SKIN CONDUCTANCE AND REACTION TIME CORRELATES OF LEARNING DISABILITY IN CHILDREN

by

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Introduction

Learning disability is a broad spectrum term referring to one or more "specific deficits in perceptual, integrative, relational or expressive processes not attributable to sense-organ defects which impair learning efficiency (Bannatyne, 1971, p. 9)." By far the most prevalent learning disability is dyslexia. Also termed "reading disability" or "reading retardation", dyslexia is defined operationally when a child's reading level is at least two years below his grade level, despite normal intelligence, adequate cultural background, and sufficient educational training. Estimates of the incidence of dyslexia range from 4 to 40 percent of all children, with the most widely accepted estimate being around 10 percent.

Many studies of reading disability indicate that dyslexics tend to be overanxious, underattentive, and hyperactive (e.g., Meier, 1971). These reports seem contradictory with respect to findings that anxiety is accompanied by high levels of physiological arousal (Lader, 1967), while underattentiveness and hyperactivity are related to underarousal (Davis & Krkovic, 1965; Sprague, Barnes & Werry, 1970). In light of the curvilinear "inverted-U" relationship between anxiety and performance (Martens & Landers, 1970; Malmo, 1957), the nature of attention and arousal in dyslexia seems to be quite important. Implications from this line of research have

potential usefulness for diagnosis, remediation, and theoretical understanding of learning disorders.

Theorists such as Conners (1972), Wender (1971) and Silver (1971) have proposed that at least certain subtypes of reading disability stem from physiological dysfunctions of arousal mechanisms in the brain. Critchley (1964) attributes an even more general physiological disorder in dyslexia. These theories are consistent with teacher reports of inattentiveness and with clinical and experimental reports of responses to stimulant drugs (e.g., Connors, 1971). In addition, a few recent studies have attempted to directly examine autonomic correlates of reading disability and the concomitant syndromes of hyperactivity and Minimal Brain Dysfunction (MBD). The present study was aimed specifically at this approach to the problem, using skin conductance as an indicant of sympathetic arousal.

In one psychophysiological investigation of reading disabled (RD) children, Hunter, Johnson, and Keefe (1972) examined electrodermal and cardiovascular responses in an RD group versus matched controls. Their subjects first listened to a series of loud tones (during which the orienting response habituated), then they responded to a simple reaction time series, and finally they were tested for auditory thresholds. They found that

> Nonreaders had lower mean skin conductance levels across trials, greater amplitude of skin resistance responses

> to a novel stimulus (75 decibel tone), fewer electrodermal offset responses, fewer negative and diphasic skin potential responses, fewer electrodermal and heart rate anticipatory responses, slower motor reaction times, and a higher degree of sinus arrhythmia (p. 14).

From this Hunter et al. concluded that RDs show signs of a general deficiency in attention and arousal. In a study of hyperactive and normal children Cohen and Douglas (1972) also found slower simple reaction times in their experimental group, but did not replicate Hunter et al.'s difference in basal skin conductance. Furthermore, hyperactive children had smaller GSRs during early trials than did controls, while the RDs of Hunter et al. had larger GSRs. In still another study Satterfield and Dawson (1971) found that hyperkinetic children had both lower conductance levels and smaller GSRs than normal children. Furthermore, none of the above studies found any indication of GSR habituation differences, yet Boydstun, Ackerman, Stevens, Clements, Peters and Dykman (1968) found that MBDs had more rapid habituation of the orienting response during conditioning than did controls. Moreover, the reaction time difference reported by Hunter et al. and by Cohen and Douglas was not replicated by Sroufe, Sonies, West and Wright (1973).

The studies presented above tend to agree that learning disabilities appear concomitantly with arousal deficits, although they differ with respect to which

specific measures show differences between LD and normal children. With these considerations the present study was designed to replicate skin conductance and reaction time findings using a few methodological modifications. First of all, while Hunter et al., Cohen & Douglas, and Sroufe et al. used loud tones (70-75 db.) and Satterfield & Dawson and Boydstun et al. used softer tones, the present study used a compound stimulus consisting of a click and a panel light, both of moderate intensity. Secondly, while several studies used both an active and a passive task, they were not designed to compare Ss' performance between tasks. The present study, however, provided a habituation task equivalent to the reaction time task in all ways except that no motor response was required during habituation. In addition the tasks were separated by a rest period and the order of presenting the tasks was counterbalanced in each group. This experiment was designed to determine whether a task demanding a motor response would differentiate LD from control children to a greater extent than a task requiring attention only.

