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The N_2 component of the event-related brain potential in abstinent alcoholics [1]

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Summary The latencies of the N_2 component of the ERP and reaction time were manipulated in abstinent alcoholics and controls. The experimental design consisted of visual stimuli that differed in difficulty of discrimination. N_2 latencies were found to be significantly delayed in alcoholics compared to controls, particularly for the easy discrimination. While controls manifested significantly earlier N_2 latencies for the easy discrimination compared to the difficult discrimination, alcoholics did not manifest any significant difference in the latency of N_2 as a function of the level of difficulty. There were no significant differences between groups in terms of RT or number of errors. In addition, alcoholics displayed significantly reduced P_3 amplitudes to target stimuli compared to controls. These results suggest that match/mismatch processes are impaired in alcoholics and that they have difficulty evaluating the potential significance of a stimulus.

Key words: N_2 component; event-related brain potential; alcoholics

For the past several years we have examined electrophysiological aberrations in abstinent alcoholics with the use of event-related brain potentials (ERPs) (Porjesz and Begleiter 1981, 1983, 1985a,b). These ERP techniques require the subject to be actively engaged in a task, usually an information-processing task. ERPs can be recorded in conjunction with behavior, or when no behavioral response is required; they can be recorded to both attended and unattended stimuli. We have designed our experiments in alcoholics to examine electrophysiological disturbances of specific ERP components which have been well documented in normal subjects.

In one bimodal study (Porjesz and Begleiter 1979), we found that the ERP Nd component (~100 msec), a negative component sensitive to the selection of a relevant or irrelevant information-processing channel (e.g., stimulus modality) (Hillyard et al. 1978; Näätänen 1982), was diminished in alcoholics (to all stimuli whether they were in the relevant or irrelevant stimulus modality). This indicates that alcoholics have difficulty differentiating between relevant and irrelevant inputs, suggesting a deficit in 'sensory filtering.'

We have also recently reported that the P_3 or P_{300} component is markedly reduced or absent in alcoholics (Porjesz et al. 1980a,b; Begleiter et al. 1980; Porjesz and Begleiter 1981, 1982, 1983, 1985a,b). This is a prominent, positive endogenous component, occurring approximately 300 msec after the stimulus; it can only be elicited under rather specific conditions related to the significance of a stimulus, e.g., task relevance (Sutton et al. 1967), unpredictability (Donchin et al. 1978), infrequency (Tueting et al. 1971), motivational factors (Begleiter et al. 1983). Alcoholics do not manifest large P_3s to rarely occurring target stimuli in a target-selection paradigm, but maintain similar wave forms to all stimuli regardless of their significance.

We now report a study in alcoholics designed

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to investigate the N_2 or N_{200} component of the ERP (a negative deflection occurring at approximately 200 msec after the stimulus). This is a modality-specific component, with a maximum amplitude at occipito-parietal scalp for the visual modality, and at central regions for the auditory modality (Simson et al. 1976, 1977). Recent evidence suggests that the latency of the N_2 component can be taken as an early index of stimulus evaluation time (Renault and Lesèvre 1979); the more difficult a discrimination, the later the N_2 latency (Ritter 1978; Ritter et al. 1979; Gaillard and Lawson 1980; Näätänen et al. 1980; Towey et al. 1980; Lawson and Gaillard 1981).

As alcoholics are known to manifest difficulty in processing visual-spatial information, we were interested in determining whether their decreased capacity to perform visual-spatial tasks was related to an increase in stimulus evaluation time. The N_2 component is a better index of stimulus evaluation than reaction time (RT) because it occurs too early to be confounded by the motor response (and is independent of RT). The RT is a complex measure of speed of information processing, as it depends on the end product of stimulus evaluation, response selection and organization, and the motor response. Therefore, although there are some reports of delayed RTs in alcoholics (Talland 1963; Bertera and Parsons 1973; Vivian et al. 1973), these studies cannot determine which aspect(s) of information processing are slower in alcoholics. We were interested in specifically examining the speed of stimulus evaluation in alcoholics using the latency of the N_2 component of the ERP. The present N_2 study was designed to assess speed of stimulus evaluation in alcoholics in a visual-spatial reaction time task involving easy and difficult line orientation discriminations. This RT design enabled us to electrophysiologically investigate the relationship between difficulty of discrimination, N_2 latency, P_3 characteristics and RT in abstinent alcoholics.

