox might find its resolution in Kiesler's (1966) speculations regarding some unexpected patterns in studies of stress and performance. Kiesler, especially on page 234, suggested that when arousal is low, the presence of coacting others may increase arousal, whereas when arousal is high, the presence of coacting others may decrease arousal. In other words, either the arousal decrease posited by Schachter (1959) or the arousal increase posited by Zajonc (1965) could occur, depending on the degree of arousal engendered by the situation. To evaluate the veracity of this possible resolution, the two elements of this interaction, the type of situation and the other people present in the situation, require careful scrutiny.

Type of Situation

Various types of situations have been used to study the effects of the presence of others on arousal, and the available research sorts itself readily into two fairly straightforward categories. On the one hand, the effects of the presence of others has been studied in aversive settings, in which the participants are engaged in an embarrassing behavior (e.g., Jackson & Latané, 1981, Study 2) or exposed to some fearful stimulus (e.g., MacDonald, 1970). On the other hand, the effects of the presence of others has been studied in neutral settings, in which the participants are engaged in some innocuous task (e.g., Berger, 1981) or are simply waiting (e.g., Elliot & Cohen, 1981). Although somewhat broad, this classification of situations into either neutral or aversive is straightforward and unambiguous and seems likely to capture the essence of the interaction implied by Kiesler's (1966) speculations: Neutral settings would be expected to generate low levels of arousal (and thereby set the stage for the presence of others to increase arousal), and aversive settings would be expected to generate high levels of arousal (and thereby set the stage for the presence of others to decrease arousal).

Type of Others

The others present in the situation can manifest their presence in different ways. A relatively small number of the studies have

included conditions examining the effects of *mere presence* others, people who are not engaged in the same behavior as the participant and who are explicitly not present to monitor and observe the participant's behavior. Indeed, mere presence others are typically presented as working on some other task and as not being a part of the participant's experiment (e.g., Geen, 1973). Mere presence others would be expected to exert minimal effects on arousal: They can provide very little in the way of social support and/or useful information about what to expect and how to behave in an aversive situation, so they would not be likely to engender much arousal decrease. Also, they would seem unlikely to require a readiness to accommodate interactions, stimulate periodic social monitoring, engender apprehension about being evaluated, or generate attentional conflict, so they would not be likely to engender much arousal increase.

Some of the studies have examined the effects of *audience* others, people who are not engaged in the same behavior as the participant but who are explicitly present to monitor and observe the participant's behavior (e.g., Borden, Hendrick, & Walker, 1976). Audience others can provide little in the way of social support and/or useful information about what to expect or how to behave in an aversive situation, so they would not be likely to engender much arousal decrease. Although some information could be conveyed by audience others' facial or postural cues, audience others in these experimental scenarios

are typically instructed or trained to minimize these cues (e.g., Geen, 1973). However, audience others would seem likely to stimulate periodic social monitoring, engender apprehension about being evaluated, or generate attentional conflict, so they would be likely to engender some arousal increase.

Finally, most of the studies in this area have examined the effects of *coactor* others, people who are engaged in the same behavior as the participant (e.g., Amoroso & Walters, 1969). Coactor others would be expected to exert both arousal-decreasing effects and arousal-increasing effects. Because the coactor (unlike the mere presence other or the audience other) is engaging in the same task in the aversive situation as the participant, the coactor may provide some social support and/or useful information about what to expect and how to behave in aversive situations, so that they would be likely to engender some arousal decrease. Also, the coactor would seem likely to require a readiness to accommodate interactions, stimulate periodic social monitoring, engender apprehension about being evaluated, or generate attentional conflict, so they would be likely to engender some arousal increase.

Interaction Between Situations and Others

Table 1 presents the possible interactions between types of situations and types of others. These interactions depict the extent to which arousal-decreasing mechanisms and arousal-

Table 1
Predicted Interactions of Type of Situation and Type of Others

Variable	Neutral situations			Aversive situations		
	Mere presence	Coactor	Audience	Mere presence	Coactor	Audience
Mechanisms increasing arousal (stimulate readiness to interact, social monitoring, evaluation apprehension, attentional conflict)	Low	High	High	Low	High	High
Mechanisms decreasing arousal (providing social support, providing useful information about what to expect and how to behave)	Low	Low	Low	Low	High	Low
Net change in arousal	None	Increase	Increase	None	Increase or decrease	Increase

increasing mechanisms can be engaged in a given situation by the various types of others. For example, mere presence others do not seem particularly potent sources of either the arousal-decreasing mechanisms or the arousal-increasing mechanisms, and their presence would be likely to yield little net change in arousal in either type of situation. Audience others would be expected to exert robust arousal-increasing effects in both neutral situations and aversive situations. In neutral situations, there is little need for others to reduce arousal, and the presence of audience others would be likely to yield a net increase in arousal. Although participants might turn to audience others to reduce arousal in aversive situations, audience others would be likely to be only minimally useful in this regard, and their presence would still yield a net increase in arousal in aversive situations. Finally, coactor others would be expected to exert both arousal-decreasing effects and arousal-increasing effects, depending on the situation. In neutral situations, there is little need for others to reduce arousal, so coactor others would not be likely to engender much arousal-decrease in neutral situations and the presence of coactor others would yield a net increase in arousal in neutral situations. In aversive situations, although these arousal-increasing effects would remain intact, coactor others could also serve to reduce arousal. Whether coactor others yield a net decrease or increase in arousal in aversive situations remains an empirical question, determined by the relative strengths of the arousal-increasing and arousal-decreasing effects of coactors.

Thus, mere presence others might be expected to exert minimal effects on arousal in either neutral situations or aversive situations, audience others would be expected to exert robust arousal-increasing effects in both neutral situations and aversive situations, and coactor others would be expected to increase arousal in neutral situations and to either increase or decrease arousal in aversive situations.

