

EFFECTS OF ALCOHOL INTAKE AND INDUCED FRUSTRATION ON FIRE-STARTING DISPOSITION

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The object of the present study was to see whether there are tendencies towards reactive arson, measured as the relationships among frustration, intoxication, and a disposition to start fires. One hundred individuals, 50 men and 50 women, participated. All were students and were randomly assigned to 1 of 5 experimental groups, namely control, placebo, frustration, alcohol, and alcohol + frustration. A projective test was devised which required the participant to complete a short story where the content involved a person who had suffered humiliation and persecution and who was fingering a box of matches in his/her pocket. Results indicated that frustration increases the probability of starting fires, but, in this study, alcohol did not increase the degree of relation to fire. Results also suggest that there are strong cognitive barriers in a population of university students against fantasizing about starting fires.

Keywords: alcohol intake, arson, fire, induced frustration, students.

According to Wiklund (1983) it is possible to distinguish two main types of arson: *goal-oriented gain* and *reactive* (emotional) arson. In goal-oriented arson the fire is an instrument for achieving a particular objective, whereas reactive arson is a reaction to previous events. Reactive arson is an impulsive reaction to an acute crisis or to long-term chaotic conditions (Wiklund). The frustrations which help build up the inner tension can be traced to the days or months just prior to the fire. The triggering event may be of a fairly banal nature but the individual's background up to that point may include many crises. Starting a fire helps relieve the feelings of anxiety, powerlessness, depression, and despair. Alcohol, peer pressure, and low intellectual ability reduce the individual's inhibitions so that they give way to the impulse to start a fire. Alcohol is very common in connection with arson. Wiklund found that as many as 66% are under the influence of alcohol when they start a fire. Expected positive consequences of the

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fire make it easier to give in to the impulse. Negative consequences can worsen the sense of frustration and may even increase the risk of arson.

Results of experimental studies show that the intake of alcohol increases aggressiveness in young men under special conditions (Gustafson, 1993, 1994) but that intoxication as such has no effect on aggressiveness unless it is combined with provocation (Taylor, Schmutte, Leonard, & Cranston, 1979) or frustration (Gustafson, 1985). Vandalism in the form of graffiti was found to increase in connection with the intake of alcohol and frustration in experimental studies, but neither the intake of alcohol nor frustration alone produces this significant difference (Nordmarker, Norlander, & Archer, 2000; Norlander, Nordmarker, & Archer, 1998).

Researchers have also found that there are gender differences in that female participants are more likely than men to “scrawl” under laboratory conditions. There is a marked difference between the sexes as regards registered cases of arson. In studies from the 1950s to 1985 the proportion of male arsonists has been placed at between 82-89% (Kolko, 1985; Stewart, 1993). The ratio of male to female arsonists is estimated at 6:1.

In research contexts, starting fires is usually related to deviant behavior, aggressiveness, emotional disturbances, and poor impulse control. No studies were found in the PsychLit or Medline databases in which a normal psychological perspective was adopted or normal psychological scales or instruments were used.

In a study of sexual offenders Tidefors-Andersson (2000) applied the Change-Stability (FS), a test which is said to measure creative attitudes with respect to change and stability (Holmquist, 1986). It was found that sexual offenders achieved much lower values on the creative attitude test (i.e., they were more oriented towards stability and less inclined to change) than the normal population; this was interpreted as an expression of a poor capacity for symbolical thinking. According to Ekvall and Holmquist (1986) a creative attitude is characterized by openness, tolerance in the face of uncertainty and ambiguity, and a positive attitude to ideas produced by others. An instrument that measures creative ability can also provide a picture of an individual's capacity for symbolic thinking (Piaget, 1969/1972). Children and adolescents playing with fire might do so because of their lack of capacity for symbolic thinking.

In an optimistic approach to life there is a strong expectation that despite setbacks and frustrations things will generally turn out all right (Goleman, 1998a). Optimists tend to solve their problems more successfully than pessimists. They have different coping strategies, in that the optimist has a more active problem-solving strategy and more often concludes that problems can be solved (provided that they are open to solution). Scheier and Carver (1985) maintain that optimism, interpreted as a powerful personality variable, is a significant factor in how people control their actions. The Life Orientation Test (LOT) has been con-

structed to measure the degree of available optimism.