Methods

Subjects

Twenty-eight learning disabled (LD) children and 28 controls were selected from local elementary schools. The LD children were diagnosed LD by a school psychologist and were enrolled in special classes for learning disabilities. The majority of the children were reading disabled, although a few had primarily spelling problems, perceptual disorders, etc. The control children (C) were selected from school files to approximately match the LD group in age, sex, and IQ. All children participated in the study with the consent of their parents or guardians.

Apparatus

Skin conductance was recorded in kiloohms on a BSR channel of a Lafayette 4-channel Datagraph. Simple reaction latency was timed with a Hunter chronometer mounted in a wooden box. Extending from the front of the box were two telegraph keys mounted beneath an amber panel light. Pressing the left-hand key operated a second light on the back of the box, which indicated to the experimenter that S's hand was not on the trigger key. Hence, E could be certain where S's hand was before each trial. The right-hand "trigger" key operated a relay inside the wooden box which stopped the timer. Simple RT was measured in milliseconds.

Procedure

In order to counterbalance the order of experimental treatments each group of children was divided in half. There were 14 Ss in each of the four cells. Approximately half of the Ss in each cell were run in the laboratory, while the other half were run in the elementary schools.

Each S was instructed to wash his hands before the start of the experiment. When finished drying his hands S was seated in a chair facing the RT box, where a screen around the RT apparatus prevented S from seeing where E would be sitting. S was instructed that the experiment would take half an hour and that he would be "hooked up to the machine" but would not be shocked or otherwise hurt. Silver electrodes were attached to the volar pads of the first and third fingers of S's nonpreferred hand, and S was asked not to play with the electrodes. S was then instructed to "sit back and relax while I get everything going." This rest period lasted for 5 minutes, after which the instructions were given for the first task.

Half of the LD Ss and half of the controls received an habituation task first (condition H-R) while the rest had a reaction time task first (R-H). During habituation S was told to hold the left key down with the index finger of his preferred hand and to pay attention to the light that would come on, but not to press the other key at all. At 30 second intervals E simultaneously pressed two buttons: one triggering the light and the timer, the other activa-

ting an event marker on the chart recorder. The stimulus to S was the simultaneous light onset with a click from the relay and a click from the event marker. The two clicks were difficult to distinguish as separate sounds. Both light and click were of moderate intensity. Duration of the light was controlled by E, averaging 500 msec. but ranging from 300 to 1000 msec., in accordance with reaction times produced by most Ss. Light offset was accompanied by a second click of the relay. For Ss in H-R 15 trials of habituation were followed by a second 5 min. rest period and 15 trials of RT. Groups in the R-H condition followed the order of RT, and habituation. The RT task was identical to habituation except that S was instructed to keep his index finger on the left key: when the light came on he was to lift his hand and press the other key as quickly as possible with the same finger.

Results

Rest periods

Skin resistance was sampled at 30 sec. intervals from the chart records of the two rest periods. For each rest period the 10 resistances were converted to common logarithm of conductance (i.e., log 1/resistance) as is typically done (Lader, 1964; Van Olst, 1968). A 2 Groups X 2 Orders X 2 Rest Period X 10 Trials analysis of variance (ANOVA) was conducted with 14 Ss in each cell. The analysis is summarized in Table 1.

Insert Table 1 about here

Neither group nor order main effects were significant, but there was a significant Group X Order interaction. Post hoc analysis with Duncan's test indicated that the control group receiving RT before habituation had significantly higher skin conductance during the rest periods than did the other three groups. Exactly why this interaction occurred is unclear; indeed, there is reason to believe that this finding represents a sampling artifact rather than an interpretable finding. That is, there should have been no interaction with order during Rest Period #1, since there had not yet been any treatment differences. However, since the Group X Order X Rest Period interaction was not significant it would appear that the

Table 1.