Operational Definitions of Arousal

A major difficulty in the theoretical use of arousal has been the failure to develop a clear and unequivocal definition of this ubiquitous yet fuzzy construct. As delineated by Blascovich (1992), the definitional imprecision that has

typified the work of many arousal theorists leaves us to infer the scientific meaning of arousal from its empirical operational definitions. Insofar as the present effort represents an attempt to evaluate the weight of available evidence (which is de facto based upon the operational definitions already used in previous research efforts), we are compelled to follow this principle of operationalism, in which the meaning of the term *arousal* is determined by the procedures or operations used to measure it.

The construct of arousal has most often been operationally defined in terms of self-report responses. These self-reports have typically taken the form of Likert-type, or rating, scales or adjective checklists variously labeled as "anxiety" (e.g., Wrightsman, 1959), "tension" (e.g., Jackson & Latané, 1981), or "arousal" (e.g., Elliot & Cohen, 1981). Although these scales and checklists may be variously labeled, they all require self-report on highly similar sets of items (e.g., uneasy, anxious, restless, tense, aroused, and nervous). These items tend to be of roughly equivalent emotionality ratings and to share relatively high free-association frequency (e.g., John, 1988), which supports the notion that these various self-report indexes are tapping into a common underlying construct of arousal. The construct of arousal has also been operationally defined in terms of physiological responses. These physiological responses have included various parameters of heart rate (e.g., Amoroso & Walters, 1969), palmar sweat index (e.g., Elliot & Cohen, 1981), pupillary responses (Simpson & Molloy, 1971), and electrodermal responses (e.g., Borden et al., 1976).

Studies examining the effects of the presence of others using self-reports dramatically outnumber those using physiological indices. In part, this may be because self-reports of arousal have been, and continue to be, eminently easier to collect than are accurate and defensible physiological indicators. Alternatively, this may be because the monotonic relation between operationalization and underlying construct is tautological for self-reports: Participants who report that they feel more aroused are assumed to feel more aroused than participants who report that they feel less aroused. However, as discussed by Blascovich and Kelsey (1990), "for both cardiovascular and electrodermal measures there are many intrinsic influences that may confound an arousal interpretation of such measures" (p.

64). For example, a participant who evidences an increase in some specific parameter of heart rate cannot be assumed to be more aroused than a participant who evidences a decrease in that parameter (see Blascovich, 1992; Blascovich & Kelsey, 1990; Lacey, 1956; Williams, Bittker, Buchsbaum, & Wynne, 1975).

Electrodermal responses are by far the most common physiological index of arousal used in the study of the effects of the presence of others (Blascovich & Kelsey, 1990). Also, studies using this "most common" physiological indicator are still scarce compared with the number of studies using self-reports. Electrodermal responses are considered to be a "widely accepted measure" (Blascovich & Kelsey, 1990, p. 58), even if they are not a "magical litmus test" (Blascovich & Kelsey, p. 64), of arousal. The relatively wide acceptance of electrodermal responses leads us to consider the effects of the presence of others on electrodermal responses as well as on self-reports of arousal. Note that this decision to focus our efforts on these two most common operational definitions of arousal (self-reports and electrodermal responses) allows us to maintain some degree of clarity in our definitions of arousal while maximizing the amount of available evidence that can be included in our effort.

A Meta-Analytic Integration

In an effort to resolve the paradox of the effects of the presence of others on arousal, a meta-analytic integration (Mullen, 1989; Mullen & Rosenthal, 1985; Rosenthal, 1991) was conducted. The purpose of this integration was to determine whether the weight of the available evidence would confirm or disconfirm the resolution of the paradox developed above. That is, the present effort was undertaken to determine the conditions under which being in a group increases arousal and the conditions under which being in a group decreases arousal. The specific goals of this effort were (a) to provide a precise summary of the significance, the strength, and the direction of the effects of the presence of others on arousal; (b) to examine the possible moderation of this effect by the type of situation and the type of others present; and (c) to examine differences between results based on self-reports of arousal and those based on

electrodermal responses. As discussed earlier, we expected that mere presence others would exert little effect on arousal, audience others would increase arousal in both neutral situations and aversive situations, and coactor others would increase arousal in neutral situations and either increase or decrease arousal in aversive situations.

Method

Using all of the standard literature search techniques, an exhaustive search was conducted for studies testing the effect of the presence of other people on arousal. Specifically, on-line computer searches were conducted, using the keywords group(s), coaction, audience, presence, or people, and stress, arousal, anxiety, galvanic skin response, or electrodermal response. These computer searches were supplemented by ancestry approach and descendancy approach searches, correspondence with researchers active in this domain (the "invisible college"), and browsing through the past 30 years of social psychology, applied psychology, and psychophysiology journals (see Mullen, 1989, for a discussion of literature search techniques). It should be emphasized that all available previous reviews (e.g., Blascovich & Kelsey, 1990; Bond & Titus, 1983; Cacioppo & Petty, 1986; Geen, 1989; Guerin, 1986; Shapiro & Crider, 1969; *inter alia*) were carefully scrutinized for potentially includable studies. Any studies that were available as of July 1996 were eligible for inclusion in this integration.

Studies were included if they met the following criteria: Participants in the studies had to be adolescents or adults not sampled from abnormal populations. Studies had to report (or intelligibly imply) a comparison between either self-reports of arousal or electrodermal responses obtained when the participant was alone versus those obtained in the presence of others. Studies were not included that examined the effect of the implied presence of others through one-way mirrors (e.g., Friedman, 1981) or the imagined presence of hypothetical stimulus people (e.g., Jackson & Latané, 1981, Study 1), or that used a control condition in which participants were not actually alone (Allen, Blascovich, Tomaka, & Kelsey, 1991). The effect of these criteria for inclusion was to focus on the effects of the presence of real people on arousal in studies that were optimally homogeneous in methodological terms. Hypothesis tests were coded as having a positive direction of effect if the presence of others increased arousal, and as having a negative direction of effect if the presence of others decreased arousal.