To summarize, it may be said that research on arson is epidemiological and descriptive, and has been carried out primarily on clinical groups. A survey of the literature databases PsychLit and Medline has not produced any experimental studies in which a motive or a disposition to start fires has been related to hypothetical triggering variables.

The aim in this experimental study was to see whether, even in nonclinical groups, there are tendencies towards reactive arson, measured as a relation between frustration, intoxication, and a disposition to start fires. Further, it was considered whether there was a relationship between the disposition to start fires and personality variables which may be assumed to be relevant such as creative attitude and degree of optimism. A further objective was to see whether the disposition to start fires could be studied by experimental method.

METHOD

PARTICIPANTS

The experiment was conducted in the Alcohol Research Laboratory at Karlstad University (Sweden). One hundred individuals, 50 men and 50 women, participated; all were undergraduate students recruited on campus. Participants were randomly assigned to one of five experimental groups (see "Design and alcoholic drinks"). The mean age for the population as a whole was 24.58 years ($SD = 6.37$, range = 19-38) and the mean weight was 70.69 kg ($SD = 13.41$, range = 60-118.50). The self-reported mean alcohol consumption for the group as a whole was 410.70 ml 100% alcohol per month ($SD = 265.21$) in comparison with the Swedish average (per capita, aged 15 or more) of 667 ml 100% alcohol per month (Kühlhorn, Hibell, Larsson, Ramstedt, & Zetterberg, 2000). There were no (two-way ANOVA) significant differences between the groups or between the sexes with regard to age and number of academic terms spent at Karlstad University ($ps > 0.05$). There was no (two-way ANOVA) significant difference between the groups with regard to alcohol consumption ($p = 0.798$) but there was a significant difference between the sexes [$F(1, 90) = 10.54$, $p = 0.002$] indicating that the male participants ($M = 495.17$, $SD = 323.42$) had higher alcohol consumption (per month) than the female participants ($M = 326.23$, $SD = 151.50$). Further, there was no significant difference between the groups with regard to weight ($p = 0.981$) but there was a significant difference between the sexes [$F(1, 90) = 36.42$, $p < 0.001$] indicating that the male participants ($M = 78.36$, $SD = 11.78$) weighed more than the female participants ($M = 63.69$, $SD = 8.99$). There were no significant differences (Kruskal-Wallis) between the experimental groups in regard to nicotine consumption, number of siblings, position in order of siblings, relationship with family, female partici-

pants' menstrual status, intake of contraceptive pills ($ps > 0.19$). There were no significant gender differences (Mann-Whitney U) in regard to nicotine consumption, number of siblings, position in order of siblings, and relationship with family ($ps > 0.1$).

A questionnaire was administered after the experimental manipulations, concerned with participants' history of behavior with fires during childhood and adolescence. Sixty-three percent of the participants indicated that they had played with fire as children whilst 37% had not. The participants indicated they had set fire to the following objects: grass, leaves, paper, personal property, and waste paper baskets. The incidence of fire-setting included: 39% had set fire to one of these objects, 20% to two, 9% to four, and 1% to five. Fourteen percent stated that playing with fire was common, whilst 54% said that it occurred less frequently. The motives for playing with fire had the following distribution: 50% wanted to see it burn, 31% indicated excitement as a motive, 19% said they did not know why they played with fire, 18% were bored, 2% indicated the desire to destroy, and 2% said they had started a fire as a reaction to an event. In 7% of the cases playing with fire had resulted in damage and in 19% they had managed to put out the fire themselves. Thirty-eight percent of the respondents said that they had nothing to do with fire today whilst 62% indicated that they had. The responses were distributed in a similar fashion across the groups, percentage-wise and with respect to significances (chi-square, goodness-of-fit).

