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The effectiveness of a brief psychological intervention on court-referred and self-referred aggressive drivers

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Abstract

This study tested the efficacy of a cognitive-behavioral psychological intervention (CBT) targeting aggressive driving behaviors within both a court-referred (N=20) and a self-referred community (N=8) sample as compared to a symptom monitoring (SM) only control condition. Treatment outcome was assessed through the use of daily driving diaries, standard psychological tests, and a global rating of change scale. The CBT treatment condition improved more than the SM condition as assessed through the daily driving diaries. Although the court-referred and self-referred samples showed equivalent improvement on the driving diaries, the self-referred group improved more on measures of general anger. Standardized measures of driving anger, state anxiety and measures of general anger indicated significant change in the expected direction. Aggressive drivers who met criteria for Intermittent Explosive Disorder (IED) showed a trend to improve less than non-IED aggressive drivers. Treatment gains were maintained at the 2-month follow-up point.

1. Introduction

As early as 1940, Ross (1940) suggested that the problem of traffic accidents be addressed not so much through mechanical improvements (car and highway safety features) or education, but through socio-psychological intervention. In a systematic study of 58,550 accident reports in seven Michigan cities, Ross estimated that human factors (specifically drivers' attitude and behavior problems), as opposed to mechanical malfunction and road conditions, accounted for 90% of motor vehicle accidents (MVAs).

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More recently, the United States Department of Health and Human Services (USDHHS, 1997) reports that motor vehicle accidents (MVAs) accounted for more than 95% of all transportation fatalities and were the leading cause of deaths (29%) by injury in 1996. In addition to fatalities, acute and lingering injuries add to the enormity of the problem. The AAA Foundation for Traffic Safety estimates that at least an average of 1500 people died annually as the direct result of an escalation of aggressive driving behavior from 1990 to 1996 (Mizell, 1997).

1.1. Aggressive driving

A review of the aggressive driving literature provides an overview of commonly accepted acts of aggressive driving (Ross, 1940; Clayton & Mackay, 1972; Stradling & Parker, 1997; Maiuro, 1998). Aggressive driving behaviors can include, but are not limited to, the following: slow driving with the intent of blocking other vehicles, tailgating, improper passing (cutting drivers off when passing), failing to yield the right of way, failing to keep right, horn honking, flashing high beams and failing to signal properly. Personal attacks on fellow drivers are also included in aggressive driving behaviors. These include obscene gesturing, verbal insults, throwing objects, and, in extreme cases, physical assault. Such behaviors tend to be reciprocated quickly, and a relatively minor infraction can quickly escalate into a major altercation resulting in injury, property damage, or even death. It is important to note that a critical element in defining aggressive driving behavior is *intent*. The driving behavior must be a purposeful act committed with the intent to punish, threaten, frighten, or harm to qualify as aggressive driving behavior. Lapses in judgment or driving errors are therefore not included within this category.

Recent media attention, along with the coining of the phrase, ‘road rage’, has generated current interest in the problem of aggressive driving. For example, Martinez (1997) has claimed that aggressive driving has been said to result in as many MVAs and fatalities as drunk driving. Thus aggressive driving, both historically and currently, appears to be a fairly common occurrence with serious consequences on the roadways.

1.2. Treatment of aggressive drivers

The effectiveness of cognitive-behavioral, multi-component interventions within the anger management literature has been fairly well-established, (Novaco, 1975; Tafrate, 1995; Beck & Fernandez, 1998). However, psychosocial interventions specifically targeting aggressive driving are limited to two, to the best of our knowledge. First Larson (1996a,b) described his one-day intensive treatment program in full. He reported the success of this uncontrolled intervention as measured by pre- and post-treatment changes on the Driver Stress Profile (Larson, 1996a,b) as impressive (Larson, Rodriquez, & Galvan-Henkin, 1998). The current study offers methodological improvements on Larson’s pioneering work in its controlled design and outcome assessed through multiple measures. Further, this study includes a court-mandated population whose aggressive driving behavior can be considered severe enough to warrant sentencing to the program.

Deffenbacher, Huff, Lynch, Oetting, and Salvatore (2000) recently reported a controlled trial comparing two treatments versus an assessment only control in a self-identified, high driving anger college population of volunteers who received research credit for participation. Group treatment conditions consisted of (1) pure relaxation training, compared to (2) relaxation training combined

with cognitive therapy, compared to (3) assessment only control. The groups met for an hour once a week for a period of eight weeks. Participants were re-assessed at post-treatment and again at a four week follow-up point. Results indicated improvement for both the experimental conditions over the control condition. However, there was very little differential effect between the two active treatment conditions. Specifically, the pure relaxation condition improved more on the Driving Anger Scale while the combined condition showed more improvement on driving diaries. Neither condition demonstrated improvement on general trait anger. The current study differs from on this research by using a more severely impaired aggressive-driving population from the courts and the community, had slightly longer follow-up, and assessed change with a wider array of measures.

1.3. Present study

The present study sought to contribute to the aggressive driving literature by investigating the efficacy of a cognitive-behavioral anger management treatment package (CBT) on both court-mandated aggressive drivers and self-identified aggressive drivers. An attempt was made to assess the generalizability of the intervention to overall levels of anger and arousal as measured by standardized psychological instruments within this population.