These selection criteria rendered a total of 16

studies using self-reports of arousal (Amoroso & Walters, 1969; Berger, 1981; Borden et al., 1976; Cohen, 1980; Elliot & Cohen, 1981; Epley, 1973; Geen, 1973; Henchy & Glass, 1968; Jackson & Latané, 1981, Study 2; MacDonald, 1970; McKinney, Gatchel, & Paulus, 1983; Sullins, 1991; Taylor, Wheeler, & Altman, 1968; Thomas & Geen, 1985; Wrightsman, 1959; Zuckerman, Persky, Link, & Basu, 1968). The 16 studies yielded 34 separate tests of the effects of the presence of others on arousal, representing the responses of 1,560 participants. Also, these selection criteria rendered a total of 8 studies using electrodermal responses (Buck & Parke, 1972; Geen, 1979; Glass, Gordon, & Henchy, 1970; Kissel, 1965; Moore, Baron, Logel, Sanders, & Weerts, 1988; Shapiro, Leiderman, & Morningstar, 1964; Shearn, Bergman, Hill, Abel, & Hinds, 1992; Snydersmith & Cacioppo, 1992). These 8 studies yielded 15 separate tests of the effects of the presence of others on arousal, representing the responses of 622 participants.¹

In addition to the requisite statistical information, each hypothesis test was independently coded by two judges for two predictors. The type of situation for each hypothesis test was coded as neutral (e.g., waiting for the experiment to begin; performing verbal problems) or aversive (e.g., impending electric shock; performing some embarrassing behavior). The type of others for each hypothesis test was coded as mere presence (not performing the same tasks as the participant and not explicitly monitoring and observing the participant's behavior), coactor (performing the same tasks as the participant), or audience (not performing the same tasks as the participant but explicitly monitoring and observing the participant's behavior). Type of situation and type of others were coded by the two judges with perfect interjudge agreement.² The hypothesis tests included in this meta-analysis, along with the corresponding statistical information and predictors for each hypothesis test, are presented in Table 2.

Results

General Effect

Overall, there was a nonsignificant, $Z = 1.081$, $p = .1399$, small, $\bar{Z}_{\text{Fisher}} = 0.037$, $\bar{r} = .037$, tendency for the presence of other people to increase arousal. However, this global composite collapses across the distinct operational definitions of self-report versus electrodermal responses, as well as the effects of type of situation and type of other, and should be interpreted with extreme caution.

Self-Report Versus Electrodermal Response

For the $k = 34$ hypothesis tests that used self-report, there was a marginally significant, $Z = 1.480$, $p = .0694$, small, $\bar{Z}_{\text{Fisher}} = -0.022$, $\bar{r} = -.022$, tendency for the presence of others to decrease arousal. For the $k = 15$ hypothesis tests that used electrodermal response, there was a significant, $Z = 4.718$, $p = .0000012$, small, $\bar{Z}_{\text{Fisher}} = 0.184$, $\bar{r} = .182$, tendency for the presence of others to increase arousal. These two

¹The included studies reported varying numbers of hypothesis tests, ranging from one per study (e.g., Borden et al., 1976) to four per study (e.g., Shearn et al., 1992). In the meta-analysis reported, each hypothesis test was treated as an independent observation. This assumption of independence is patently false. For example, each of the four hypothesis tests included in Shearn et al. was derived from the same participant population at the same time. However, without making this assumption of nonindependence, one would be forced to select the "best" hypothesis test from a study, such as that of Shearn et al., or to pool the results from the reported hypothesis tests into a single test. In the present context, these alternatives seem even more arbitrary and capricious than the present assumption of independence. The effects of this assumption of independence are examined later in the article.

²In addition, we attempted to check the validity of this categorization of hypothesis tests into neutral versus aversive situations. Specifically, the type of situation used in each of the 49 hypothesis tests included in this effort were independently judged by two judges on a scale ranging from 1 (*would induce low arousal*) to 7 (*would induce high arousal*). Given an acceptably high level of interjudge agreement ($r = .719$; Spearman-Brown effective reliability, $R = .837$), these two sets of judgments were averaged across judges, and these 49 averaged judgments of arousal were subjected to a 2 (neutral vs. aversive) \times 2 (self-report vs. electrodermal responses) analysis of variance. Supporting the validity of our categorization of hypothesis tests, the mean judged arousal for the neutral situations (2.08) was significantly lower than that for aversive situations (4.93), $F(1, 45) = 180.192$, $p = 1.82E-16$. It is surprising, however, that there was also a weaker but significant main effect for measurement paradigm, $F(1, 45) = 11.057$, $p = .00088$, as well as a significant interaction, $F(1, 45) = 6.704$, $p = .00646$. The neutral situations were equivalently nonarousing for both the self-report hypothesis tests (2.16) and the electrodermal response hypothesis tests (2.00). However, the aversive situations were considerably more arousing for the self-report hypothesis tests (5.56) than for the electrodermal response hypothesis tests (4.30). Thus, our categorization of hypothesis tests into neutral versus aversive situations in an effort to distinguish between situations that would induce low versus high levels of arousal seems valid. However, it is puzzling that the aversive situations used for electrodermal response studies were less arousing than those used for self-report studies.