Methods

Subjects

Two groups of age- and education-matched, right-handed subjects were studied: 20 alcoholics and 20 controls. The alcoholics were diagnosed according to the Research Diagnostic Criteria (RDC) and consisted of 14 males and 6 females, with a mean age of 35.52 (S.D. = 7.44). They had been drinking an average of 13.4 years and had been abstinent an average of 3.85 weeks. Only neurologically intact alcoholics who were free of liver disease (cirrhosis, hepatic encephalopathy) and without history of head trauma and seizures unrelated to alcohol withdrawal were accepted for the study. Alcoholics with histories of abuse of other psychoactive drugs were excluded. In order to be tested, alcoholics had to be abstinent from alcohol and all medication for a minimum of 3 weeks.

The control group consisted of a matched group of medication-free healthy paid volunteers (18 males and 2 females), with a mean age of 32.03 (S.D. = 7.66). They were occasional 'social drinkers' who drank an average of 10.19 glasses of wine or beer a month (or the equivalent). Subjects were excluded if they ever had a drinking problem or were total abstainers.

Procedure

Subjects were seated in a sound-attenuated enclosure with their heads resting on a chin rest, 44 cm from a computer-generated display (CRT). They were instructed to fixate on a fixation point in the center of the CRT. They were presented with 240 straight line stimuli (42 mm), rotated in 3 possible orientations, all passing through the central fixation point (visual angle 5.46°). The stimuli were presented one at a time at a random rate (2–5 sec). The non-target (NT) stimulus was a frequently occurring vertical line (75%). Two types of rarely occurring line stimuli were used as targets: an easy discrimination (horizontal line), which differed from vertical by 90° (T_{90}), and a difficult discrimination that differed from vertical by only 3° (T_3); each target stimulus occurred 30 times. The subject's task was to press a button to all non-vertical stimuli as quickly as possible in a target-selection, reaction-time paradigm.

Electrodes

Electrodes were placed at midline frontal (Fz),

central (Cz), parietal (Pz) and occipital (Oz) scalp locations as well as bilaterally at right and left parietal (P_3 and P_4, respectively) in accordance with the 10-20 international system. The linked ears served as reference and the nasion as ground. Vertical eye leads were used to monitor possible eye movement contamination and trials with excessive eye movements (>50 μV) were removed.

Event-related brain potentials (ERPs)

The ERPs were amplified 50,000 times with Grass P511J amplifiers (bandwidth 0.03–60 Hz). The ERPs were sampled by a PDP11/40 computer for 49 msec preceding the stimulus (baseline) and for a 700 msec epoch following the stimulus (142.86 pts/sec sampling rate).

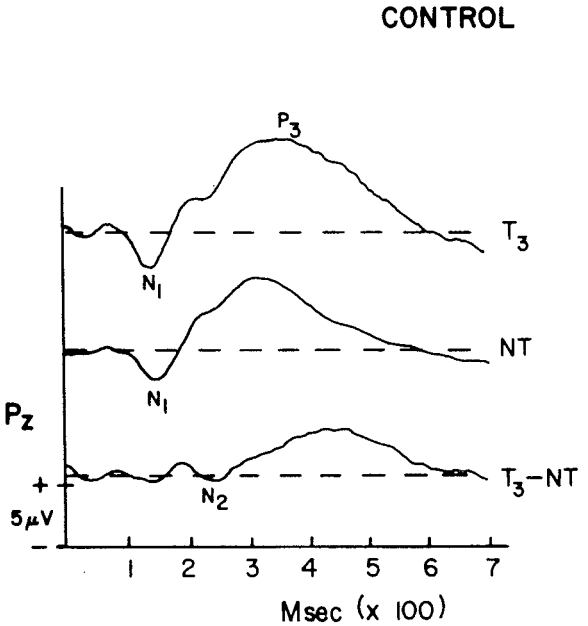

Fig. 1. Illustration of subtraction procedures. Top trace is the grand mean wave form of ERPs to 3° deviant target stimulus (T_3) at the parietal electrode for the control group. Notice that while the N_1 and P_3 components are very clear in this grand mean wave form, the P_2 and N_2 components overlap and are difficult to differentiate. Middle trace is the grand mean wave form to the frequently occurring non-target (vertical stimulus) at Pz in the control group. Notice that the target and non-target wave forms have a large N_1 component in common. The bottom trace illustrates the subtraction procedures, subtracting the frequent NT wave form (middle trace) from the rare target (top trace) wave form. Early components (P_1-N_1-P_2) common to both target and non-target stimuli tend to cancel out with these procedures leaving only the later components – N_2 and P_3 – which are elicited by rare target stimuli only. Notice that the N_2 component has emerged clearly.