DESIGN AND ALCOHOLIC DRINKS

Participants were randomly assigned in equal numbers (10 men and 10 women) to each of the five experimental groups; *control*, *placebo*, *frustration*, *alcohol*, and *alcohol + frustration*. Each participant received a beverage with the following contents: 5.0 ml tonic water (Schweppes) per kg body weight in the *control group* and the *frustration group*; 5.0 ml tonic per kg body weight plus 25 ml vodka essence (Simpson), with a few drops of vodka smeared on the inside of the glass to provide the taste and smell of alcohol in the *placebo group*; 1.0 ml of 100% alcohol per kg body weight given in the form of colourless commercial Swedish vodka (Absolut Vodka), 40% by volume, mixed with an equal volume of tonic water in the *alcohol group* and in the *alcohol + frustration group*.

INSTRUMENTS

Background data. A demographic questionnaire with general background data.

FS – Change and Stability. An attitude to change and stability test (Holmquist, 1986) which correlates highly with several creativity tests was applied. The test

consists of 20 items of the type: "Risk-taking is necessary for success", and each participant was asked to respond on a 4-point scale, ranging from *agree* to *disagree*. There was no time limit for the FS test.

LOT – Life Orientation Test. The test (Scheier & Carver, 1985) consists of eight items, plus four filler items. The task of each participant is to indicate whether or not one is in agreement with each of the items described, on a scale of 0–4, where 0 indicates *strongly disagree* and 4 indicates *strongly agree*. The test measures dispositional optimism, defined in terms of generalized outcome expectancies. There was no time limit for the LOT test.

Frustration-inducing task. One problem-solving task (Johansen, 1979) was adjusted so that it was impossible to solve. In the original version the problem required the individual to form three squares out of seven toothpicks and break only one of the toothpicks. As a frustration-inducing task, the number of toothpicks was reduced to six and the participant was given written instructions that the task could normally be solved in fifteen minutes.

Fire narrative. For this study a projective test was devised requiring the participant to complete a short story in which the content involved a person (a man if the participant was male and a woman if they were female) returning to their old school, where they had suffered humiliation and persecution. Each individual in the story is observed walking through the corridors remembering what had happened and fingering a box of matches in their pocket. The test had a time limit and had to be completed in five minutes. Three mutually independent judges assessed the resulting narrative from two standpoints: *the number of fictive fires* and *the degree of relation to fire*. Fictive fires refers to the number of fires started by the main character in the story. In regard to relation to fire the assessment focused on the story content. The assessment used a 10-point scale where 0 = *no focus* and 10 = *a very great focus*. Zero was given when the content did not center on fire. The notion of *consensual definition* (Amabile, 1983) was used in connection with the degree of relation to fire, that is the individual assessor based his assessment on his own feeling for, and evaluation of, the concept.

Sparkler. A sparkler was hung up on a line and participants were instructed to light it and observe it until it had burnt out. Thereafter they were required to assess their experience with a cross on a VAS scale with a 100mm ungraded line from *no experience at all* to *a very intense experience*.

Fire questionnaire. A questionnaire concerned with fire behavior in childhood and adolescence.

PROCEDURE

When each participant arrived at the laboratory he or she was required to provide a breath sample (LION SD 2) for breath alcohol analysis (BAL 1). None of the participants showed a positive result in the breathalyser test and all were

allowed to participate in the experiment. Next, the participant was asked to sign a contract in which they gave a guarantee that they were not currently using any form of medication. They were also required to promise not to discuss the experiment with any other person(s) until all the experiments had been concluded. Further, they promised not to drive a car or ride a bicycle until at least nine hours after the completion of the experiment, and that none of the female participants was pregnant (there was no separate contract for female participants). Next, they were weighed and were then asked, in a common randomized order, to complete the FS and LOT tests, and a questionnaire concerning background information. Whilst this was in progress, the person in charge of the experiment drew lots to assign the participants to a group.

They then received their assigned alcoholic or non-alcoholic drink. Each participant was allowed to drink during a 20-minute period and then made to wait for an additional 15 minutes. The members of the *alcohol + frustration* and the *frustration groups* were allowed to carry out the frustration-inducing task while consuming their drink and spending the subsequent “waiting-period“ (20 + 15 = 35 minutes). Following this, a second breath analysis sample was secured (BAL 2), and the fire narrative and the sparkler were tested on all the participants. Thereafter the participants were asked to estimate the amount of alcohol in the drinks and to complete the fire questionnaire. After the test session a final breath sample was collected (BAL 3) and this was followed by a debriefing. Then the participants were reminded of the contract they had signed, that is the promise not to drive a car or ride a bicycle until at least nine hours after the completion of the experiment.