Table 2
Studies Included in the Meta-Analysis

Study	Statistic	Z	r	N	DOE ^a	S ^b	Other ^c
Self-reports							
Amoroso & Walters (1969)	$t(56) = 0.420$	-0.418	-.056	30	-	N	C
	$t(56) = 2.791$	-2.689	-.349	30	-	A	C
Berger (1981)	$F(1, 22) = 3.109$	1.686	.352	24	+	N	M
Borden et al. (1976)	$F(1, 20) = 8.37$	2.611	.543	24	+	N	A
Cohen (1980)	$t(108) = 1.128$	-1.122	-.108	80	-	N	M
	$t(108) = 0.161$	0.161	.015	80	+	N	A
Elliot & Cohen (1981)	$t(88) = 2.172$	2.138	.226	48	+	N	C
	$t(88) = 1.168$	1.160	.124	48	+	N	C
	$t(88) = 1.510$	1.496	.159	48	+	N	C
Epley (1973)	$r(194) = .028$	0.390	.028	60	+	A	C
	$r(194) = .088$	1.226	.028	60	+	A	C
Geen (1973)	$t(156) = 2.707$	2.672	.212	40	+	N	A
	$t(156) = 0.769$	-0.767	-.061	40	-	N	M
Henchy & Glass (1968)	$t(62) = 0.891$	-0.885	-.112	34	-	N	M
	$t(62) = 2.582$	2.506	.312	34	+	N	A
Jackson & Latané (1981)	$t(47) = 2.320$	-2.245	-.321	20	-	A	C
	$t(47) = 1.932$	-1.885	-.271	12	-	A	C
	$t(47) = 3.045$	-2.893	-.406	22	-	A	C
	$t(47) = 2.932$	-2.795	-.393	18	-	A	C
MacDonald (1970)	$t(64) = 0.450$	0.448	.056	40	+	A	C
	$t(64) = 1.968$	1.932	.239	40	+	A	C
McKinney et al. (1983)	$t(40) = 0.420$	0.417	.066	36	+	A	A
	$t(40) = 0.931$	0.920	.146	36	+	A	A
Sullins (1991)	$t(66) = 0.601$	0.598	.074	48	+	N	M
	$t(66) = 0.342$	-0.341	-.042	48	-	N	C
Taylor et al. (1968)	$t(108) = 3.726$	-3.606	-.337	44	-	A	C
	$t(108) = 3.637$	-3.524	-.330	44	-	A	C
	$t(108) = 4.469$	-4.271	-.395	44	-	A	C
	$t(108) = 4.659$	-4.437	-.409	44	-	A	C
Thomas & Geen (1985)	$t(60) = 1.502$	1.482	.190	32	+	N	C
	$t(60) = 0.529$	0.526	.068	32	+	N	A
Wrightsmann (1959)	$Z = 0.703$	-0.703	-.060	136	-	A	C
	$Z = 0.710$	-0.710	-.061	136	-	A	C
Zuckerman et al. (1968)	$t(69) = 0.000$	0.000	.000	48	+	A	C
Electrodermal responses							
Buck & Parke (1972)	$t(38) = 2.760$	2.618	.409	40	+	A	C
Geen (1979)	$F(1, 72) = 12.09$	3.331	.379	80	+	N	A
	$t(72) = 6.239$	5.559	.592	40	+	A	A
Glass et al. (1970)	$t(67) = 0.670$	0.666	.082	32	+	A	C
	$t(67) = 1.765$	1.738	.211	32	+	A	C
Kissel (1965)	$t(83) = 1.593$	-1.576	-.172	64	-	A	A
	$t(83) = 3.846$	-3.678	-.389	64	-	A	A
Moore et al. (1988)	$t(9) = 2.660$	-2.221	-.663	12	-	N	A
Shapiro et al. (1964)	$t(82) = 2.567$	2.510	.273	84	+	N	C
Shearn et al. (1992)	$t(45) = 1.483$	1.457	.216	32	+	A	A
	$t(45) = 0.270$	0.268	.040	32	+	A	A
	$t(45) = 2.292$	2.217	.323	32	+	A	A
	$t(45) = 5.259$	4.617	.617	32	+	A	A
Snydersmith & Cacioppo (1992)	$F(1, 31) = 5.120$	2.159	.376	23	+	N	A
	$F(1, 31) = 0.040$	0.198	.036	23	+	N	A

^a Direction of effect: Plus signs indicate presence of others increases arousal, minus signs indicate presence of others decreases arousal. ^b Situation: N = neutral situation; A = aversive situation. ^c Other: C = coactor others; A = audience others; M = mere presence others.

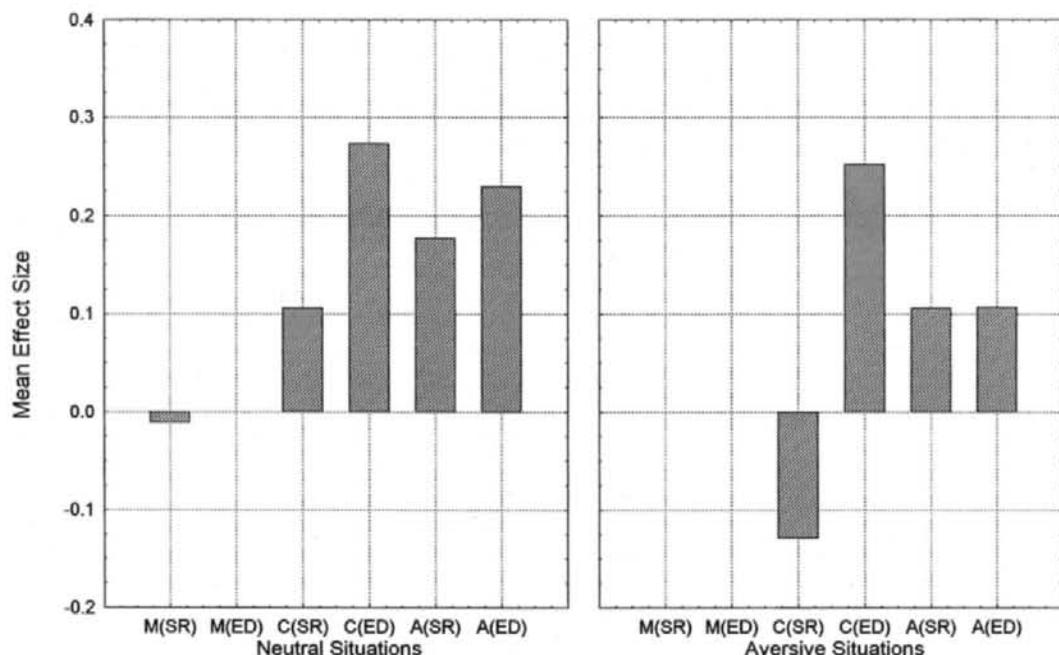


Figure 1. Observed interactions of type of situation and type of others. M = mere presence; C = coactor; A = audience; (SR) = self-report; (ED) = electrodermal response.