The endogenous N_{200} component is often obscured by the simultaneously occurring P_{200} component under conditions with physically present, rare stimuli. Subtraction procedures (subtracting rare targets from frequent non-target stimuli) have made it possible to separate the N_2 component from the overlapping P_2 component; early exogenous components (P_1-N_1-P_2) common to both target and non-target stimuli cancel out with these procedures, leaving only the endogenous components, N_2 and P_3, which are only elicited by rare target stimuli (Simson et al. 1977) (Fig. 1).

The latency of N_2 was obtained from these difference wave forms for the easy (T_{90}-NT) and difficult (T_3-NT) targets for each subject. Baseline-peak and peak-peak amplitudes and latencies of P_1, N_1 and P_3 were also measured on the original average wave forms for the easy and difficult targets, as well as the non-targets for each subject. Two raters made these measurements independently ($r = 0.89$).

These measures were subjected to a Repeated Measures Analysis of Variance (BMDP) and independent and dependent t tests, wherever appropriate (Winer 1971). Degrees of freedom were reduced to 1 and N − 1 (1, 39) according to the method outlined by Jennings and Wood (1976) to take into account unequal variance-covariance matrices in repeated measure designs.

Results

Table I indicates that the latency of N_2 (based on subtraction wave forms) is significantly different between groups (F (1/39) = 12.49, $P < 0.01$), stimuli (F (1/39) = 16.72, $P < 0.001$) and stimuli × groups (F (1/39) = 7.48, $P < 0.01$). No other significant effects were obtained for the N_2 latency.

The t test results indicated that the latency of N_2 (based on subtraction wave forms) was earlier for the easy (T_{90}) discrimination than the difficult (T_3) discrimination in control subjects only (Figs. 2 and 3). The mean latency of N_2 peaked at 215.6 msec (S.D. 27.5) for the easy discrimination and at

TABLE I

ANOVA: latency of N_2 (based on subtraction wave forms using conservative $df = 1, 39$).

Source	F	P
Groups	12.49	< 0.01
Stimuli	16.72	< 0.001
Stimuli x groups	7.48	< 0.01
Electrodes	0.88	NS
Electrodes x groups	1.49	NS
Stimuli x electrodes	0.92	NS
Stimuli x electrodes x groups	1.51	NS

260.4 msec (S.D. 28.33) for the difficult discrimination at the Oz electrode, where it is maximum; this difference of 44.8 msec was statistically significant at $P < 0.001$ ($t = 7.01$). Similar results were obtained at the parietal lead. Unlike the control group, the small difference in N_2 latency between easy (276.5 msec) and difficult (288.4 msec) discriminations (11.9 msec) did not reach statistical significance in the alcoholic group (Fig. 3).

Furthermore, the N_2 latency occurred later in the alcoholic group than in the control group for both the easy and difficult discriminations (Figs. 3, 4 and 5). This latency difference between groups

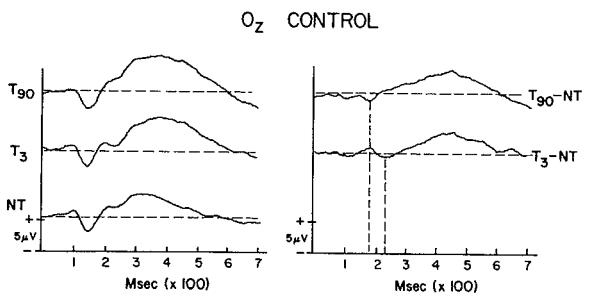

Fig. 2. N_2 latency to easy and difficult discriminations. On the left side of the figure are the grand mean ERP wave forms for easy target (T_{90}), difficult target (T_3) and non-target (NT) stimuli for the control group at the occipital (Oz) electrode. On the right side are the grand mean difference wave forms for the easy discrimination (T_{90}) (top), and for the difficult discrimination (bottom) (T_3). Notice that the latency of N_2 for the easy discrimination wave form occurs at 189 msec while the difficult discrimination wave form occurs at 245 msec. This is 56 msec later for the difficult discrimination wave form indicating that the more difficult the discrimination, the later the N_2 latency. Similar results were obtained at the parietal lead.