RESULTS

BLOOD ALCOHOL LEVELS (BALs)

All the participants showed zero (undetectable) blood alcohol levels (BAL 1) when they arrived at the laboratory. The mean blood alcohol level as measured immediately before (BAL 2) and after (BAL 3) the test session was as follows: for the *alcohol group* 0.076% ($SD = 0.035$) and 0.080% ($SD = 0.026$) respectively, which should be compared with BAL 2 ($M = 0.080\%$, $SD = 0.026$) and BAL 3 ($M = 0.078\%$, $SD = 0.029$) for the *alcohol + frustration group*. Two-way ANOVAs showed no significant differences between the groups or the sexes and no interactions in regard to BAL 2 and BAL 3 ($ps > 0.06$).

INTERJUDGE RELIABILITIES

Regression analysis (enter-method) was used for calculating the multiple correlation coefficient (R), which showed significant correlations between the three judges for R with regard to the number of fictive fires or the absence of them ($R = 0.91$, $p < 0.001$), and the degree of relation to fire ($R = 0.93$, $p < 0.001$). Since

the regression analysis indicated high ($R > 0.90$) R values, it was considered meaningful to summate the results from the three judges for the fictive fires and average the results for the degree of relation to fire relation.

DEPENDENT VARIABLES

Analysis of variance (5*2 factorial design) was used with group and gender as independent variables and fictive fires, degree of relation to fire and the experience of the sparklers as dependent variables. The results of the two-way ANOVAs and, where appropriate, post hoc tests are described below. For means and standard deviations see Table 1.

TABLE 1
EFFECTS OF CONTROL, PLACEBO, FRUSTRATION, ALCOHOL, AND ALCOHOL + FRUSTRATION TREATMENTS ON MEANS AND STANDARD DEVIATIONS OF FICTIVE FIRES, DEGREE OF FIRE RELATION, AND SPARKLERS.

	Control	Placebo	Frustration	Alcohol	Alco. + Frustr.
Fictive fires	0.35 (0.88)	1.00 (1.30)	0.70 (1.26)	0.80 (1.32)	0.25 (0.72)
Fire relation	3.45 (2.72)	3.88 (3.62)	5.32 (3.54)	2.95 (3.63)	1.77 (1.75)
Sparklers	38.05 (27.65)	45.05 (18.99)	41.10 (27.38)	45.05 (24.81)	48.45 (31.43)

(a) *Fictive fires*. Two-way ANOVAs showed no significant effects ($ps > 0.15$).

(b) *Degree of relation to fire*. Two-way ANOVAs showed a significant difference between the groups [$F(4, 90) = 3.47, p = 0.011$], but no significant differences in regard to gender and interaction ($ps > 0.2$). A post hoc test (Tukey-HSD, 5% level) indicated that the frustration group had a greater relation to fire as compared to both the *alcohol + frustration* and *alcohol* groups.

(c) *Experience of sparklers*. Two way ANOVAs showed no significant differences with regard to interaction or groups ($ps > 0.6$), but there was a significant difference with regard to gender [$F(1, 90) = 18.39, p > 0.001$]. Further analyses showed that the female participants experienced the sparklers as more grandiose ($M = 54.02, SD = 26.35$) as compared to male participants ($M = 33.06, SD = 21.37$).

DEPENDENT VARIABLES VS. CHANGE - STABILITY (FS) AND LIFE ORIENTATION TEST (LOT)

Analyses with one-way ANOVAs with F_s (cut in the middle with low scores indicating stability and high scores change) as an independent variable showed no significant differences for the degree of fire relation or the experience of sparklers ($ps > 0.1$), but it did for fictive fires [$F(1, 98) = 5.34, p = 0.041$] where further analyses showed that the participants who were oriented towards change had more fictive fires ($M = 0.83, SD = 1.27$) than the stability oriented partici-

pants ($M = 0.37$, $SD = 0.90$).