effects were significantly different, $Z = 3.299$, $p = .000484$.³

Effects of Type of Situation and Type of Other

Given this significant difference between self-report and electrodermal responses, the effects of type of situation and type of other were considered separately for each operational definition of arousal. For self-report, five combinations of type of situation and type of other had been examined in previous research. As shown in Figure 1, there was no change in arousal as a result of mere presence others in neutral situations, $k = 5$, $Z = -0.742$, $p = .2291$, $\bar{Z}_{\text{Fisher}} = -0.011$, $\bar{r} = -.011$. Audience others rendered an increase in arousal in both neutral situations, $k = 5$, $Z = 2.743$, $p = .00305$, $\bar{Z}_{\text{Fisher}} = 0.179$, $\bar{r} = .177$, and in aversive situations, $k = 2$, $Z = 0.945$, $p = .1722$, $\bar{Z}_{\text{Fisher}} = 0.107$, $\bar{r} = .106$. Coactor others rendered an increase in arousal in neutral situations, $k = 6$, $Z = 2.356$, $p = .00924$, $\bar{Z}_{\text{Fisher}} = 0.107$, $\bar{r} = .106$, but a decrease in arousal in aversive situations, $k = 16$, $Z = 3.925$, $p = .000044$, $\bar{Z}_{\text{Fisher}} = -0.130$, $\bar{r} = -.129$. There were no hypothesis

tests for self-report for mere presence others in aversive situations.

For electrodermal response, four combinations of type of situation and type of other had been examined in previous research. As shown in Figure 1, audience others rendered an

³ As indicated in Footnote 1, the assumption that each of the 49 hypothesis tests represented an independent observation is false. However, it can be seen that such an assumption does not seem to render a distorted summary of this research domain. Consider the results of a supplementary meta-analysis of wholly independent effects, in which multiple hypothesis tests obtained from a single study were combined into a single test. This heavy-handed solution precludes the examination of the effects of type of situation and type of other, but it does eliminate the problem of nonindependence. This produced 24 distinct, wholly independent hypothesis tests, one from each includable study. The results of this supplemental meta-analysis revealed the same patterns reported above: For the $k = 16$ studies that used self-report, there was a small, $Z = 0.969$, $p = .1664$, $\bar{Z}_{\text{Fisher}} = -0.021$, $\bar{r} = -.021$, tendency for the presence of others to decrease arousal. For the $k = 8$ hypothesis tests that used electrodermal response, there was a small, $Z = 3.597$, $p = .00016$, $\bar{Z}_{\text{Fisher}} = 0.193$, $\bar{r} = .191$, tendency for the presence of others to increase arousal. These results indicate that the degree of distortion engendered by the assumption of independence of the original 48 hypothesis tests is (at worst) tolerable.

increase in arousal in both neutral situations, $k = 4$, $Z = 3.373$, $p = .00037$, $Z_{\text{Fisher}} = 0.234$, $\bar{r} = .230$, and in aversive situations, $k = 7$, $Z = 1.357$, $p = .0873$, $Z_{\text{Fisher}} = 0.108$, $\bar{r} = .107$. Coactor others also rendered an increase in arousal in both neutral situations, $k = 1$, $Z = 2.510$, $p = .00060$, $Z_{\text{Fisher}} = 0.280$, $\bar{r} = .273$, and in aversive situations, $k = 3$, $Z = 3.007$, $p = .00132$, $Z_{\text{Fisher}} = 0.258$, $\bar{r} = .252$. There were no hypothesis tests for electrodermal responses for mere presence others in either neutral situations or aversive situations.

Discussion

The patterns revealed in this integration are consistent with Schachter's (1959) premise that the presence of others can reduce arousal. However, this premise must be qualified in several ways. It is true that coactor others may decrease arousal in aversive situations; however, coactor others do not decrease arousal in neutral situations. As discussed earlier, there is little situation-induced arousal to be reduced in neutral situations. In addition, audience others do not reduce arousal in either neutral or aversive situations. Also, as discussed earlier, audience others are not very potent sources of arousal-decreasing mechanisms. It is interesting to note that the increase in arousal due to the presence of audience others was weaker in aversive situations than in neutral situations, for both self-reports and electrodermal responses. This suggests (a) that participants might turn to audience others to provide social support and/or useful information, about what to expect and how to behave in aversive situations and (b) that minimal facial or postural cues from the audience others might actually be somewhat useful in this regard. Nonetheless, the primary effect of audience others in aversive situations seems to be on social monitoring, evaluation apprehension, and attentional conflict, rendering a net increase in arousal.

The patterns revealed in this integration are also consistent with Zajonc's (1965) premise that the presence of others can enhance arousal. However, again, this premise must be qualified in several ways. It is true that audience others may increase arousal in both neutral situations and aversive situations; however, mere presence others do not increase arousal in neutral situations. In addition, coactor others do not

increase arousal in aversive situations. As discussed earlier, coactor others could serve as a uniquely potent source of social support or useful information, or both, in that aversive situation.

Thus, both Schachter (1959) and Zajonc (1965) were in part correct, and both Schachter (1959) and Zajonc (1965) were in part incorrect. The paradox represented by these two opposing perspectives on the effects of the presence of others does indeed seem to find its resolution in Kiesler's (1966) speculations regarding an interaction between the type of situation and the type of other people present in the situation. It bears emphasis that future summaries of the effects of the presence of others on arousal should take a more conditional form. The results summarized cannot clearly and unequivocally support either the simple Schachterian position or the simple Zajoncian position.