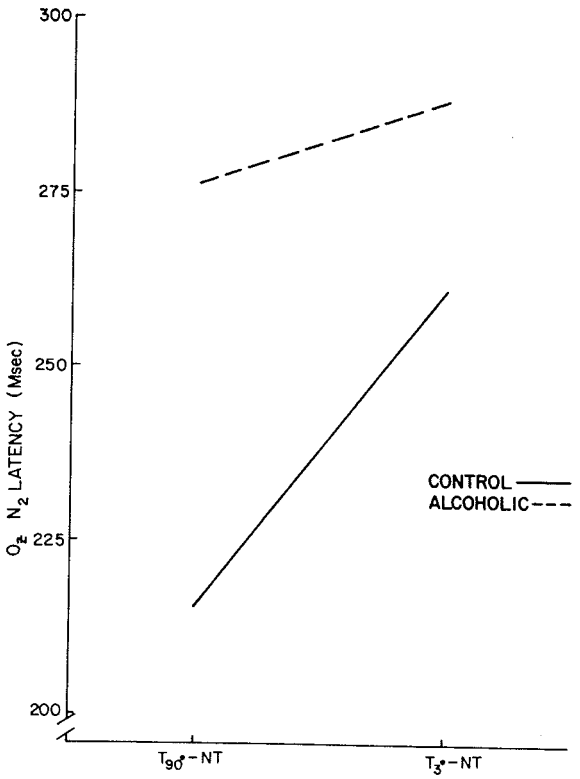

Fig. 3. Mean N_2 latencies in control (solid line) and alcoholic (dashed line) groups based on subtraction wave forms (T-TNT) for easy (T_{90}-TNT) and difficult (T_3-TNT) discriminations at the occipital electrode. Notice that the latency of N_2 increases significantly with task difficulty in the control group ($P < 0.001$) but not the alcoholic group. Also note that N_2 is significantly later in the alcoholic group than the control group for both the easy discrimination (61 msec, $P < 0.001$) and difficult discrimination (28 msec, $P < 0.05$).

was even more apparent for the easy discrimination, where it occurred 60.9 msec later in the alcoholic group than the control group ($t = 4.26$, $P < 0.001$); for the difficult discrimination, it only occurred 20.0 msec later. No significant sex differences in N_2 latency were obtained. The grand mean subtraction wave forms for the 2 groups of subjects are illustrated in Fig. 4 for the easy discrimination (T_{90}-NT) and in Fig. 5 for the difficult discrimination (T_3-NT).

ANOVA results of the amplitude of N_2 based on subtracted wave forms indicated significance for stimuli (F (1/39) = 5.58, $P < 0.05$) and electrodes (F (1/39) = 13.56, $P < 0.001$).

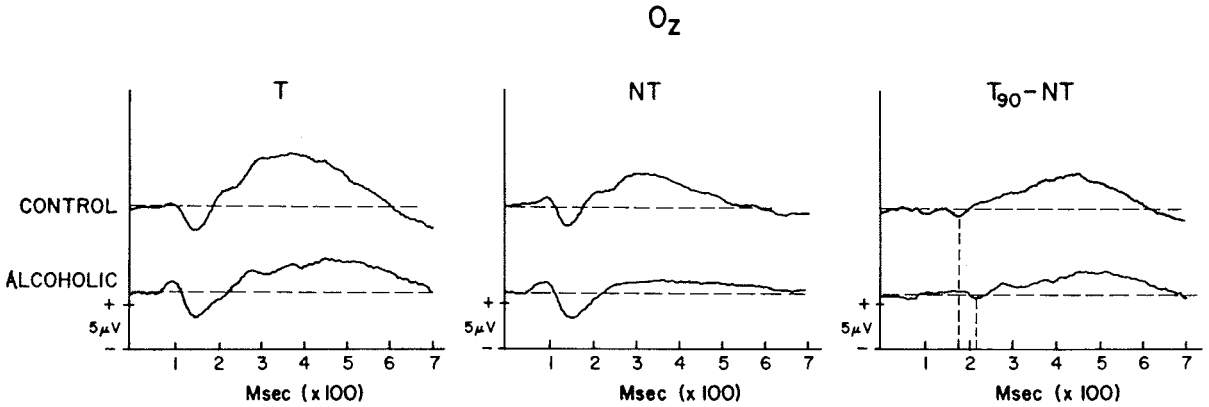

Fig. 4. Comparison of N_2 latency in controls and alcoholics for easy discrimination. On the left panel are the grand mean occipital (Oz) ERPs obtained to the easy discrimination (T_{90}) for the controls (top) and alcoholics (bottom). The middle tracings are the grand mean non-target (NT) wave forms recorded at Oz for each group of subjects, respectively. The right panel illustrates the grand mean subtraction wave forms for the control and alcoholic groups (T_{90}-NT). The latency of N_2 is marked with the dashed vertical lines. Notice the latency of N_2 occurs 35 msec earlier in the control group (189 msec) than in the alcoholic group (224 msec).

