intervals, are matched to the functions they perform.

The synaptic mechanisms that determine the durations of the IPSP's in the crayfish are unknown. However, γ-aminobutyric acid (GABA) is the putative transmitter at two synapses with PSP's of long duration [those onto the motor giant (*6, 7*) and onto the flexor muscles (*24*)] and at two synapses with PSP's of short duration [those onto the muscle receptor organ (*25*) and onto the extensor muscles (*24*)]. Since these synapses are accessible, it should be possible to distinguish among explanations based on different durations of transmitter release, transmitter inactivation, or postsynaptic response.

The behavioral significance of PSP durations shown here calls attention to the importance of PSP durations in neural information processing and should encourage investigations of the mechanisms that determine the time courses of synaptic events.

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20. Photography at 250 frames per second was accomplished with a Hycam 16 mm camera (Redlake Laboratories) and Kodak Ektachrome EFB 449. Film was viewed with a stop-frame projector; durations were measured from the first detectable movement.
21. An interesting but, at first sight, confusing feature of the escape response is that most of the flexor elements are silent during the actual flexion movement. This is because the flexor motor discharge is abrupt, ending within about 10 msec of stimulation, while delays caused by excitation-contraction coupling and by inertia retard the onset of movement. Hence peak velocity of flexion may occur roughly 20 msec after stimulation, at a time when all of the neural elements that triggered the flexion are being inhibited.
22. For details of electrophysiological recordings see (*6, 7, 11, 15, 16*). Briefly, 3*M* KCl or potassium acetate electrodes were placed in cell bodies or muscle fibers; ganglia were desheathed and the preparations superfused with oxygenated crayfish saline at 14° to 18°C.
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Pitch Memory: An Advantage for the Left-handed

Abstract. *In an auditory or musical memory task, subjects made pitch recognition judgments when the tones to be compared were separated by a sequence of interpolated tones. The left-handed subjects performed significantly better than the right-handed and also had a significantly higher variance. Further analysis showed that the superior performance was attributable largely to the left-handed subjects with mixed hand preference.*

People who are left-handed differ as a group from those who are right-handed and display more heterogeneity, in terms of both direction and degree of cerebral dominance. (i) In the overwhelming majority of the right-handed population, speech is represented in the left cerebral hemisphere; however, in about two-thirds of the left-handed population, speech is represented in the left hemisphere and in about one-third, in the right. (ii) Although the right-handed tend to show a clear-cut dominance of the left hemisphere for speech, a considerable proportion of the left-handed have some speech representation in both cerebral hemispheres (*1*).

Interest has developed in the possibility that such neurological differences might be reflected in differences in various abilities. Thus, some investigators have argued for a relationship between left-handedness or mixed hand preferences and reading disability (*2*). Others have presented evidence that left-handed persons or those with mixed hand preference perform more poorly than right-handed persons on visuospatial tasks (*3*). In contrast, I now report what is, to my knowledge, the first evidence for an association between left-handedness and superior auditory or musical processing ability. The research was prompted by the observation that among subjects selected for high performance on a pitch memory task, an unexpectedly high proportion were left-handed. I therefore planned an experiment to determine whether the two populations differ statistically in terms of their ability to make pitch memory judgments.

A test tone was presented and followed by a sequence of six interpolated tones and then by a second test tone. The test tones were either identical in pitch or differed by a semitone. The subjects indicated on paper whether the test tones were the same or different. All tones were 200 msec in duration and separated by 300-msec pauses, except that a 2-second pause intervened between the last interpolated tone and the second test tone. The tones were sine waves with frequencies taken from an equal-tempered chromatic scale (International Pitch; A = 435 hertz) ranging over an octave from middle C (259 hertz) to the B above (488 hertz). The interpolated tones were chosen at random from this range, except that no interpolated sequence contained repeated tones or tones that were identical in pitch to either of the test tones. Twenty-four sequences were presented in two groups of 12, with 10-second pauses between sequences within a group and 2-minute pauses between the groups. Before the experimental session began, the procedure was explained

Table 1. Performance levels of all four handedness populations on the pitch memory task. Each subgroup was compared with the moderately left-handed subgroup by means of a median test.