2. Method

2.1. Participants

Thirty men and women (between the ages of 18 and 75) who were identified as aggressive drivers were recruited for the study. The aggressive driving participants were divided into two groups based on their referral process. Ten participants (recruited through the local media and advertisement) formed the *Self-Referred Group* (SR) comprised of clients who voluntarily joined the study. The second group, comprised of twenty participants, was the *Court-Referred Group* (CR) and included individuals who were referred through the court system as a direct result of an aggressive driving-related conviction. Subjects were matched into pairs within each group (CR and SR) based on psychopathology, gender, age, and SES. Each member of these matched pairs was randomly assigned to either the cognitive-behavioral treatment (CBT) condition or to an extended (six week) symptom-monitoring control condition (SM) after which SM participants were then crossed over to the treatment condition. The end result was a semi-crossover design. Two SR subjects were assessed but not treated due to personal difficulties (personal injury and relocation, respectively). Thus, 28 completed treatment; post-treatment data were collected on 27 subjects as 1 subject (SR) did not return post-treatment questionnaires and diaries. In this manner, treatment results were compared between treatment versus symptom monitoring and then between referral conditions. Demographics are provided in Table 1. The CR and SR group differed on age, $P<0.001$, and on years of education, $P<0.001$. The groups did not differ on marital status, income, ethnicity or gender.

In order to be eligible for the study, participants had to acknowledge at least one aggressive driving behavior (listed later in text) a day on at least three out of seven driving days. Subjects

Table 1
Demographic information

Demographics by referral source	Court-referred (N=20)	Self-referred (N=10)	Statistic
Age	χ=29.2	χ=39.5	$t(28)=2.29$, $P<0.03$
	SD=10.1	SD=14.5	
Gender	20% Female	50% Female	ns
Marital status	40% Single	40% Single	Ns
	10% Married	40% Married	
	10% Divorced	10% Divorced	
	40% Relationship	10% Relationship	
Ethnicity	85% Caucasian	100% Caucasian	Ns
	15% African-American		
Years of education	χ=12.28	χ=15.5	$t(28)=3.65$, $P=<0.001$
	SD=2.47	SD=1.71	
Driving history			
Years driving	χ=13.8	χ=23	$t(28)=1.86$, $P=0.07$
	SD=13	SD=12.5	
Number of MVAs	χ=2.4	χ=3.1	Ns
	SD=1.8	SD=2.6	
Number of moving violations	χ=8.8	χ=3.9	$t(28)=1.48$, $P=0.15$
	SD=13	SD=3.6	
Number of DWI convictions	χ=0.65	χ=0.5	Ns
	SD=1.4	SD=0.5	
Number of annual driving violations	χ=1.96	χ=0.30	Ns
	SD=4.28	SD=0.31	

were excluded if found to be currently positive for Bipolar I or II, schizophrenia, schizophreniform psychosis, current alcohol or substance dependence, or current strong suicidal ideation. No participants were excluded.

Table 2 depicts the subjects' reported driving behaviors as gathered through the structured interview including years driving, number of motor vehicle accidents, number of moving violations, number of driving while intoxicated arrests, and average number of moving violations committed annually. Comparisons between the two referral sources on these variables are shown in Table 1. Despite the large arithmetic differences in frequency of moving violations and violations per year of driving, only for years of driving was there a trend (P=0.07) for the self-referred drivers to be greater than the court-referred group.

Table 3 was constructed separately to report the traffic offense which precipitated sentencing to the program (CR subjects only) to protect the anonymity of these participants. Tables 2 and 3 give a good idea of the severity of the aggressive driving offenses committed by the CR group as well as overall level of aggressive driving behavior endorsed within the entire population.

Table 2
Driving behavior by referral status

Driving behaviors Court-referred sample (*N*=20) Subject #	Years driving	# of MVAs	# Moving violations	DWI conviction	# Annual driving violations
100	4	0	2	0	0.75
101	3	6	4	0	1.67
102	2	2	4	0	2.5
103	2	2	35	0	19.5
104	25	4	7	1	0.4
105	3	2	10	2 (in one night)	4.33
106	10	4	10	4	1.3
107	16	2	4	0	0.38
108	55	2	6	0	0.04
109	24	6	25	0	1.13
110	25	5	5	5	0.28
111	28	3	2	1	0.11
112	4	2	2	1	1.00
113	14	2	1	0	0.21
114	12	0	1	0	0.25
115	14	3	1	0	0.21
116	4	1	2	0	1.00
118	4	1	1	0	0.50
119	17	1	50	1	3.24
120	9	0	4	0	0.56
Mean	13.8	2.4	8.8	0.65	1.96
SD	13	1.8	13	1.4	4.29
Self-referred sample (*N*=10)					
200	34	5	1	0	0.03
201	27	1	0	0	0.00
202	33	2	1	1	0.03
203	13	0	9	1	0.69
204	24	5	6	0	0.25
205	11	5	10	0	0.91
206	40	7	6	1	0.15
207	34	5	1	1	0.15
208	6	1	3	0	0.50
209	8	0	2	1	0.25
Mean	23	3.1	3.9	0.5	0.30
SD	12.5	2.6	3.6	0.5	0.31

2.2. Assessment procedures

An extensive history of driving-related questions as well as past and present psychosocial functioning was gathered through the use of a locally constructed, clinician-administered structured interview. Axis I and Axis II psychopathology were also assessed at this point (the results of this portion of the assessment are reported elsewhere in Galovski, Blanchard, & Veasey, in press).