The reaction time (RT) data indicated that both groups of subjects responded significantly faster to the easy discrimination than the difficult discrimination. In the control group the mean RT was 519.36 msec (S.D. 92.51) for T_{90} and 572.32 msec (S.D. 134.08) for T_3; in the alcoholic group the mean RT was 510.66 (S.D. 90.47) for the easy target and 548.43 msec (S.D. 121.70) for the difficult target. There were no significant differences in RTs between the alcoholics and controls, although the alcoholics tended to have somewhat faster RTs than controls for both easy and difficult targets. However, the alcoholics also tended to have more false alarms, and they failed to correctly respond to target stimuli more often, particularly for the difficult discrimination. None of these differences in errors was significant.

Table II indicates that the amplitude of P_3

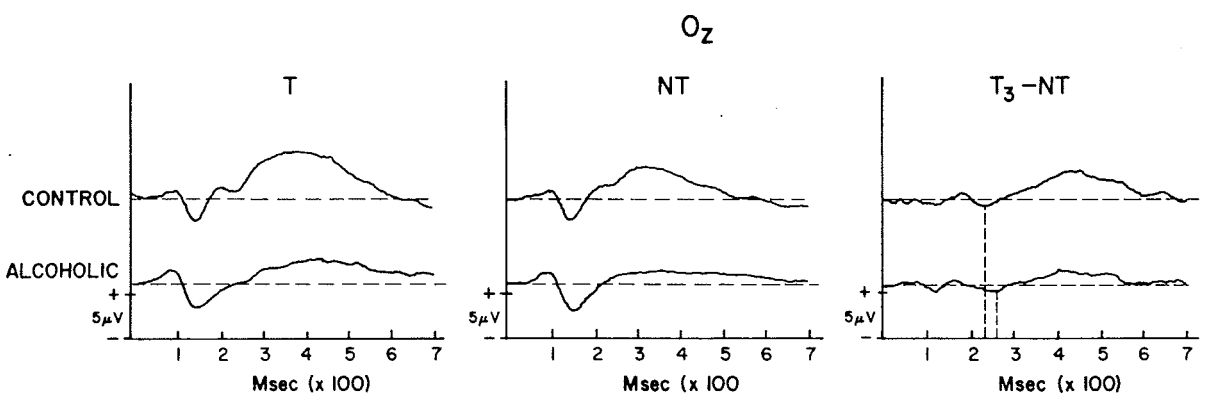

Fig. 5. Comparison of N_2 latency in controls and alcoholics for difficult discrimination. Grand mean ERP wave forms for the difficult discrimination (T_3) recorded at Oz in the two groups of subjects. On the left panel are the grand mean ERPs to T_3 in the control (top) and alcoholic (bottom) groups. The middle panel illustrates the grand mean ERPs obtained to NTs in each of the two groups. The grand mean subtraction wave forms (T_3-NT) are illustrated on the right panel for each group of subjects. The latency of N_2 is marked with the vertical dashed lines. Notice that the latency of N_2 is 28 msec later in the alcoholic group (273 msec) than in the control group (245 msec).

TABLE II

ANOVA: amplitude of P_3 (baseline-peak measures of original average wave forms, using conservative $df = 1, 39$).

Source	F	P
Groups	14.17	< 0.001
Stimuli	35.15	< 0.001
Stimuli × groups	2.25	NS
Electrodes	21.49	< 0.001
Electrodes × groups	6.52	< 0.05
Stimuli × electrodes	2.18	NS
Stimuli × electrodes × groups	2.08	NS

(based on original average wave forms) was significantly different for all main effects (see Table II), and the electrode × group interaction. The mean P_3 amplitudes at Pz for T_{90} were 8.52 μV (S.D. 2.83) and 4.74 μV (S.D. 1.98) for the control and alcoholic groups respectively; these values for T_3 were 7.48 μV (S.D. 3.11) for the controls and 4.58 μV (S.D. 1.79) for the alcoholics.