Group	*N*	Average error (%)	χ^2
Right-handed			
Strongly	52	36.9	10.02*
Moderately	24	41.0	9.65*
Total	76	38.1	
Left-handed			
Moderately	23	29.0	
Strongly	30	35.3	4.45†
Total	53	32.5	

*$P<.01$. †$P<.05$.

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to the subjects and they were given four practice sequences (*4*).

The subjects were 76 right-handed and 53 left-handed university undergraduates (*5*). The average error rates for these two groups are shown in Table 1. The variance of the left-handed group was significantly higher than that of the right-handed group [$P < .05$ (*6*)]. Further, the left-handed subjects made significantly fewer errors than the right-handed (median test, $\chi^2 = 8.03$, d.f. = 1, $P < .01$) (*7*). Given the larger variance in the left-handed group, I hypothesized that those who were strongly left-handed might differ from those with a mixed preference, since individuals in the latter group would be expected to have more bilateral representation of function (*8*). Each population was therefore subdivided on the basis of strength of manual preference (Table 1) (*9*). There was an overall significant difference among these four subgroups (median test, $\chi^2 = 12.33$, d.f. = 3, $P < .01$). Further, the performance of the left-handers with a mixed preference (moderately left-handed) was significantly more accurate than that of any of the other three groups (Table 1). The other groups did not differ significantly from each other.

These findings suggest an explanation in terms of a duplication of storage of pitch information by the moderately left-handed. If the efficiency of storage and retrieval at one locus is identical for all populations, then the retrieval of this information from two separate loci should significantly increase the overall probability of correct judgment. We can further hypothesize that such duplication of representation occurs in parallel with the duplication of representation of speech functions in the two hemispheres. We cannot, of course, specify whether the pitch information is retained in the dominant or the nondominant hemisphere in the case of people for whom a more completely unilateral storage is hypothesized (*10*).

It remains to be determined to what extent the superiority of the moderately left-handed on this pitch memory task generalizes to other auditory or musical situations. However, other left-handed subjects selected for previous experiments on the basis of superior performance on such a task performed unusually well on a variety of tests of musical memory, including the transposition of melodic sequences (*11*).

The finding that the moderately left-handed differ significantly in performance from the moderately right-handed also demonstrates that the "ambidextrous" should not be considered a single population, as is often assumed. Had the two groups been combined in this study, no significant differences would have been seen (*12*).

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5. Handedness was assessed by the short form of the Edinburgh Handedness Inventory [R. C. Oldfield, *Neuropsychologia* **9**, 97 (1971)]. The right-handed were defined as those with positive laterality quotients and the left-handed as those with negative laterality quotients. In both populations, the ratio of male to female subjects was 1 : 1.3. The right-handed subjects had had an average of 3.64 years of musical training (including self training and school choir) and the left-handed subjects an average of 3.77 years.
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Dextroamphetamine: Cognitive and Behavioral Effects in Normal Prepubertal Boys

Abstract. *The behavioral, cognitive, and electrophysiological effects of a single dose of dextroamphetamine (0.5 milligram per kilogram of body weight) or placebo was examined in 14 normal prepubertal boys (mean age, 10 years 11 months) in a double-blind study. When amphetamine was given, the group showed a marked decrease in motor activity and reaction time and improved performance on cognitive tests. The similarity of the response observed in normal children to that reported in children with "hyperactivity" or minimal brain dysfunction casts doubt on pathophysiological models of minimal brain dysfunction which assume that children with this syndrome have a clinically specific or "paradoxical" response to stimulants.*

Considerable clinical experience indicates that the behavioral response of increased alertness and focused activity of children with "hyperactivity" or minimal brain dysfunction (MBD) given stimulant drugs is nonparadoxical with regard to adult response, and nonspecific in comparison to other pediatric populations. Clinical nonspecificity is suggested by the fact that children selected for treatment on the basis of teacher recommendation alone (*1*), delinquent behavior without documented motor restlessness or attentional deficit (*2*), or learning disorder without associated behavioral disturbance (*3*) all show approximately the same short-term improvement on cognitive test performance or show decrease in restless-impulsive behaviors when given stimulant medication. Moreover, the increased alertness and arousal, as measured by changes in reaction time and performance on cognitive tests, are similar to those reported for normal adults given comparable doses of stimulant drugs (*4*); in addition,

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