Several elements of these results highlight some critical features of the topography of this research domain. First, there is less than one half as much data to summarize for electrodermal responses as there is for self-report (and recall that electrodermal response is the most common physiological indicator in this research domain). By dint of sheer numbers, we are thereby led to have more confidence in the summary of results for self-report than those for electrodermal responses. However, it should be underscored that this position is *not* a reflection of the apparent bias toward the acceptance of self-report measures when they conflict with results based on physiological measures (noted by Cacioppo & Petty, 1986). Rather, it is simply based on the fact that we have twice as much data available for self-reports as we do for electrodermal responses.

Second, the results for self-report and those for electrodermal response are generally in agreement (specifically, arousal is increased on both measures in neutral situations for both coactor others and for audience others; arousal is increased on both measures in aversive situations for audience others). This runs counter to previous claims of a lack of any correspondence between self-reports of arousal and physiological indices (e.g., Glass et al., 1970; Pennebaker & Hoover, 1984). Only one inconsistency between these two operational definitions does emerge: the effects of coactor others in aversive situations. This one inconsis-

tency may be due to the relative paucity of data in this specific combination of type of situation and type of other for electrodermal responses (only 3 hypothesis tests), compared with self-reports (16 hypothesis tests). Moreover, the small failsafe (f_s) number for those three electrodermal responses data points, $N_{f_s}(p = .05) = 6.3$, is smaller than Rosenthal's (1991) benchmark of "5 k + 10," $5(3) + 10 = 25$. This indicates a comparatively lower tolerance for future null results than that documented for the 16 data points for self-reports, $N_{f_s}(p = .05) = 229.3$, which exceeds the $16(3) + 10 = 58$ benchmark. For this reason, we have more confidence in the self-report measures with their greater amount of data, and this does happen to be the one instance in which self-report measures conflict with results based on physiological measures (cf. Cacioppo & Petty, 1986).

However, if future tests of the hypothesis with electrodermal responses confirm the interesting discrepancy between self-report and electrodermal responses, then this discrepancy would need to be explained. One possible account would evoke a misattribution of arousal mechanism (e.g., Cantor, Zillman, & Bryant, 1975; Schachter & Singer, 1962). For example, in the aversive situation with a coactor, the participant might indeed be experiencing an increased level of arousal (as gauged by the electrodermal responses). However, unlike mere presence others or audience others, the coactor other might provide an alternative source to which to attribute the arousal (such as, to the support or companionship rendered by the coactor). Thereby, the arousal might not be interpreted in terms of the self-report items of "tense" or "aroused" (see above), but in terms of an evaluative response toward the coactor. Future research might be directed toward scrutinizing this possibility.

Third, the overall results for the electrodermal response hypothesis tests supported Zajonc's (1965) position. That is, there was a significant tendency for the presence of others to increase arousal as operationally defined by electrodermal responses. Note that previous narrative reviews have concluded that, "studies in which arousal is inferred from electrodermal measures likewise provide little support for drive theory" (Geen, 1989, p. 21; also see Kushner, 1981, p. 187). The present results run counter to these

claims that electrodermal measures provide little support for drive theory.

Clearly, the present meta-analytic effort has served one of the broad and indirect goals of any meta-analysis, to provide a useful compass heading for primary-level researchers regarding the gaps in our nomological net (Mullen, 1989). Subsequent research on the effects of the presence of others using any operational definitions should certainly begin to explore the effects of mere presence. The aversive settings used for the study of electrodermal responses have tended to be somewhat less arousing than those used for the study of self-report, and subsequent research might address this anomaly. Finally, the field might well benefit from further study of the effects of the presence of coactor others in aversive situations on electrodermal operational definitions.

The purpose of this integration was to determine the conditions under which group membership increases or decreases arousal. In light of the results of this effort, two intriguing implications emerge. First, consider theoretical perspectives that use group-induced arousal as a mediating mechanism (notably, the many variants on Zajonc's (1965) drive-arousal hypothesis, cited in the beginning of this article). The present results suggest that any summaries of the effects of the presence of others on arousal should take a more conditional form: The weight of the available evidence cannot clearly and unequivocally support the simple Zajoncian position that the presence of others increases arousal (e.g., mere presence others do not increase arousal, and coactor others in aversive situations do not increase arousal). Therefore, when the presence of others exerts predictable effects on performance (e.g., Sanders & Baron, 1975), it now seems considerably less plausible that these performance effects are attributable to group-induced arousal. Accounts for the effects of the presence of others on performance that do not rely on arousal as a mediating mechanism, such as self-regulation perspectives (e.g., Mullen, 1983, 1987) or expectancy value perspectives (e.g., Karau & Williams, 1993), may provide more compelling theoretical alternatives.

Second, consider interventions that use group settings to directly affect how people feel (notably, group psychotherapy [e.g., Rose, 1993] and self-help groups [e.g., Flores, 1988]). As discussed by Flannery, Perry, and Harvey

(1993), victims of traumatic events often suffer from high levels of physiological arousal, which can be effectively reduced by the proper group experience. The present results suggest that these efforts are indeed likely to render the desired effects of reducing felt arousal: The specific combination of the type of situation (highly aversive) and type of others present (coactors who are suffering through similar trauma) in these group interventions is precisely the one that the available evidence suggests will render a decrease in arousal. This seems to be precisely the scenario described by Lakin (1985): "The group represents a hope of relief from stress, a promise of personal betterment. One comes to the group with the expectation that the group experience will provide answers to one's problems" (p. 68).

In summary, the present results indicate that there is a marginally significant tendency for the presence of others to decrease self-reports of arousal and a significant tendency for the presence of others to increase electrodermal responses. These tendencies are moderated by the type of situation and the type of others present. Future research might be directed toward examining the combinations of type of situation, type of others present, and operational definitions of arousal that have been ignored in previous research. In the meantime, the present effort offers a tentative resolution to the paradoxical effects of the presence of others on arousal.

References

References marked with an asterisk indicate studies included in the meta-analysis.