2 Groups X 2 Orders X 2 Rest Periods X 10 Trials ANOVA for basal conductance levels during rest.

Source	Mean Square	DF	Error	F Ratio	Probability
A (Groups)	.2317	1	1	.659	NS
B (Orders)	.7725	1	1	2.196	NS
A X B	1.6300	1	1	4.634	<.05
J (Rest Periods)	1.5818	1	2	90.301	<.01
A X J	.0031	1	2	.176	NS
B X J	.0300	1	2	1.714	NS
A X B X J	.0266	1	2	1.518	NS
K (Trials)	.0070	9	3	6.588	<.01
A X K	.0045	9	3	4.208	<.01
B X K	.0006	9	3	.590	NS
A X B X K	.0009	9	3	.916	NS
J X K	.0008	9	4	1.016	NS
A X J X K	.0005	9	4	.598	NS
B X J X K	.0024	9	4	2.972	<.01
A X B X J X K	.0010	9	4	1.255	NS
Error 1	.3518	52			
Error 2	.0175	52			
Error 3	.0010	468			
Error 4	.0008	468			

Group X Order interaction was roughly parallel between the two rest periods. In addition, analysis of variance for the first rest period alone showed a trend ($F(9,468)=3.245$, $p<.10$) in the direction of a Group X Order interaction.

The significant Order X Rest Period X Trial effect provides further support for the argument that a sampling artifact inadvertently differentiated the H-R and R-H groups. In particular, an ANOVA of basal conductance levels during Rest Period #1 demonstrated a significant Order X Trials interaction ($F(9, 468)=2.207$, $p<.05$), indicating that the H-R Ss tended to drop in arousal to a greater extent across trials than did R-H. During the second rest, however, the Order X Trial interaction was nonsignificant ($F<1$).

The difference between the pre-task and between-task rest periods was highly significant ($F(1,52)=90.3$, $p<.01$). The rest period which preceded the first task was accompanied by lower arousal (means of .921 vs. .996 log micromhos). Since conductances during the second rest period were close to those during tasks (means of .993 for habituation and 1.012 for RT) it would appear that the second rest period might have differed qualitatively from the first one.

Both trials and Group X Trial effects were highly significant, the latter indicating that the LD children dropped off considerably in tonic conductance levels while

the controls maintained a steady baseline. When slopes were calculated by linear regression methods and B-weights used as the dependent variable, Group X Order ANOVAs produced significantly greater negative slopes for the LD groups in both the first rest period ($F(1,52)=4.30, p<.05$) and the second rest period ($F(1,52)=4.37, p<.05$). Despite the higher mean level of conductances during the second rest period, the between groups slope difference was replicated during the second period; furthermore, the effects were parallel, the Group X Rest Period X Trial interaction being nonsignificant ($F<1$). It would appear, then, that this finding was both reliable and robust.

Task periods

Basal Conductance Levels. Prestimulus resistance values were converted to log micromhos for each of the 15 habituation trials and 15 reaction time trials. A 2 Groups X 2 Tasks X 15 Trials ANOVA was computed with 28 Ss in each cell. Subjects were collapsed across orders since pretask conductance levels differed for H-R vs. R-H Ss, making any interactions with order uninterpretable. The source table for the analysis is shown in Table 2.

Insert Table 2 about here

The significant task main effect indicates that BCLs were higher during the reaction time task than during

Table 2.

2 Groups X 2 Tasks X 15 Trials ANOVA for basal conductance levels during tasks.

Source	Mean Square	DF	Error	F Ratio	Probability
A (Groups)	.5753	1	1	1.023	NS
J (Tasks)	.1585	1	2	5.640	<.01
A X J	.0135	1	2	.480	NS
K (Trials)	.0018	14	3	3.051	<.01
A X K	.0009	14	3	1.526	NS
J X K	.0010	14	4	1.923	<.05
A X J X K	.0016	14	4	3.077	<.01
Error 1	.5618	54			
Error 2	.0281	54			
Error 3	.0006	756			
Error 4	.0005	756			

habituation. The main effect of trials and the Task X Trials interaction may be better understood in relation to the significant Group X Task X Trials interaction. It appears that skin conductance increased across trials in all cases except for controls during habituation. Separate ANOVAs for the two tasks indicated significant Group X Trial interactions in each task. That is, during the RT task basal levels increased for both LDs and controls, though to a greater extent for controls ($F(14,728)=2.258$, $p<.05$). However, during habituation the LDs increased basal conductance while controls decreased ($F(14,728)=2.444$, $p<.05$). Thus, the three-way interaction is due to the reversal of slope differences from passive to active task.

Galvanic Skin Responses. An increase in conductance occurring within 1-4 seconds of the stimulus onset was assumed to be a specific orienting response. Galvanic skin responses were measured by converting pre-stimulus resistance and peak resistance during the response into log conductances, and then subtracting to obtain GSR in change in units of log micromhos. This technique has the advantage of producing a phasic arousal score that is not correlated with basal conductance level, thus eliminating the so-called "law of initial values." The scores were analyzed in a 2 Groups X 2 Orders X 2 Tasks X 15 Trials ANOVA with 14 Ss per cell. Table 3 summarized the analysis.