Table 3
Combined traffic offences for which the CR group were referred

Specific offence	Number of separate incidences	Brief description of each incident
Assault	3	1. Vehicular assault on a 2nd vehicle 2. Physical assault on a person after driving incident 3. Vehicular assault on person resulting in hospitalization
Menacing	4	1. Verbally threatened to kill another driver 2. Threatened with gun 3. Verbal threats 4. Threatened with weapon
Harassment	3	1. Criminal harassment: threatened to kill person after driving incident 2. Attempted to forcibly extract another driver from car for beating 3. Chased driver to home after driving error
Reckless endangerment	1	1. Threw object out window at another vehicle
Disorderly conduct	5	All charges involved altercations with police following aggressive driving-related arrests
Reckless driving	4	No specifics
Reckless operation of a vehicle	1	No specifics
Passing on the shoulder	1	Passed on the shoulder of a crowded highway at speeds in excess of 65 mph
Failure to comply	1	Would not stop when police tried to pull over
Aggravated driving with a suspended licence	1	No specifics
Failure to keep right	1	Tried to outrun the police
Unsafe lane change	2	Crossed several lanes at once
Failure to yield/failure to keep right	3	No specifics
Unsafe start	2	Revved engine and ‘peeled out’ at a stoplight
Following too closely	1	Tailgating
Crossing a hazard marking	1	No specifics
Speeding	6	20–45 mph over the limit
Running a stop sign	1	No specifics

However, of great relevance to this study, 10 participants (seven court referred, three self-referred) met DSM-IV (Anon, 1994) criteria for Intermittent Explosive Disorder (IED) whereas 20 did not. Instructions were given to the client for completing a locally constructed aggressive driving diary, modeled after that of Deffenbacher et al. (2000), on a daily basis for the duration of the study; participants recorded the frequency and/or severity of aggressive driving behaviors in the diary. This daily diary was used as the primary outcome measure to assess change in driving behavior.

Given that the individual driving behaviors included in the driving diary range in level of *severity*, the various driving behaviors were weighted using the following method. Fourteen advanced doctoral level students, Ph.D.’s in psychology ranked the 21 driving behaviors included on the diaries according to what they perceived was the level of severity of each driving behavior.

These rankings were tabulated and resulted in the weighting system used in the reduction of the driving diaries' data. Five levels of driving severity emerged. 'Physical assault' was unanimously ranked as the most severe by all of the judges and so was given the highest severity value of '5'. 'Throwing objects' and 'chasing other vehicles' were given a severity value of '4'. 'Slow driving', 'tailgating', 'improper passing', 'failure to yield the right of way', 'horn honking', 'flashing high beams', 'obscene gestures', and 'verbal insults' were given a severity value of '3'. 'Failure to keep right', 'not signaling', and 'wishing harm to other drivers' were given a severity value of '2'. Finally, 'feeling angry', 'feeling impatient', and 'feeling upset', were rated as the least severe of the aggressive driving behaviors by the judges and given a severity value of '1'.

The following instruments were administered prior to treatment, post-treatment, and then again at a 2-month follow-up point. Two standardized aggressive driving measures, the Driver Stress Profile (DSP; Larson et al., 1998) and the Driving Anger Scale (DAS; Deffenbacher, Oetting, & Lynch, 1994) were included to assess for expected changes in aggressive driving behaviors and attitudes. Both have been shown to have good internal consistency (DSP—Blanchard, Barton, & Malta, 2000; DAS—Deffenbacher et al., 1994). Blanchard et al. (2000) showed the total scores of the two measures were correlated 0.59.

To assess for change in general psychological distress, the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), the State-Trait Anxiety Inventory (STAI; Spielberger, Gorusch, & Lushene, 1970), and the State-Trait Anger Expression Inventory (STAXI; Spielberger, 1979) were included. A patient rating of global change on a 0–100 visual analog scale was obtained at the post-treatment point for (aggressive driving behavior, global changes in mood, overall changes in bodily tension, improvement in general physical health, and global change in general anger).

2.3. Treatment

The experimental treatment protocol (CBT) was adapted from both the anger management literature previously reviewed along with Larson's (1996) driving modification text. The first author, an advanced doctoral level student, conducted all assessments and treatment. Treatment consisted of four weekly sessions, of approximately 90 min duration, conducted in group format. There were eight total groups conducted with the number of participants in each group ranging from two to five. Once the groups commenced, no members dropped out of the group. This cognitive-behavioral treatment consisted of progressive muscle relaxation strategies, coping skills, education about the impact of aggressive driving, and cognitive strategies. The treatment is outlined as follows.