- Allen, K. M., Blascovich, J., Tomaka, J., & Kelsey, R. M. (1991). The presence of human friends and pet dogs as moderators of autonomic responses to stress in women. *Journal of Personality and Social Psychology, 61*, 582-589.
- * Amoroso, D. M., & Walters, R. H. (1969). Effects of anxiety and socially mediated anxiety reduction on paired associate learning. *Journal of Personality and Social Psychology, 11*, 388-396.
- Baron, R. A., & Byrne, D. (1994). *Social psychology: Understanding human interaction*. Boston: Allyn & Bacon.
- Baron, R. S., Moore, D. L., & Sanders, G. S. (1978). Distraction as a source of drive in social facilitation research. *Journal of Personality and Social Psychology, 36*, 816-824.
- * Berger, R. E. (1981). *Heart rate, arousal, and the "mere presence" hypothesis of social facilitation*. Unpublished doctoral dissertation, Virginia Commonwealth University.
- Blascovich, J. (1992). A biopsychosocial approach to arousal regulation. *Journal of Social and Clinical Psychology, 11*, 213-237.
- Blascovich, J., & Kelsey, R. M. (1990). Using electrodermal and cardiovascular measures of arousal in social psychological research. In C. Hendrick & M. S. Clark (Eds.), *Research methods in personality and social psychology* (pp. 45-73). Newbury Park, CA: Sage.
- Bond, C. F., & Titus, L. J. (1983). Social facilitation: A meta-analysis of 241 studies. *Psychological Bulletin, 94*, 265-292.
- * Borden, R. J., Hendrick, C., & Walker, J. W. (1976). Affective, physiological, and attitudinal consequences of audience presence. *Bulletin of the Psychonomic Society, 7*, 33-36.
- Bovard, E. (1959). The effects of social stimuli on the response to stress. *Psychological Review, 66*, 267-277.
- * Buck, R. W., & Parke, R. D. (1972). Behavioral and physiological response to the presence of a friendly or neutral person in two types of stressful situations. *Journal of Personality and Social Psychology, 24*, 143-153.
- Butt, D. S. (1987). *Psychology of sport: The behavior, motivation, personality, and performance of athletes*. New York: Van Nostrand Reinhold.
- Cacioppo, J. T., & Petty, R. E. (1986). Social processes. In M. G. H. Coles, E. Donchin, & S. W. Porges (Eds.), *Psychophysiology: Systems, processes and applications* (pp. 646-679). New York: Guilford Press.
- Cantor, J. R., Zillman, D., & Bryant, J. (1975). Enhancement of experienced sexual arousal in response to erotic stimuli through misattribution of unrelated residual excitation. *Journal of Personality and Social Psychology, 32*, 69-75.
- * Cohen, J. L. (1980). Social facilitation: Audience vs. evaluation apprehension effects. *Motivation and Emotion, 4*, 21-34.
- Cottrell, N. B. (1968). Performance in the presence of other human beings. In E. C. Simmel, R. A. Hoppe, & G. A. Milton (Eds.), *Social facilitation and imitative behavior* (pp. 185-236). Boston: Allyn & Bacon.
- Cottrell, N. B., Wack, D. L., Sekerak, G. J., & Rittle, R. H. (1968). Social facilitation of dominant responses by the presence of an audience and the mere presence of others. *Journal of Personality and Social Psychology, 9*, 245-250.
- Deaux, K., & Wrightsman, L. S. (1988). *Social psychology*. Pacific Grove, CA: Brooks/Cole.
- * Elliot, E. S., & Cohen, J. L. (1981). Social facilitation effects via interpersonal distance. *Journal of Social Psychology, 114*, 237-249.