Insert Table 3 about here

Since the dependent measure here is somewhat independent of basal conductance (r=.07 for habituation and r=.10 for RT) the likelihood of a Group X Order artifact affecting the data is low. It is noteworthy that there was no significant Group X Order effect in this data, however there was a Group X Order X Task interaction. That is, while all 4 groups had larger GSRs during RT than during habituation, the Task effect was considerably smaller in the LD group with order H-R than in either of the other 3 groups. Although less subject to the criticism of sampling error, this latter finding does not lend itself to a ready explanation.

During the RT task it appears that the control children in condition H-R responded with larger ORs than did any of the other three groups. It is particularly puzzling that the controls responded more to the RT stimuli after having already habituated to it, compared to those controls to whom the stimuli were novel. This is especially true since control group H-R was not the most labile in the habituation task. Furthermore, one could not propose that the added signal value enhanced ORs for controls in H-R without some further hypothesis concerning the lack of a corresponding concomitant increase for LDs in

Table 3.

2 Groups X 2 Orders X 2 Tasks X 15 Trials ANOVA of galvanic skin responses during tasks.

Source	Mean Square	DF	Error	F Ratio	Probability
A (Groups)	.7062	1	1	0.706	NS
B (Orders)	1.9364	1	1	1.935	NS
A X B	.0314	1	1	0.031	NS
J (Tasks)	26.3890	1	2	114.931	<.01
A X J	.4056	1	2	1.766	NS
B X J	.1621	1	2	0.706	NS
A X B X J	1.1958	1	2	5.208	<.05
K (Trials)	.4291	14	3	11.452	<.01
A X K	.0678	14	3	1.808	<.05
B X K	.0518	14	3	1.383	NS
A X B X K	.0571	14	3	1.525	NS
J X K	.0435	14	4	1.061	NS
A X J X K	.0566	14	4	1.383	NS
B X J X K	.0351	14	4	0.857	NS
A X B X J X K	.0518	14	4	1.265	NS
Error 1	1.0005	52			
Error 2	.2296	52			
Error 3	.0375	728			
Error 4	.0409	728			

H-R. While novelty had an expected effect in elevating GSRs during habituation, it would appear that at least one group reacted paradoxically during RT to prior experience with the stimuli.

The difference in GSR for the two tasks was highly significant with means of .028 log micromhos for habituation vs. .053 log micromhos for RT. While it is not surprising that autonomic responses should be greater when an active, motor response is required, it is interesting that the slopes of habituation for the two tasks were parallel (Task X Trials interaction nonsignificant). This was the case despite the fact that orienting responses were confounded with motor feedback in producing GSRs in the RT task. Of perhaps greater theoretical importance was the finding of a significant Group X Trials effect. That is, there was a more rapid rate of habituation for LD children than for controls. When separate ANOVAs were computed for each task the differential rate of decline was significant during RT ($F(14,728)=1.757$, $p < .05$), but only a trend during the passive task ($F(14,728)=1.420$, $p > .05$).

Reaction time. Reaction latencies were converted to speeds in order to partially reduce the skewness of the RT distribution, and to conform in directionality with the electrodermal indicants of arousal. Nine out of the 840 RT measures were not obtainable due to equipment failure, so predicted values for those points were computed by a

regression routine of the Statistical Analysis System (Barr & Goodnight, 1971). This was in accordance with Winer's (1968) proposition that missing data be filled in so as to minimize the error variance, and later reduce the degrees of freedom for the missing data points. A 2 Groups X 2 Orders X 14 Trials ANOVA was computed, excluding trial 1 since there had been no previous practice trial. The ANOVA source table is shown in Table 4. It may be seen that only the groups main effect reached significance, in-

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Insert Table 4 about here

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dicating that the control group had faster reaction times than did the RD group, even though the RD children showed a trend for faster speeds on the first trial.

Relationship Between RT and GSR. Pearson product-moment correlations were computed based upon each individual's mean response speed and mean GSR during RT. When the coefficient was calculated for all 56 Ss combined, the result was nonsignificant ($r(56)=.05$, $p>.05$). Likewise, when separate correlations were computed for the control group and the LD group neither correlation reached significance ($r(28)=.27$, $p>.05$ for controls; $r(28)=-.28$, $p>.05$ for LDs). However, the correlation was in the expected direction for controls but actually in the opposite direction for LDs. A test of significance between correlations

Table 4.