Individual t tests indicated that the amplitude of P_3 was significantly smaller in the alcoholic group than the control group for both the easy ($t = 3.61$, $P < 0.001$) and difficult ($t = 4.90$, $P < 0.001$) targets at the Pz lead where P_3 is maximum (Figs. 6 and 7, respectively). The P_3 amplitude was lower for the 3° target when compared to the 90°

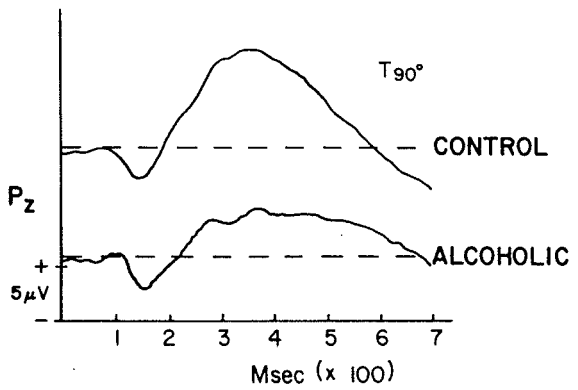

Fig. 6. Grand mean wave forms (unsubtracted) to the 90° target stimulus in the control group (top trace) and the alcoholic group (bottom trace) at the parietal (Pz) electrode. Notice the large P_3 component (positive deflection peaking between 300 and 400 msec). The amplitude of the control grand mean P_3 wave form is approximately double that of the alcoholic P_3 amplitude, and is significant at $P < 0.001$.

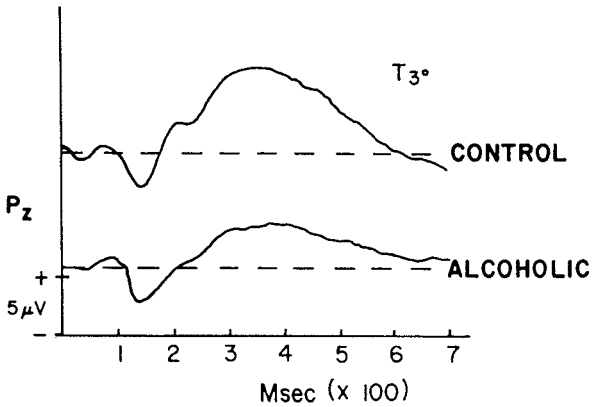

Fig. 7. Grand mean wave forms for the 3° target for the two groups of subjects. The P_3 amplitude difference between groups is significant at $P < 0.001$.

target in the control group, but not the alcoholic group. Furthermore, controls manifested significant target/non-target differences in baseline-peak measures of P_3 (T_{90}/NT, $t = 3.82$, $P < 0.001$; T_3/NT, $t = 82$, $P < 0.005$), while alcoholics did not.

Results of repeated measures ANOVA indicated that the latency of P_3 was significantly different between groups (F (1/39) = 14.96, $P < 0.001$), stimuli (F (1/39) = 4.84, $P < 0.05$), and stimuli × electrodes (F (1/39) = 5.42, $P < 0.05$). At the parietal lead, where P_3 is maximum, its latency occurred at 354.9 msec (S.D. 55.12) for the easy target and 370.3 msec (S.D. 58.09) for the difficult target in the control group, and at 396.7 msec (S.D. 54.81) and 391.3 msec (S.D. 56.91) for the easy and difficult targets respectively in the alcoholic group. The latency of P_3 was significantly later for the easy ($t = 2.38$, $P < 0.025$), but not the difficult target in the alcoholic group when compared to controls.

Discussion

Our results indicate that the latency of N_2 is directly related to the difficulty of visual discrimination in healthy control subjects in whom the N_2 latency to the difficult discrimination was significantly later than to the easy discrimination

(45 msec) (Fig. 3). However, in alcoholics N_2 latency did not clearly reflect difficulty of discrimination. This relationship between task difficulty and N_2 latency is predicted by the auditory ERP literature in which it has been demonstrated that the more difficult a pitch discrimination, the longer the processing time and the latency of N_2 (Näätänen et al. 1980; Fitzgerald and Picton 1983). This relationship has also been reported for easy and difficult auditory intensity discriminations (Towey et al. 1980), and phonetic CV syllables that differ in terms of the number of available cues (Gaillar and Lawson 1980). In the recent Fitzgerald and Picton (1983) experimental design, the easy and difficult rare targets were presented during the same run. This is similar to the procedure used in the present experimental paradigm.