Session 1 included educational material on aggressive driving, anger and aggression. Subjects were asked to identify with Larson's (1996) driver categories. Coping strategies, as suggested by Larson (1996a,b), were presented and hierarchy lists of provoking driving situations were derived. The rationale for therapeutic, deep relaxation strategies in the treatment of aggressive driving was introduced along with Progressive Muscle Relaxation. Clients received an audiotape to guide daily practice of relaxation as homework. Session 2 identified and addressed the antecedents, behaviors, and consequences of aggressive driving and introduced the cognitive component of treatment. The relaxation training continued and patients were instructed to continue practicing relaxation on a daily basis. In Session 3, the maintaining variables of aggressive driving were identified as

a group process. Relaxation by recall was reviewed and cue-controlled relaxation was introduced. Practicing coping strategies on their hierarchy list items and daily relaxation practice was assigned for homework. Session 4 was primarily a review of all procedures and a wrap-up. Subjects were given the opportunity to provide feedback about the program. Clients completed the post-treatment measures (DSP, DAS, BDI, STAI, STAXI) as well as a global rating of improvement. Subjects were given a week's worth of driving diaries to be mailed back to the clinic after completion.

2.4. Two-month follow-up

At the 2-month follow-up point, clients completed psychological measures (DSP, DAS, BDI, STAI, STAXI) and one week's worth of driving diaries. The participants also reported any side effects or anecdotal information. Twenty-one subjects (75%) returned follow-up data. Of the twenty CR subjects, sixteen subjects returned follow-up data. Of the remaining four subjects, one had died, one moved away and could not be located, and two returned clearly inconsistent data that was discarded. Of the eight treated SR subjects, five returned completed data, two moved away and could not be located, and one did not respond to repeated inquiries.

2.5. Data analytic plan

Within this study, we have sought to address a number of questions which dictated the data analytic plans. It would be possible to cast this study as a 2 (Condition) X 2 (Referral Source) X 2 (IED presence–absence) X 2 (Pre–Post) analysis. However, the cell sizes would be absurdly small. So, instead, we have asked a series of questions (Q 2–5) which entail reanalyzing the data. We realize that such an approach has the potential for inflating error rate and plan to interpret the data cautiously.

1. Is there a differential effect of treatment versus SM on driving diary, aggressive driving specific measures, general anger measures, and other psychological distress measures?
2. Across all treated subjects, is there significant within group change on driving diary, aggressive driving specific measures, general anger measures, and other psychological distress?
3. Do results hold up or improve at 2-month follow-up?
4. Is there a differential effect on treatment outcome of referral source-—court-referred versus self-referred?
5. Is there a differential effect on treatment outcome of presence of IED or not?

3. Results

3.1. Treatment versus self-monitoring

3.1.1. Self-monitoring analyses (driving diaries)

As noted above, the daily symptom monitoring diaries were considered the primary outcome measure for assessing change in daily driving behaviors, following the example of Deffenbacher

et al. (2000). Each driving behavior will be considered a 'symptom' for the purposes of clarity. Using these daily diaries, a single index, called the Composite Primary Symptom Reduction (CPSR) score, was calculated following the method of Blanchard and Schwarz (1988). This score is an index of overall change in symptom level and serves the function of reducing potential Type I error from analyzing multiple symptoms. The CPSR also provides a means for describing clinically significant improvements in symptomatology.

After adjusting for severity using the method described in the assessment section, the following formula was computed in order to arrive at the CPSR score. The 'symptoms' used in the calculations are examples only. The specific symptoms (driving behaviors) acknowledged by the subject were included in the formula where appropriate.

$$\text{Assault reduction score} = \frac{\text{Average pretreatment assault ratings} - \text{average posttreatment assault ratings}}{\text{Average pretreatment assault ratings}}$$

This formula provides symptom reduction scores (SRS). An SRS is calculated for each of the symptoms (driving behaviors) endorsed. These scores are then used to calculate the overall CPSR score as follows:

$$\text{CPSR score} = \frac{\text{Assault reduction score} + \text{improper passing reduction score, etc.}}{\text{4 (or 5, 6, etc.) (depending on the number of symptoms present)}}$$

The average CPSR score for those participants who were treated initially (n=10) was 0.50 whereas the CPSR score over the same interval for those in the symptom monitoring waiting list condition (n=16) was 0.007. This difference was significant ($t(24)=2.3$, $P<0.03$). Once the wait list participants were treated and their post-treatment CPSR scores were averaged with those who were initially treated, an average value of 0.62 was found across the entire treated sample.

Table 4 depicts the distribution of these CPSR scores by the improvement categories previously used by Blanchard and Schwarz (1988). Following Blanchard and Schwarz's precedent, the CPSR scores are divided into four categories based on the level of *clinically* significant improvement. These categories are termed 'worse, unimproved' (0–24%), 'somewhat improved' (25–49%), and 'improved' (50–74%, 75%+). The percentage of improvement within the treatment only condition, the symptom-monitoring control condition, this same control condition after being crossed over to treatment, and the entire treatment population (treatment only combined with the control group after being crossed over to treatment) are summarized in Table 4. We also present these distributions for CR versus SR drivers and for IED versus non-IED drivers.