2 Groups X 2 Orders X 14 Trials ANOVA of reaction speed during RT trials 2-15.

Source	Mean Square	DF	Error	F Ratio	Probability
A (Groups)	7.8091	1	1	4.543	<.05
B (Orders)	4.5976	1	1	2.675	NS
A X B	.9915	1	1	0.577	NS
J (Trials)	.1553	13	2	1.030	NS
A X J	.1048	13	2	0.695	NS
B X J	.1029	13	2	0.683	NS
A X B X J	.1157	13	2	0.767	NS
Error 1	1.7190	52			
Error 2	.1508	667			

for independent samples indicated a low probability that the population rhos were equal (z=1.989, p < .05).

Discussion

The most general hypothesis under examination in this study, that learning disabled children tend to have arousal deficits, was clearly supported. In particular, LD children had longer simple reaction times, greater adaptation of tonic conductance levels during rest, and greater habituation of GSRs during task periods. While basal conductances were not significantly lower for LDs, there was a trend in that direction. On the other hand, GSR amplitude did not seem to differentiate LDs from controls. Nonetheless, it would appear that a constellation of measures exists which indicates that at least one concomitant of learning disability is a lessened physiological arousal. One important question arising from such a position is whether this arousal dysfunction is situation-specific, or whether it is a general product of arousal systems in the brain, and as such, may be detected equally in a variety of situations. The latter notion would not predict that arousal differences would be particularly sensitive to changes in task demand placed upon the individual. A second issue examined in this study, then, was whether an active task would be equal to a passive task in finding group differences in arousal.

In the present study a simple reaction time task was compared with an equivalent habituation task. In both situations subjects were instructed to rest their index

finger on a "home key" and to watch for the onset of an amber panel light. Intertrial intervals, stimulus duration, and the number of trials for the two tasks were equivalent, the only methodological difference being the requirement of an active response during RT. One consequence of that active response, however, was that during the habituation task the stimulus can only be said to have elicited orienting responses. In comparison, the GSRs to the RT stimulus might each be said to have consisted of an orienting response and a motor feedback component. This distinction is an important one, since the reaction time task was more sensitive to group differences in GSR habituation. That is, one cannot assert that the active task was more sensitive to differences in orienting response habituation, but only in overall GSR decline. Nevertheless, GSRs decreased at a parallel rate during the two tasks, furthering the likelihood that the active task might actually have been more sensitive. This would correspond with similar findings by Cohen & Douglas (1972), who compared GSRs to a warning stimulus in an RT task to an identical stimulus in a nonsignal (i.e., habituation) condition. They reported that hyperactive children failed to produce a GSR on an earlier RT trial than controls, but that no such finding occurred in the nonsignal condition.

Along with the Cohen & Douglas study the present experiment supports the proposition that LD children habi-

tuate more rapidly than controls, and that this difference is more easily detectable during an active task than during one in which Ss are required only to attend to the stimulus. In this study it was found that during the RT task controls responded more appropriately to task demands than did LDs. That is, subjects were required to respond rapidly and to sustain attention. The controls demonstrated less decrement of orienting responses, greater increase in basal skin conductance, and faster reaction times than the LDs. It is suggested that the passive task was less sensitive to group differences because the task demanded less attention. This is along the same lines as Cohen & Douglas' suggestion that "hyperactivity cannot be viewed in terms of a simple notion of physiological arousal; in looking at physiological functioning it is important to take into account the type of situations in which a deficit is observable(p. 244)."

Another example of psychophysiological differences being sensitive to task demands was reported by Hunter (1971). She noticed that autonomic responses to low-flying aircraft noises did not differ between reading disabled children and controls during a rest period. However, during a reaction time task the reading disabled children responded with significantly larger heart rate and skin potential responses than the controls. Like Cohen & Douglas, Hunter also rejects the notion that learning disabilities are due to

general arousal deficits. Rather, she supported Dykman et al.'s hypothesis that defective inhibitory mechanisms account for attentional deficits in learning disabilities. According to this view LD children "are less efficient than controls in selective inhibition and selective arousal (Dykman et al., 1970, p. 780)," which would account for the differential responses to task demands. While the present study provides only moderate support for this notion, it certainly does not refute it.