- * Epley, S. W. (1973). *The effect of the presence of a companion upon the speed of escape from electric shock*. Unpublished doctoral dissertation, University of Iowa.
- Flannery, R. B., Perry, J. D., & Harvey, M. R. (1993). A structured stress-reduction group approach modified for victims of psychological trauma. *Psychotherapy, 30*, 646–650.
- Flores, P. J. (1988). *Group psychotherapy with addicted populations*. New York: Hayworth Press.
- Forsyth, D. R. (1990). *Group dynamics*. Pacific Grove, CA: Brooks/Cole.
- Friedman, L. (1981). How affiliation affects stress in fear and anxiety situations. *Journal of Personality and Social Psychology, 40*, 1102–1117.
- * Geen, R. G. (1973). Effects of being observed on short- and long-term recall. *Journal of Experimental Psychology, 100*, 395–398.
- * Geen, R. G. (1979). Effects of being observed on learning following success and failure experiences. *Motivation and Emotion, 3*, 355–371.
- Geen, R. G. (1989). Alternative conceptions of social facilitation. In P. B. Paulus (Ed.), *Psychology of group influence* (2nd ed., pp. 15–52). Hillsdale, NJ: Erlbaum.
- * Glass, D. C., Gordon, A., & Henchy, T. (1970). The effects of social stimuli on psychophysiological reactivity to an aversive film. *Psychonomic Science, 20*, 255–256.
- Guerin, B. (1986). Mere presence effects in humans: A review. *Journal of Experimental Social Psychology, 22*, 38–77.
- Guerin, B., & Innes, J. M. (1982). Social facilitation and social monitoring: A new look at Zajonc's mere presence hypothesis. *British Journal of Social Psychology, 21*, 7–18.
- * Henchy, T., & Glass, D. C. (1968). Evaluation apprehension and the social facilitation of dominant and subordinate responses. *Journal of Personality and Social Psychology, 10*, 446–454.
- Hersey, P., & Blanchard, K. H. (1977). *Management of organizational behavior: Utilizing human resources*. Englewood Cliffs, NJ: Prentice Hall.
- * Jackson, J. M., & Latané, B. (1981). All alone in front of all those people: Stage fright as a function of number and type of co-performers and audience. *Journal of Personality and Social Psychology, 40*, 73–85.
- John, C. H. (1988). Emotionality ratings and free association norms of 240 emotional and nonemotional words. *Cognition and Emotion, 2*, 49–70.
- Karau, S. J., & Williams, K. D. (1993). Social loafing: A meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology, 65*, 681–706.
- Kiesler, S. B. (1966). Stress, affiliation, and performance. *Journal of Experimental Social Psychology, 1*, 227–235.
- * Kissel, S. (1965). Stress-reducing properties of social stimuli. *Journal of Personality and Social Stimuli, 2*, 378–384.
- Kushner, T. (1981). The status of arousal in recent social facilitation literature: A review and evaluation of assumptions implied by the current research model. *Social Behavior and Personality, 9*, 185–190.
- Lacey, J. I. (1956). The evaluation of autonomic responses: Toward a general solution. *Annals of the New York Academy of Sciences, 67*, 123–164.
- Lakin, M. (1985). *The helping group: Therapeutic principles and issues*. Reading, MA: Addison-Wesley.
- * MacDonald, A. P. (1970). Anxiety, affiliation, and social isolation. *Developmental Psychology, 3*, 242–254.
- * McKinney, M. E., Gatchel, R. J., & Paulus, P. B. (1983). The effects of audience size on high and low speech-anxious subjects during an actual speaking task. *Basic and Applied Social Psychology, 4*, 73–87.
- * Moore, D. L., Baron, R. S., Logel, M. L., Sanders, G. S., & Weerts, T. C. (1988). Methodological note: Assessment of attentional processing using a parallel phenomenon strategy. *Personality and Social Psychology Bulletin, 14*, 565–572.
- Mullen, B. (1983). Operationalizing the effect of the group on the individual: A self-attention perspective. *Journal of Experimental Social Psychology, 19*, 295–322.
- Mullen, B. (1987). Self-attention theory. In B. Mullen & G. R. Goethals (Eds.), *Theories of group behavior* (pp. 125–146). New York: Springer-Verlag.
- Mullen, B. (1989). *Advanced BASIC meta-analysis*. Hillsdale, NJ: Erlbaum.
- Mullen, B., & Rosenthal, R. (1985). *BASIC meta-analysis: Procedures and programs*. Hillsdale, NJ: Erlbaum.
- Pennebaker, J. W., & Hoover, C. W. (1984). Visceral perceptions vs. visceral detection: A comparison of methods and assumptions. *Biofeedback and Self-regulation, 9*, 339–352.
- Rose, S. D. (1993). Cognitive-behavioral group psychotherapy. In H. I. Kaplan & B. J. Sadock (Eds.), *Comprehensive group psychotherapy* (pp. 205–212). Baltimore: Williams & Wilkins.
- Rosenthal, R. (1991). *Meta-analytic procedures for social research*. Beverly Hills, CA: Sage.
- Sanders, G. S., & Baron, R. S. (1975). The motivating effects of distraction on task performance. *Journal of Personality and Social Psychology, 32*, 956–963.
- Schachter, S. (1959). *The psychology of affiliation*. Stanford, CA: Stanford University Press.
- Schachter, S., & Singer, J. E. (1962). Cognitive,

- social, and physiological determinants of emotional state. *Psychological Review*, 69, 379-399.
- Scott, W. G., & Mitchell, T. R. (1976). *Organization theory: A structural and behavioral analysis*. Homewood, IL: Irwin.
- Shapiro, D., & Crider, A. (1969). Psychophysiological approaches in social psychology. In G. Lindzey & E. Aronson (Eds.), *The handbook of social psychology* (Vol. 3, pp. 1-49). Reading, MA: Addison-Wesley.
- * Shapiro, S., Leiderman, H., & Morningstar, M. E. (1964). Social isolation and social interaction: A behavioral and physiological comparison. In J. Wortis (Ed.), *Recent advances in biological psychiatry* (Vol. 6, pp. 110-126). New York: Plenum Press.
- * Shearn, D., Bergman, E., Hill, K., Abel, A., & Hinds, L. (1992). Blushing as a function of audience size. *Psychophysiology*, 29, 431-436.
- Simpson, H. M., & Molloy, F. M. (1971). Effects of audience anxiety on pupil size. *Psychophysiology*, 8, 491-496.
- * Snydersmith, M. A., & Cacioppo, J. T. (1992). Parsing complex social factors to determine component effects: I. Autonomic activity and reactivity as a function of human association. *Journal of Social and Clinical Psychology*, 11, 263-278.
- * Sullins, E. S. (1991). Emotional contagion revisited: Effects of social comparison and expressive style on mood convergence. *Personality and Social Psychology Bulletin*, 17, 166-174.
- * Taylor, D. A., Wheeler, L., & Altman, I. (1968). Stress relations in socially isolated groups. *Journal of Personality and Social Psychology*, 9, 369-376.
- * Thomas, S. L., & Geen, R. G. (1985, May). *Effects of observer presence on coaction*. Paper presented at the annual meeting of the Midwestern Psychological Association, Chicago.
- Vaux, A. (1988). *Social support: Theory, research, and intervention*. New York: Praeger.
- Weinberg, R. S., & Gould, D. (1995). *Foundations of sport and exercise psychology*. Champaign, IL: Human Kinetics.
- Williams, R. B., Bittker, T. E., Buchsbaum, M. S., & Wynne, L. C. (1975). Cardiovascular and neurophysiological correlates of sensory intake and rejection: I. Effects of cognitive tasks. *Psychophysiology*, 12, 427-433.
- * Wrightsman, L. S. (1959). *The effects of small group membership on levels of concern*. Unpublished doctoral dissertation, University of Minnesota.
- Wrightsman, L. S. (1960). Effects of waiting with others on changes in level of felt anxiety. *Journal of Abnormal and Social Psychology*, 61, 216-222.
- Zajonc, R. B. (1965). Social facilitation. *Science*, 149, 269-274.
- Zajonc, R. B. (1980). Compresence. In P. B. Paulus (Ed.), *Psychology of group influence* (pp. 35-60). Hillsdale, NJ: Erlbaum.
- * Zuckerman, M., Persky, H., Link, K. E., & Basu, G. K. (1968). Experimental and subject factors determining responses to sensory deprivation, social isolation, and confinement. *Journal of Abnormal Psychology*, 73, 183-194.