3.1.2. Self-report measures: global ratings of change

At the post-treatment point, each subject was asked to complete a visual analogue scale (0–100) indicating global ratings of change on five important areas of functioning. Twenty-six subjects returned these data. Each global rating can be considered a percent improvement on any given domain of improvement. Improvement categories were created mimicking those set for the CPSR scores. Table 5 indicates the results of the subjects' global ratings of change.

Table 4
Distribution of CPSR scores by experimental condition[a]

	Improved		Somewhat improved 25–49%	Unimproved 0–24%	Worsened
	75+%	50-74%			
Treatment only condition (*n*=10)	5 (50%)	2 (20%)	1 (10%)	0 (0%)	2 (20%)
Sx. monitoring control condition (*n*=16)	0 (0%)	0 (0%)	3 (19%)	8 (50%)	5 (31%)
Sx. monitoring control condition after treatment (*n*=14)	5 (36%)	5 (36%)	4 (28%)	0 (0%)	0 (0%)
Overall Treatment (*n*=24)	10 (42%)	7 (29%)	5 (21%)	0 (0%)	2 (8%)
2-Month follow-up (*n*=20)	7 (35%)	5 (25%)	6 (30%)	0 (0%)	2 (10%)
Court-referred group (*n*=17)	7 (41%)	5 (29%)	3 (18%)	0 (0%)	2 (12%)
Self-referred group (*n*=7)	3 (42%)	2 (29%)	2 (29%)	0 (0%)	0 (0%)
IED (*n*=7)	1 (14%)	2 (29%)	2 (29%)	0 (0%)	2 (29%)
Non-IED (*n*=17)	9 (53%)	5(29%)	3 (18%)	0 (0%)	0 (0%)

[a] Does not include subjects #108, 109 and 114 as they did not endorse any aggressive driving behaviors during the course of the self-monitoring. Subjects 108 and 109 met criteria for IED.

3.1.3. Standardized tests

To complete the answer to Question 1, an initial multivariate analysis of variance (MANOVA) on each class of self-report measures (psychological distress, general anger, and driving anger) between experimental conditions (immediate Treatment and SM) over time was followed up as appropriate with univariate ANOVAs on the individual measure. These analyses revealed a significant main effect of time, $F(2.23)=3.25$, $P<0.04$ on the measures of psychological distress (*depression*—BDI, *state anxiety*—STAI, and *trait anxiety*—STAI). The interaction was not significant. No significant main effects or interactions emerged on the overall MANOVA on measures of general anger or driving behavior. Exploratory univariate ANOVAs revealed significant Group X Time interactions on trait anger ($F[1,27]=4.07$, $P=0.05$), angry temperament ($F[1,27]=6.14$, $P=0.02$, and state anger ($F[1,27]=5.19$, $P=0.03$). Follow-up ANCOVAs on post-test scores using the pre-test score as a covariate were significant for all three variables, indicating that the treated group had changed more than the symptom monitoring group.

Table 5
Distribution of global ratings of change

Global rating	Distribution of global change scores (*N*=26)				
	Improved		Somewhat improved	Unimproved	
	75+%	50–74%	25–49%	0–25%	Worsened
Overall driving behavior	7 (27%)	8 (31%)	5 (19%)	6 (23%)	0 (0%)
Overall change in mood	4 (15%)	5 (19%)	6 (23%)	11 (42%)	0 (0%)
Overall change in tension	3 (12%)	5 (19%)	3 (12%)	15 (58%)	0 (0%)
Overall change in health	2 (8%)	3 (12%)	3 (12%)	18 (69%)	0 (0%)
Overall change in anger	3 (12%)	8 (31%)	2 (8%)	13 (50%)	0 (0%)

3.2. Within-subjects comparisons

To address Question 2 and to capitalize on the increased power provided by examining the entire treated sample from before treatment to after treatment, paired sample *t*-tests were conducted on all psychological distress, general anger, and driving anger scales and subscales. Modified Bonferroni follow-up tests (Holland & Copenhaver, 1988) were conducted within each of the four classes of measures to control for error rate. All comparisons as well as the appropriate means and standard deviations for the pre- to post-treatment comparisons within the entire population are provided in Table 6.

Significant decreases in *state anxiety*, $t(26)=3.74$, $P<0.001$, *trait anger*, $t(26)=2.58$, $P<0.02$, *angry temperament*, $t(26)=2.86$, $P<0.008$, *anger reactivity*, $t(26)=2.16$, $P<0.04$, and *anger directed outward*, $t(26)=2.33$, $P<0.03$ emerged on the measures of psychological distress and anger. After the application of the modified Bonferroni, only the difference on state anxiety and angry temperament remained significant. It thus appears that the treatment effect generalized somewhat to measures of psychological distress and anger.

With respect to measures of driving anger, *competing behavior* on the roadways as measured by the DSP indicated improvement, $t(26)=2.31$, $P<0.03$. Total driving anger (DAS) significantly decreased, $t(26)=3.43$, $P<0.002$, as well as anger as a reaction to *hostile gestures*, $t(26)=2.61$, $P<0.02$, anger as a response to *illegal driving*, $t(26)=2.51$, $P<0.02$, anger precipitated by *slow driving*, $t(26)=3.22$, $P<0.003$, anger precipitated by *discourtesy*, $t(26)=3.81$, $P<0.001$, and anger caused by *traffic obstructions*, $t(26)=2.62$, $P<0.02$. After the application of the modified Bonferroni correction, overall driving anger (DAS), anger as a response to slow driving and to discourtesy remained significant.