One-way ANOVAs, with LOT (cut in the middle with low scores indicating pessimists and high scores optimists) as an independent variable showed no significant differences for fictive fires and the experience of sparklers ($ps > 0.1$), but it did for the degree of relation to fire [$F(1, 98) = 4.17$, $p = 0.044$] where further analyses showed that optimists had a higher degree of relation to fire ($M = 4.06$, $SD = 3.30$) than pessimists ($M = 2.73$, $SD = 3.16$). There was also a significant difference in respect of LOT for the self-declared disposition to start fires [$F(1, 98) = 5.88$, $p = 0.017$] where further analyses showed that optimists had a greater disposition to start fires as children ($M = 1.64$, $SD = 1.26$) than did pessimists ($M = 1.07$, $SD = 1.07$).

DISCUSSION

The main result gained in the study was the emergence of a difference between the groups with respect to the degree of relation to fire where the *frustration group* was more focused on fire than both the *alcohol + frustration* and *alcohol groups*. The results would suggest that frustration increases the probability of starting fires. This is commensurate with the results attained in clinical studies. Wiklund (1983) among others, describes starting fires as a reaction to frustrating circumstances, so-called *reactive arson*. Conversely, alcohol did not increase the degree of relation to fire, something that – given the results gained in previous clinical studies – might have been expected. Moreover, in experimental studies of vandalism (e.g. Nordmarker et al., 2000), it has been indicated that it is the combination of frustration and alcohol which triggers the destructive behavior. In the present study alcohol seems to have had a frustration-subduing role.

One explanation of these findings might be the type and degree of frustration experienced by the participants. It could have been uniquely different from the clinical group (i.e., one experience of failure in solving a problem cannot be compared to chaotic life circumstances). It must also be taken into account that the participants in the clinical studies consisted of individuals with social problems, whereas in the present investigation the participants were students. The results may differ from the experimental studies because a completely different dependent variable has been used here. The disposition to start fires may perhaps not be directly comparable to, for instance, destructive graffiti.

As regards fictive fires there was no difference between the groups. A limited number of students in fact fantasized that the main character in the story started one or more fires (26%). This would suggest that there are strong cognitive barriers in a population of university students against fantasizing about starting fires and that these barriers were not affected by either the frustration-inducing task

or alcohol. Those who, nevertheless, broke through the barriers did not do so through lack of ability to symbolize (i.e., those who were stability-oriented on FS), but it was those who were most disposed to change who dared to break the pattern. The ability to symbolize could also serve as a protection. With this ability there is no need to start real fires as an answer to a frustration since the situation can be handled mentally. This can be compared with the fact that it was the most optimistic participants who had the highest degree of relation to fire. It is very possible that a clinical sample would produce a completely different response pattern. When trying to explain the motive for their crime, arsonists often say that the fire was set as revenge or a cry for help (Bradford, 1982). The fire has also been seen as the final attempt to make a change in one's life conditions when everything else has been in vain (Jacksson, Glass, & Hope, 1987).

Furthermore, there was no difference between the groups regarding fascination with sparks from sparklers. There was, however, a difference between the genders in terms of women experiencing sparklers as more exciting. It is possible that women are more fascinated by fire and sparks in safe and controlled environments. A completely different explanation could be that in Swedish culture sparklers are associated with Christmas and that preparations for the Christmas holiday season have traditionally been seen as being in the female sphere. If fireworks and rockets had been used instead, it is possible that the male participants would have appreciated them more than did the women.

Background data showed that 63% of the participants in the present study played with fire as children, a figure which is comparable with that given by Terjestam and Rydén (1995) for compulsory school children (80%), and Perrin-Wallqvist (2001) for young men enlisting for military service (70%). The vast majority channel their interest in fire in a socially acceptable manner and only a few individuals develop asocial behavior in these contexts. This was the first experiment on the disposition to start fires and the question of whether the experimental method can help cast light on this phenomenon – that is to say, can contribute to an understanding of the mechanism whereby a few individuals develop asocial arsonist behavior – cannot be answered here. The technique of using fire narratives and the application of tests such as LOT and FS must first be tried on clinical groups so that comparative data can be obtained. Further, it will be necessary to test and compare different dependent variables. Results indicate, however, that it may be worth continuing with the work of developing experimental techniques for studying the disposition to start fires.

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