The latency of N_2 occurred later in the alcoholic group than the control group for both the easy and difficult discriminations. As N_2 latency is taken to reflect stimulus evaluation time (Renault and Lesèvre 1979), it appears that the alcoholics find the discrimination task more difficult and hence need more time for stimulus evaluation. Interestingly, it seems as though they need proportionately more time to make an easy discrimination (vertical from horizontal) when compared to the controls (who can process this information more quickly), than to make a difficult discrimination (which both groups presumably find difficult).

Thus, based on these N_2 findings, there appear to be 2 aspects of stimulus evaluation that are aberrant in alcoholics: (1) they have longer stimulus evaluation processes than controls; (2) stimulus evaluation times do not reflect the difficulty of discrimination in alcoholics, but appear to be almost as long for easy discriminations as they are for difficult discriminations. These results suggest that for alcoholics, even the easy task is difficult and requires longer processing time. These findings imply that alcoholics adopt and undifferentiated mode of responding regardless of task requirements.

There were no significant differences in RTs between the 2 groups of subjects, although the alcoholics tended to have somewhat faster RTs than controls. However, the alcoholics tended to make more errors, both in terms of false alarms and missing target stimuli, although these results were not significant. This response pattern suggests that alcoholics adopt different response strategies than controls, stressing speed over accuracy (Kutas et al. 1977). It should be noted that the instructions in this study stressed accuracy, perhaps explaining the rather long RTs in the control group. This perhaps implies a lack of inhibition in alcoholics, reflected in their apparent inability to withhold responding until certainty of accuracy or correctness have been established.

In addition, alcoholics manifested significantly delayed P_3 latencies to easy, but not difficult discriminations when compared to controls; these P_3 latencies were in a range comparable to those expected for a difficult task. While we have never reported P_3 latency delays in alcoholics in our previous studies, these P_3 latency delays have been reported by Pfefferbaum et al. (1979, 1980) in a simple auditory target-selection paradigm. Perhaps task difficulty is the key factor which determines whether or not delays in P_3 latency are observed in alcoholics. These P_3 latency differences seem to be the consequence of the N_2 latency differences observed between groups.

Most studies investigating processing time, ERP measures and RT, try to correlate RT with the latency of the P_3 component (Kutas et al. 1977; Donchin 1979; Duncan-Johnson 1981; McCarthy and Donchin 1981; Pfefferbaum et al. 1983), where a high correlation between P_3 and RT has been associated with an accuracy strategy (Kutas et al. 1977). However, the P_3 component often occurs after the motor response has been made. More recently it has been reported that the earlier, modality-specific N_2 component also correlates with RT (Renault and Lesèvre 1979; Ritter et al. 1979, 1983; Renault et al. 1980, 1982). Recent evidence suggests that N_2 may be a better index of stimulus evaluation time than P_3, and that P_3 latency increases with task difficulty are in fact secondary to N_2 latency increases (Ritter et al. 1979, 1983; Towey et al. 1980). With increased task difficulty, the time interval between P_2 and N_2 has been reported to lengthen, while the interval between N_2 and P_3 remains constant (Towey et al. 1980), suggesting that it is the increase in N_2

that causes P_3 to increase. Interestingly, these increases in N_2 with task difficulty have been demonstrated in a non-reaction time task (Towey et al. 1980), indicating that N_2 is an index of evaluation time whether or not speed of responding is stressed. Therefore, N_2 may be more valuable as a measure of stimulus evaluation time than RT.

In addition to the latency results, we once again confirmed our previous finding that alcoholics have significantly depressed P_3 amplitudes (Porjesz et al. 1980a,b; Begleiter et al. 1980; Porjesz and Begleiter 1981, 1982, 1983, 1985a,b). These reduced P_3 amplitudes in abstinent alcoholics are not likely to be due to latency jitter, as we obtained low P_3 amplitudes following latency corrected averaging (LCA) procedures (Aunon and McGillem 1979) in abstinent alcoholics in a separate study (Porjesz and Begleiter 1985a,b).