3.3. Two-month follow-up

Twenty-one subjects (75%) returned follow-up data to help us address Question 3. The distribution of CPSR scores in percent improvement categories at 2-month follow-up is depicted in

Table 6
Pre- to post-treatment comparisons of self-report measures for entire aggressive-driving sample

Measure	Pre-treatment M (and SD)	Post-treatment M (and SD)	Statistics *t, P*	Modified Bonferroni critical alpha
		General psychological distress		
STAI-State[a]	45.41 (17.98)	31.22 (10.54)	t=3.74, $P<0.001$	0.05/3=0.017
STAI-Trait	35.3 (12.72)	32.7 (10.17)	t=1.52, $P<0.14$	0.05/2=0.025
BDI	4.69 (5.61)	3.08 (4.35)	t=1.49, P=0.15	0.05/1=0.050
		General anger		
STAXI-Angry Temperament[a]	6.74 (3.36)	5.3 (1.6)	t=2.86, $P<0.008$	0.05/6=0.008
STAXI-Trait Anger	17.74 (7.79)	15.07 (5.18)	t=2.58, $P<0.02$	0.05/5=0.010
STAXI-Anger Out	16.44 (4.79)	15.04 (3.26)	t=2.33, $P<0.03$	0.05/4=0.013
STAXI-Angry Reaction	7.33 (3.13)	6.52 (2.64)	t=2.16, $P<0.04$	0.05/3=0.017
STAXI-Anger Control	23.04 (5.87)	22.67 (6.35)	t=0.39, $P<0.7$	0.05/2=0.025
STAXI-Anger In	13.44 (4.27)	13.33 (3.17)	t=0.19, $P<0.85$	0.05/1=0.050
		Driving anger and aggression		
DAS-Discourtesy[a]	24.67 (10.7)	19.85 (7.48)	t=3.81, $P<0.001$	0.05/7=0.007
DAS-Total*	75.74 (33.22)	63.85 (23.9)	t=3.43, $P<0.002$	0.05/6=0.008
DAS-Slow Driv.*	14.07 (6.74)	11.74 (4.9)	t=3.22, $P<0.003$	0.05/5=0.010
DAS-Illegal Driving	8.3 (4.45)	7 (3.42)	t=2.51, $P<0.02$	0.05/4=0.013
DAS-Hostile Gestures	6.26 (3.61)	4.89 (2.59)	t=2.61, $P<0.02$	0.05/3=0.017
DAS-Traffic Obstruction	16 (7.85)	14.07 (6.24)	t=2.62, $P<0.02$	0.05/2=0.025
DAS-Police Presence	6.81 (3.72)	6.41 (2.69)	t=0.72, $P<0.47$	0.05/1=0.050
DSP-Competing	5.3 (6.52)	3.59 (4.22)	t=2.31, $P<0.03$	0.05/5=0.010
DSP-Total	27.14 (26.56)	22.56 (17.42)	t=1.84, $P<0.08$	0.05/4=0.013
DSP-Punishing	5.78 (6.62)	4.52 (3.92)	t=1.73, $P<0.095$	0.05/3=0.017
DSP-Anger	8.96 (7.71)	7.89 (5.88)	t=1.12, $P<0.28$	0.05/2=0.025
DSP-Impatience	7.11 (7.61)	6.22 (5.38)	t=1.01, $P<0.32$	0.05/1=0.05

[a] Significant within group change after modified Bonferroni correction.

Table 4. Results indicated no significant differences between average CPSR score at post-treatment (χ=0.61) as compared to CPSR score at 2 month follow-up (χ=0.56).

3.3.1. Self-report measures

One way repeated measures ANOVAs were conducted to compare changes in self-report measures across time (pre-treatment, post-treatment, 2-month follow-up) for the entire treated sample. Significance across time was followed up with pairwise comparisons to detect specific changes. Although no further significant decreases in symptomatology emerged between the post-treatment and 2-month follow-up assessment points, all treatment gains were maintained. Non-significant, downward trends from post-treatment to 2-month follow-up point emerged on many measures including all three measures of psychological distress and the total score on driver stress (DSP).

3.4. Court-referred versus self-referred comparisons

A comparison of CPSR scores from the driving diaries for all court-referred completers (0.63) to those of all self-referred completers (0.60) was non-significant. These results are in Table 4.

