

Time Estimation and Planning Abilities: Students With and Without Mild Disabilities

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ABSTRACT: *In this study we sought to examine differences among groups of elementary students with and without disabilities on a measure of time estimation. We assessed the time estimation recall of 51 students with and without emotional handicaps, learning disabilities, and attentional disorders and examined the relationship between time estimation and the self-regulatory skills of planning and organization. Group differences in time estimation recall were documented, but these differences were no longer significant after controlling for IQ. In planning and organization, students who scored higher on time estimation were less likely to use notes and lists for organization. Our findings call into question prior research that has not controlled for group differences in IQ and support the need for a curriculum in which time-estimation skills are taught directly and in a functional manner.*

■ For students with disabilities to function in time-conscious mainstream school environments, they need to possess certain skills related to time. Among these skills are the ability to arrive at class on time, complete tasks within time limits, monitor time during test taking, and anticipate the length of breaks and recess. Students must develop a concept of time, time-telling skills, and the ability to perform different tasks within varying time frames. Developing a concept of time and the ability to function well in school settings within given time frames are separate skills. One is a cognitive task, and one is a performance task.

While the acquisition of both skills requires exposure to sufficient cultural and developmental experiences, only the cognitive time skills (i.e., time concepts and clock time) are included in all elementary school curricula and are taught directly. Cognitive time skills are considered developmental in nature (Daniels, 1984; Hays-Roth, 1980), and once these skills are learned, it is assumed that the student will function adequately on time-bound tasks.

Students with mild disabilities often fail to function accurately or consistently within prescribed time frames. This lack of attention to time often results in punishment (e.g., teachers not accepting late assignments, detention for being tardy) or in teachers providing additional structure to the assignments which in turn may

adversely affect a student's independence and responsibility-taking skills. Students with Attention Deficit Hyperactivity Disorder (ADHD) have been characterized by their poor planning skills and failure to complete assignments (Barkley, 1990). For students with emotional and behavioral disorders, deficits in planning and failure to complete assignments have been attributed to an inability to estimate time (Nelson, Smith, Dodd, & Gilbert, 1991). Failure to finish assignments, in turn, is likely to affect academic achievement as well as teacher and peer perceptions and acceptance.

We have identified two types of measures of time estimation—those that assess functioning, which we called "experienced," and those that assess cognitive time concepts, which we have named "recalled." Experienced time assesses a student's ability to observe a beginning cue and to signal the end of a prespecified time interval or, in some research, to signal both the beginning and ending of the interval. The interval experienced may be empty or activity-filled.

Capella, Gentile, and Juliano (1977) asked students to signal the beginning and end of a 7-, 15-, or 30-sec interval by dropping a ball or pushing a button. Students with hyperactivity demonstrated a greater error rate than their peers without disabilities by waiting too long to respond, especially when estimating the longest intervals (e.g., these students' estimated M

for 30 seconds = 50.8 seconds). One problem with this research, however, was that the IQ variable was not controlled.

Senior, Towne, and Huessy (1979) found students with mental disabilities estimated the elapsed time of the 30-second interval to be 36.7 seconds on average. When children with co-occurring ADHD and emotional disturbance were asked to estimate a 30-second empty interval, they responded relatively more rapidly than the control group (i.e., $M = 11.6$ seconds compared to $M = 22.6$ seconds for the non-hyperactive group).

White, Barratt, and Adams (1979) controlled for IQ and found adolescents with hyperactivity experienced 2-min intervals differently from control students. Adolescents with hyperactivity had a median error of 29 seconds compared to an average 9-sec error for students without hyperactivity. In a similar study by Walker (1982), youth identified as either impulsive or reflective were instructed to tap a pencil when they thought a 12-sec interval had elapsed. Both groups responded in less than 12 seconds; however, the students who were impulsive tapped earlier than their reflective peers.

This research on estimations of empty-time intervals suggests that students with the characteristics associated with ADHD perceive empty intervals to be longer than they really are—when IQ is statistically controlled. Moreover, students with lower IQ, may experience a time delay as relatively shorter than it is. Research on estimations and activity filled intervals suggests different conclusions.