Though the habituation effects during tasks may be of greatest theoretical importance, clearly the most dramatic finding in this study was the large drop in resting BCL in the LD group. This finding was not reported in any previous study of LD children, although no study reported any attempt to find such a difference. In the present study this BCL slope difference was not only highly significant in each period individually. Furthermore this resting slope effect was roughly parallel in the two periods, even though the mean BCL was much higher during the between-task compared to pre-task rest period. An interesting finding analogous to this effect and to the GSR habituation effect was reported by Lader (1964) in reference to the effects of a barbiturate upon normal adults. That is, a 300 mg. dose of cyclobaritone resulted in a greater decrease of resting BCL compared to a placebo group. Specific GSRs to a series of loud auditory stimuli likewise

decreased in amplitude more rapidly in the drug groups than in placebo group. The concomitant finding of these two effects due to a drug well known to lower alertness and vigilance suggests that a common physiological mechanism might be involved. This would appear to support the proposition that a similar physiological mechanism might account for the greater tonic and phasic habituation rates in the LD children of the present study.

Finally, a word should be said about the slower reaction times of LD children compared to controls. This finding replicates an effect reported by Dykman et al. (1970), Cohen & Douglas (1972), and Hunter et al. (1972), but not found by Sroufe et al. (1973). A question arises, however, whether this finding is indicative of an arousal deficit or perhaps some other disability, such as poor motor coordination. Still another interpretation has been proposed by Dykman et al.: "There is no reason to assume that the peripheral transmission time...is any longer in (children with learning disabilities) than controls. Therefore, the slower reaction times of (LDs) more likely reflect a slower processing of information in the central nervous system, i.e. more thinking time (pp. 775-776)." Dykman et al. have further posited "that the critical variable determining inattentiveness of many (children with learning disabilities) in the classroom is not lack of desire but rather an incapacity to process information at the same rate as normal

students (p. 777)."

On the other hand, evidence that arousal and reaction speed are related may be seen in the literature concerning stimulant drugs. For example, Sprague, Barnes and Werry (1970) found that methylphenidate decreases reaction latency compared to placebos; Sprague, Werry, and Davis (1969, cited in Connors, 1971) have reported a linear dose-response relationship between methylphenidate and reaction speed. Furthermore, Cohen, Douglas & Morgenstern (1971) found that hyperactive children produced faster reaction times when given methylphenidate than when given a placebo. Despite these relationships, one must be careful not to equate reaction time with arousal. That is, methylphenidate is known to increase arousal, and methylphenidate has been shown to increase reaction speed; however, the logic here will not allow one to conclude that RT is necessarily equivalent to arousal.

Yet another possibility exists for the relationship between RT and arousal: they might be related in normals but not in LDs. In fact, Sroufe et al. found high correlations between RT and heart rate deceleration for normal children and LDs treated with methylphenidate, but no correlation or even a trend in the opposite direction for untreated LDs. Likewise, the present study found a trend towards a positive correlation between reaction speed and mean GSR for controls and a negative trend for LD children.

The finding that correlations between RT and GSR were significantly different between the two groups of the present study suggests, at the least, a difference in physiological mechanisms underlying the two measures.

In conclusion, the results of this study may be interpreted in terms of either a general arousal deficit or a lack of selective inhibitory mechanisms in LD Ss. It would seem that LD researchers advancing a general arousal hypothesis should first aim toward a better specification of what indices would support their view. That is, tonic levels, phasic responses, tonic habituation, and phasic habituation can all be viewed as arousal measures. However, little progress can be made if studies disagree as to which measures differentiate learning disabled and normal children. On the other hand, studies proposing more specific attentional dysfunctions should be geared toward isolating those task demands and environmental situations in which specific arousal deficits can be observed. Should such task situations be found they might be quite valuable in predicting which children have a high likelihood of learning disability, or they might have diagnostic value in separating LDs into subgroups. Furthermore, instructional techniques for learning disabilities could be improved by better understanding the situational attentional deficits. Considering the potential gains, further research along these lines should be quite worthwhile.

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SKIN CONDUCTANCE AND REACTION TIME CORRELATES OF LEARNING DISABILITY IN CHILDREN

by

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(ABSTRACT)

Skin conductances and galvanic skin responses (GSRs) of learning disabled (LD) children and controls were compared during an habituation task and a simple reaction time task, each preceded by a rest period. The two tasks were methodologically equivalent except that only the latter required an active response. LDs had more rapid decline of basal conductances during rest, more rapid habituation of GSRs during tasks, and slower reaction times. In addition, the active task was more sensitive to GSR habituation differences than was the passive task. The results were interpreted in terms of a general arousal deficit in LD children, although the greater sensitivity of the active task in detecting habituation differences was seen as supporting the proposal that LDs have selective arousal dysfunctions.