To address Question 4, MANOVAs were conducted on the standardized tests between referral source (CR versus SR) to assess differences over time (pre-treatment to post-treatment). In comparing improvement on measures of psychological distress, the groups did not differ. The groups *did* differ on measures of general anger; the MANOVA revealed a significant main effect for Time, $F(7,19)=4.88$, $P<0.003$, and a significant Group by Time interaction, $F(7,19)=5.63$, $P<0.001$. Univariate tests revealed a significant time by referral source interaction on the *angry reaction* subscale, $F(1,25)=8.15$, $P<0.009$, and on the *anger in* measure, $F(1,25)=9.31$, $P<0.005$. Post-hoc ANCOVAs were conducted on post-test scores with the pre-test scores as a covariate and found to be non-significant. Finally, in comparing improvement on measures of driving anger, the MANOVA indicated a significant main effect for Time, $F(1,24)=3.99$, $P<0.008$. The interaction showed a trend ($F[1,24]=2.20$, $P=0.08$. Exploratory univariate analyses revealed significant Group X Time interactions on DAS total score ($F[1,25]=7.18$, $P<0.01$), anger at hostile gestures ($F[1,25]=5.43$, $P<0.03$), anger at slow driving ($F[1,25]=7.85$, $P<0.01$). Follow-up ANCOVAs were significant only for anger at hostile gestures and at discourtesy, with the SR group showing greater changes than the CR group. The CR and SR groups did not differ with respect to maintenance of treatment gains.

3.5. Effects of presence of IED on outcome

The CPSR scores for the aggressive drivers with IED (0.37) were compared to those of the non-IED aggressive drivers (0.72). This comparison approached significance ($t[22]=2.14$, $P=0.06$). These results are in Table 4. To answer Question 5, similar MANOVA analyses comparing aggressive drivers who met criteria for IED ($n=9$) to those who did not ($n=18$), revealed no significant Group main effect or Group X Time interactions for any of the three dependent variable clusters. The IED and non-IED aggressive drivers did not differ in follow-up maintenance of treatment gains achieved at post-treatment.

4. Discussion

This study reports on a controlled evaluation of a brief, cognitive-behavioral group training program for court-referred and self-referred aggressive drivers evaluated by driving diaries and standardized psychological tests. It also provides short-term (2 month) follow-up data on treated aggressive drivers.

4.1. Evaluation of cognitive-behavioral intervention on aggressive drivers

With regards to Question 1, the results of this study provide good evidence for the efficacy of a cognitive-behavioral intervention on aggressive driving behaviors in the general population. Improvements were realized in reductions of daily aggressive driving behaviors (average CPSR score of 0.62 across the entire treated sample).

The initially treated group improved significantly more on CPSR scores from the driving diary than the symptom-monitoring group. Based on the CPSR scores, the treated group averaged 50% improvement while the waitlist group did not improve at all (CPSR of 0.007). This lack of improvement in the symptom monitoring condition is surprising as one might expect that the punishment alone (being sentenced to a time-consuming program) would cause some reduction in aggressive driving behavior. Also, in the SR group, the lack of improvement during waitlist is surprising as self-monitoring often has the side effect of symptom improvement. The symptom-monitoring group did not improve significantly on any of the self-report measures. They also showed arithmetic, non-significant worsening over time on several self-report measures including the BDI, state anger, and anger in.

When crossed over to treatment, the SM group evidenced an average reduction in driving diary scores of 64% (as based on the CPSR score). It thus appears that the experience of the intervention itself (and not necessarily being sentenced to the program or monitoring one's driving behaviors and reactions) directly impacted aggressive driving behaviors.

Overall, self-report measures indicated significant decreases in state anxiety, trait anger, angry temperament, angry reaction, anger out, overall driving anger, anger in response to hostile gestures, illegal driving, slow driving, discourtesy, and traffic obstruction, and competing behavior of the DSP. Downward, non-significant trends emerged on many of the remaining measures.

With regards to Question 4, the SR and CR groups showed similar reductions of daily aggressive driving behavior (CPSR of 0.60 and 0.63, respectively). Although there were significant Group X Time interactions on angry reaction and anger in subscales of the STAXI and on DAS total score, angry reactions to hostile gestures, discourtesy, and slow driving, both groups showed similar improvements on measures of depression, state anxiety, state anger, trait anger, angry temperament, anger out, and several driving anger measures. The SR group improved significantly more than the CR group on measures of driving anger, anger in response to hostile gestures, and discourtesy. The CR group evidenced non-significant increases in anger directed inward, overall driving anger (DAS), driving impatience and a decrease in anger control. This group showed trends toward improvement on all other subscales. The SR group improved arithmetically on all self-report measures.

Finally, addressing Question 5, we found that meeting the criteria for IED showed a trend (P=0.06) to make a difference. Those aggressive drivers who did *not* meet criteria for IED had

CPSR scores on the driving diary almost twice as great (0.72 vs 0.37) as those who did meet IED criteria. Moreover, data from two participants with IED had to be removed (and thus could potentially push results either way). It appears that aggressive drivers with IED may require a more intensive and prolonged treatment.

This study offers methodological improvements over both of the previous outcome studies in this field. This is the first intervention to be conducted using a randomized, controlled design with a community-based population of aggressive drivers. Deffenbacher et al. (2000) conducted the best treatment outcome study, methodologically, prior to the current investigation by comparing a pure relaxation condition, a cognitive-behavioral condition (CBT), and a no-treatment control condition with high driving anger college students. Both of their experimental conditions realized decreases in aggressive driving behavior as measured by the driving logs and the DAS. The current study (using a CBT experimental condition only) found significant improvement on the daily diaries similar to the results of Deffenbacher et al. (2000) with their CBT condition. However, the CBT group in the current study also showed significant decreases on the DAS. Additionally, the current study saw a generalization effect to other measures of psychological distress (state anxiety, anger, and non-significant decreases in depression). These differences in treatment effects could certainly be due to the differences in the populations included in the treatment study. Deffenbacher et al.'s (2000) sample was college students receiving research credit for participation, whereas the current study used an adult community sample. The current study's inclusion of court-referred participants demonstrates that CBT treatments are effective with a very severe population. (Refer to Tables 2 and 3 to note the severity of their driving behaviors.) In summary, results from both studies provide evidence for the efficacy of CBT interventions within the aggressive-driving population. Motivation for participation in the study may be predictive of treatment outcome.