Bruno, Johnson, and Simon (1988) asked students to estimate time in one of six different activities (i.e., listening to music, doing math problems, reading, looking at a detailed picture, sitting, and taking a break). When asked to disengage from an activity and signal the end of an interval, middle school youth with learning disabilities (LD) signaled the end of a 15-sec interval to be 26 seconds, on the average, compared to 20 seconds for the non-LD sample. In other words students with LD experienced activity-filled intervals as shorter.

In contrast to experienced time, recalled time estimation requires thinking about life experiences and estimating how long a future activity should take based on this retrospect. Students without disabilities score better on multiple-choice and paper/pencil measures of recalled time than their peers with learning disabilities (Dodd, Griswold, Smith, & Burd, 1985), reading disabilities (Edelstein, 1971), emotion-

al handicaps (Francis, 1988; Nelson et al., 1991), and impulsivity (Goldman & Everett, 1985). Unfortunately, none of these recall studies (except for Edelstein) controlled for IQ. Therefore, it is possible that differences in students' ability to recall time may be a correlate of IQ and is not specific to disability or behavioral characteristics.

Because assumptions have been made about the ability of students to function within given time frames based on their scores on measures of time estimation, it seems important that the measures used accurately reflect time skills and not IQ. Thus, the present study sought to determine whether students with mild disabilities, including emotional and attentional difficulties, differ from peers without disabilities on a measure of recalled time estimation when IQ differences were statistically controlled. Second, the predictive validity of the time estimation skills of students was examined.

Method

Subjects

Students participating in this study were in the second through eighth grade, ranged in age from 8 to 14 years, and included 8 girls and 44 boys (85% white and 15% Hispanic). Participants attended general and special education classes in 10 different schools (8 elementary and 2 junior high) from 4 different school districts in mid-western communities with populations ranging from 14,000 to 27,000. All 10 schools were attended by students from the lower to lower-middle range of socioeconomic status and received services from the same special education cooperative with the same eligibility criteria. All of the students in this study were initially nominated by their general and special education teachers as (a) active and inattentive or (b) normally active and attentive for their grade level. These procedures were followed-up with formal identification procedures.

Those students nominated as average or "typical" in activity and attention fell into three subgroups including 7 students receiving services for emotional handicaps (EH), 6 students receiving services for learning disabilities (LD), and 12 comparison students who were also average, compared to their grademates, in classwork. The criteria for determining eligibility for services for learning disabilities and emotional handicaps followed federal guidelines, Indiana

State Rule Article 7, and local identification procedures.

For those students nominated as more active and inattentive than their peers, teachers were then asked to complete the ACTeRS (see Ullmann, Sleanor, & Sprague, 1985; 1991, for norms, validity data, and reliability estimates). Ullmann et al. (1991) recommend that scores below the 10th percentile be considered severely problematic, and scores from the 10th to the 25th percentiles be considered borderline. However, Cohen, Kelly, and Atkinson (1989) found that inclusion of borderline-scoring students increased the sensitivity of the test in matching to DSM-III diagnoses. Twenty students met the criterion for ADHD, problematic to borderline, using this scale. Six with ADHD did not meet the ACTeRS criterion scoring; however, three of these boys were receiving trials of medication and the others met criterion scoring on the SNAPz (adapted version of the Swanson, Nolan, and Pelham Checklist, SNAP; Pelham & Bender, 1982). Of the 26 students in the ADHD group, 13 were receiving special education services for co-occurring emotional handicaps.

For each student in the study, teachers were asked to complete two rating scales, the COS-T and SNAPz'. Analyses of variance were conducted on the variables grade, age, SNAPz hyperactivity ratings, and IQ for all the subgroups, yielding differences on hyperactivity ratings and IQ (see Table 1). Tukey post hoc analyses were employed for the variables, hyperactivity ratings and IQ. For the SNAPz hyperactivity scores, significant group differences were revealed with both groups of children with ADHD rated higher than the other groups, who in turn did not differ from each other. In IQ, the comparison group scored significantly higher than the LD, ADHD only, and co-occurring disorder, but not the EH group.