While P_3 amplitudes are significantly depressed for both easy and difficult discriminations, this low amplitude is even more apparent for the easy discrimination, where control subjects manifest high P_3 voltages. The larger P_3 voltage to the 90° target in the control group is predicted on the basis of Ruchkin's equivocation hypothesis (Ruchkin and Sutton 1978) which states that the amplitude of P_3 depends on the amount of information delivered by a stimulus minus the amount lost due to uncertainty (equivocation), or the amount 'received.' Many studies have demonstrated that the more deviant a rare stimulus is from the background, the more easily discriminable it is (and hence the greater the certainty it has occurred), and the larger the P_3 amplitude (Ritter et al. 1972; Johnson and Donchin 1978; Ruchkin and Sutton 1978; Ford et al. 1979; Towey et al. 1980). While the control group manifested these selectively larger P_3s to the 90° target stimulus, there was no difference in P_3 amplitude on the basis of ease of discrimination in the alcoholic group. Perhaps, this indicates that alcoholics are more uncertain of the correctness of their decision than are controls, as they stress speed over accuracy. Furthermore, while the controls manifest significant target/non-target differences in baseline-peak measures of P_3, alcoholics do not.

Thus, in agreement with our previous findings, we report low P_3 voltages in abstinent alcoholics. Furthermore, alcoholics display less amplitude and latency differentiation in their ERPs to relevant discriminations, but rather seem to display uniform responses to changing environmental stimuli.

The neural origin(s) of the P_3 component is not clearly known at the present time. However, some evidence with intracranial recording implicates the medial temporal lobe as contributing to the generation of the scalp P_3 (Halgren et al. 1980; Wood et al. 1980, 1984; McCarthy 1985; Stapleton 1985; Smith et al. 1986). It has recently been suggested that source(s) within the frontal lobe are also involved in P_3 generation (McCarthy 1985). This finding coupled with the rather small effect of unilateral temporal lobectomy on scalp P_3 during auditory discrimination tasks (Wood et al. 1984; Stapleton 1985) suggests multiple brain sites contribute to the scalp P_3 (McCarthy 1985; Stapleton 1985; Smith et al. 1986).

Thus, on the basis of this visual-spatial, RT study we were able to detect two very different types of electrophysiological brain dysfunction in abstinent alcoholics, both reflected in the so-called endogenous components of the ERP: the N_2 and P_3 components. The first type involves the modality-specific N_{200} component, the component sensitive to stimulus evaluation time. The second type of brain anomaly is evident in the P_3 component. Alcoholics display low amplitudes, perhaps indicating that the neutral substrate subserving the production of P_3 voltages is defective.

Finally, on the basis of both endogenous ERP components (N_2 and P_3), it was concluded that alcoholics have difficulty evaluating the potential significance of a stimulus. They do not electrophysiologically differentiate between relevant and irrelevant inputs, or easy and difficult discriminations, but rather maintain the same ERP characteristics (both amplitude and latency) regardless of the task requirements.

This perhaps indicates that their template for match/mismatch decisions is lost (memory dysfunction) or not readily available (memory retrieval). In either case, this suggests a memory deficit where each incoming stimulus must be evaluated anew. Our data suggest that alcoholics manifest both types of brain dysfunction; the delay in N_2 latency suggests that the template for

comparison is not as easily accessible in the alcoholics, while the low P_3 voltages suggest that once retrieved, the match/mismatch processes themselves are impaired in chronic alcoholics.

Résumé

La composante N_2 du potentiel évoqué cérébral lié à l'événement (ERP) chez des alcooliques abstinents

La latence de la composante N_2 de l'ERP et le temps de réaction (TR) ont été étudiés chez des alcooliques abstinents et chez des témoins. Le test expérimental comprenait une gamme de stimulus visuels plus ou moins difficiles à discriminer. Les latences de N_2 se sont révélées significativement plus longues chez les alcooliques que chez les témoins, surtout pour les discriminations simples. Alors que les témoins présentaient des latences pour N_2 significativement plus brèves pour les discriminations simples par rapport aux discriminations difficiles, les alcooliques n'ont pas présenté une telle différence significative, pour la latence de N_2 en fonction du niveau de difficulté. Il n'y avait pas de différences significatives entre les groupes en termes de TR ou de nombre d'erreurs. De plus, les alcooliques ont présenté une P_3 d'amplitude significativement réduite pour le stimulus cible, comparée aux témoins. Ces résultats suggèrent que les processus d'appariement/non appariement sont déficitaires chez les alcooliques et qu'ils ont des difficultés à évaluer la significativité potentielle d'un stimulus.

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