4.2. 2-month follow-up data

The study provided some evidence for the maintenance of the treatment gains. There was no driving-related recidivism in the court-referred sample. Two members were arrested for non-driving related crimes between the post-treatment and 2-month follow-up point. The effect of a cognitive-behavioral intervention on the aggressive driving behaviors thus appears to be relatively enduring. Two-month follow-up results revealed significant improvements between reported initial baseline driving behaviors and 2-month follow-up aggressive driving behaviors. There was no significant difference between post-treatment CPSR scores and 2-month follow-up scores, although there was a slight trend towards loss of improvement (post-treatment CPSR score of 0.61, 2-month follow-up average CPSR score of 0.56). Thus it appears, on average, that treatment gains realized at post-treatment were maintained. Self-report measures also evidenced continued improvement in measures of psychological distress and fairly good maintenance of improvements in general anger and driving anger. It is worth noting that all DSP subscales (direct measures of aggressive driving behaviors) showed continued arithmetic improvement between the post-treatment point and 2 month follow-up.

4.3. Study limitations

There were several limitations in the current study. The reliance entirely on self-report measures is potentially problematic. The chance for untruthful or misleading responses is heightened whenever one is working with a court-mandated population. Consistently throughout the program, members of the CR group appeared unwilling to endorse any level of aggressive behavior or psychological distress. For a few individuals, the lack of responsivity appeared to involve 'faking good' or clearly dishonest responding. When responses were clearly dishonest, the data were removed from analyses. This subset of individuals presented clinically as the most antisocial.

However, more often, subjects who endorsed little symptomatology were found to be substantially lacking in insight. Denial of the problem of aggressive driving among the number of court-referred subjects appeared to be a direct result of this lack of insight. Serious and dangerous driving behaviors were simply not perceived to be problematic to these individuals. Some felt entirely justified in their actions, especially when aggressive driving behaviors were reactions to perceived wrongdoing on the part of other drivers. Thus the low base rate of reported driving behaviors and low endorsement of items on self-report measures may be conceptualized as poor empathy for other drivers and poor insight into one's own behavior. This conceptualization directly informs treatment formulation. For these individuals, the over-riding goal of treatment was to help them gain an insight into their aggression and begin to fully understand the impact and consequences of their behavior on society. The ability to finally accept responsibility for driving behaviors directly predicted treatment outcome. Future studies with this population should involve substantial effort towards this goal of accepting responsibility for behaviors.

To overcome the self-report limitation, use of behavioral and psychophysiological measures while the participant operated a driving simulator would be a first step.

A second limitation is that a single professional performed all of the treatments and all of the pre-treatment assessment interviews. This confounding of therapist and assessor is not as serious a matter at the post-treatment assessment since no detailed interviews were conducted. While having the information from the pre-treatment assessment is helpful in therapy, the single therapist is a decided limitation.

The small sample size of the self-referred population is also problematic. The study received fairly extensive media coverage and was advertised to some extent. However, the emotion of anger itself is often experienced as a catharsis or a 'stress-reliever'. As such, the experience of anger can be very reinforcing. The automobile provides the perfect environment to relieve one's stress or to express anger in an anonymous fashion. The relative anonymity and the ability for a quick escape leave the perpetrator relatively unpunished and unaccountable for his/her actions. Therefore, aggressive driving may not be a behavior experienced as abhorrent or uncomfortable to the aggressive driver him/herself. Furthermore, the vast majority of individuals in the program (CR or SR) did not feel at fault or to blame for aggressive driving behaviors. Quite the contrary, many group discussions centered around what to do about the 'other driver' on the roadways. Thus it appears that the majority of aggressive drivers (as sampled in this study) considered themselves to be good drivers and view their non-aggressive counterparts on the roadways as 'the problem'.

A final limitation is the duration of follow-up. While it was twice as long as that of Deffen-

bacher et al. (2000), it was only 2 months. Much longer follow-ups and retrieval of police records would be desirable in future research.

5. Conclusion

In conclusion, the findings could directly impact the way that we currently deal with aggressive drivers. As we have seen in the previous literature, anger continually escalates if not addressed early on. Rather than ticketing and fining drivers for overt aggression on the roadways, our program offers an intervention targeting the core behavior. Similarly to a defensive driving course or a drunk-driving program, the current program offers a brief, viable alternative to the court system. Participation in the program may eventually save someone's life. As one participant spontaneously reported, "Before taking this class, I never considered myself an aggressive driver. However, I think if I hadn't taken this class, I would have eventually become so angry that I would have killed someone on the roads."

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