Instruments

Time estimation. Time estimation was assessed using the 22-item, multiple-choice Functional

Time Estimation Questionnaire (FTEQ; Francis, 1988) which reportedly has adequate reliability and validity (Dodd, Burd, & Cook, 1990).² This instrument was adapted by eliminating items outside the realm of an elementary student's experience (e.g., college experiences). The adapted scale (A-FTEQ) included items such as: "About how long is recess?" Six items on the adapted version (A-FTEQ) were related to school topics while the other 16 were taken from daily activities in a student's life (e.g., dressing, watching TV, eating, and sleeping).

Planning and organization. Organization skills were assessed using the Child Organization Scale (COS) and the Child Organization Scale-Teacher version (COS-T). For predictive validity and interrater reliability data, see Zentall, Harper, and Stormont-Spurgin, 1993.³ The COS is a 26-item, self-rating scale that assesses a child's perception of his or her organization

² Split-half reliability was calculated to be .84 with a Pearson product-moment correlation and .92 with the Spearman-Brown prophecy formula. The Kuder-Richardson reliability coefficient or Cronbach's alpha calculated for individual items was .91. The publishers of the FTEQ established construct validity by conducting factor and regression analyses. Three broad domains were represented and the total variance accounted for by the factor solution was 90.9%. The A-FTEQ was adapted from the version of the FTEQ used by Francis (1988). Items were dropped (from 46 to 22 items) to cover only areas within a grade school student's experience. An example of a deleted item was: "About how long do you go to college and medical school to get to be a doctor?" Item numbers 2, 8, 16, 19, 23, 28, 33, 41, 42, and 43 from Francis were used without changes. These appear as items 9, 1, 43, 44, 22, 32, 28, 33, 34, and 35 on the Dodd et al. version. Francis' items 1, 13, 14, and 15 (Dodd numbers 8, 16, 17, & 18) were changed to clarify or eliminate experience bias. For example, "How long does it take to watch the news on TV?" was changed to "How long does it take to watch a program on TV?" For items 3, 7, 11, 12, 20, 24, 25, and 30 (Dodd numbers 10, 13, 14, 15, 21, 5, 45, & 25), one choice was changed from the menu to make the selections more plausible.

³ See Zentall, 1990; Zentall & Smith, 1993, for further validity data on an adapted form of the Swanson, Nolan, and Pelham (SNAP) Checklist (see Pelham & Bender, 1982, p. 370, for reliability and validity data).

³ Discriminant and concurrent validity have been documented for this scale with the interrater inter-scale correlation between children's COHI scores and teachers' rating of difficulty organizing work [$r(12) = .68, p = .015$].

TABLE 1
Study Sample: Demographic Equivalence Among Groups

Factor	Co-occurring	ADHD	EH	LD	Control	P	MSE	F	df
Age	10.7 (1.6) ^a	11.6 (1.7) ^a	12.0 (1.9)	11.5 (1.0)	10.4 (.8)	.104	2.14	2.05	4,46
IQ	94.5 (6.2) ^b	95.1 (12.7) ^b	103.5 (10.6) ^{ab}	97.0 (8.0)	113.8 (13.4)	.001	14.17	5.50	4,41
SNAPz hyperactivity	4.4 (1.4) ^a	5.0 (1.4) ^a	6.1 (2.0) ^a	5.0 (1.1) ^a	4.5 (.8)	.085	1.80	2.19	4,46
ACTeRS hyperactivity	7.9 (4.2)	9.9 (3.1)	3.4 (2.0)	2.2 (1.2)	.6 (1.1)	.0001	7.81	23.41	4,46
	17.8 (5.6)	20.2 (4.8)	---			.293	27.2	1.16	1,21

Note. Co-occurring = children with attention deficit hyperactivity disorder and emotional handicaps;

ADHD = children with pure attention deficit hyperactivity disorder;

EH = children with emotional handicaps;

LD = children with learning disabilities;

Control = comparison children;

MSE = Standard error of measurement.

Within a row, differing superscripts (i.e., a, b) indicate significant differences ($p < .05$) in mean scores among experimental groups as determined by a Student-Newman-Keuls analysis.

skills. The first category consists of 15 items relating to the organization of objects in space; the remaining 11 items assess a child's temporal organization. Items encompass the topics of being on time, organizing events within a time framework, completing tasks, planning for future events, setting priorities, and making lists. The COS-T is a 13-item, teacher-rating scale. Eight of the items on this scale assess the teacher's perceptions of the child's system of organization of objects; five items are related to time commitments and planning.

Procedures

The Adapted Functional Time Estimation Questionnaire (AFTEQ) and the Child Organization Scale (COS) were administered by the same experimenter in a similar manner to all 51 students. Each assessment was 15 to 20 minutes and took place in a separate room from the students' normal classrooms. The test rooms varied in size from school to school but were all private and quiet.

The instructions for completing the measures were standardized. Questions were read aloud and repeated when necessary. Students were instructed to circle the best answer. The test administrator responded to requests for clues or help with, "Just mark what you think is the best answer."

Results

Analysis of variance was performed with students' total scores on the A-FTEQ entered as the dependent variable with the group as the independent variable (five levels: LD, ADHD, ADHD+EH, EH, C). Analysis of variance yielded a significant group difference on the A-FTEQ total scores [$F(4, 46) = 3.52, MSE = 27.01, p = .014$]. Post-hoc (Tukey) analyses indicated that the comparison group scored higher ($M = 40.00, SD = 2.49$) than both the ADHD+EH and LD groups, who did not differ (M of ADHD+EH = 33.25, $SD = 4.86$; M of LD = 32.00, $SD = 8.49$).

Because significant group differences were yielded on IQ, the analysis was rerun with IQ as the covariate. After controlling for IQ, group responses on the A-FTEQ were not significantly different ($F < 2$).

In order to assess the validity of students' abilities to estimate time (A-FTEQ) as it is related to their ability to function in time (self-rated,

COS, and teacher-reported, COS-T) several correlations were run. Of the five teacher-rated time organizational items on the COS-T, one item was significantly correlated with the total A-FTEQ score. Students who had higher scores on the A-FTEQ (indicating greater time estimation ability) were more likely to be rated by their teachers as planning ahead for important activities—a reverse-coded item with a score of 1 = always [$r(51) = -.28; p = .05$]. On the student self-rated COS time organization items, one correlation was significant. Students who had better time estimation ability and who had many tasks to complete were less likely to put notes around the house or make a list [$r(51) = -.32; p = .021$].

These correlational analyses were rerun with IQ serving as the partial variable. In these analyses, the teachers' ratings of students' time organization was no longer significant. That is, students who had better time estimation and were rated by their teachers as planning ahead for important activities also had associated higher IQ scores. However, the results for the children's self-ratings of the time organization remained. That is, students who had better time estimation abilities were less likely to put notes around the house or to make lists [$r(51) = -.36; p = .017$], a finding that was not dependent on IQ.

Discussion

The present study assessed differences among groups of students with and without disabilities on a measure of recalled time estimation with IQ differences statistically controlled. We found that comparison youth scored higher than both the ADHD+EH and LD groups, who did not differ in their ability to estimate time. When we reran the analysis, controlling for IQ, the group differences documented in time-estimation ability were no longer significant.

Our research demonstrates that when IQ is not a confounding factor, students do not differ in their ability to estimate time on a recalled time estimation task. Thus, students of average intelligence with disabilities should be able to estimate time for scheduled activities or tasks (i.e., for planning) as well as their peers of equivalent IQ. Implications from this research are that IQ scores, rather than learning or behavioral disability, may be better indicators of the ability to estimate time accurately. Because children with behavioral handicaps generally score in