The relationship between the ability to divide attention and standard measures of general cognitive abilities

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Running Head: Divided attention and cognitive abilities

ABSTRACT

This study focused on individual differences in the ability to allocate processing resources among competing tasks and its relationship with general cognitive ability. Fifty participants performed three single tasks and two types of dual tasks composed of pairs of the single tasks. Two single tasks and one dual task were repeated three times. Individual differences in dual task performance exhibited satisfactory levels of test-retest reliabilities. In addition, performance on the dual tasks could not be completely accounted for by performance on the single tasks. The dual task variance unaccounted for by the single tasks was found to be stable and consistent, indicating that the ability to allocate resources is a distinct ability. Furthermore, various types of data analyses indicated that dual task performance better predicts a measure of general cognitive ability (the Inter-University Psychometric Entrance Test) than the single tasks, in the first administration of the tasks, but not in subsequent administrations. These results imply that the unique ability to perform the dual tasks may become more automatic and less controlled with practice, and thus its relationship with general cognitive ability declines.

The relationship between the ability to divide attention and standard measures of general cognitive abilities

INTRODUCTION

In the last two decades, the research on individual differences in cognitive abilities has become increasingly influenced by theories and findings from cognitive psychology. A prominent example of a theoretical construct in cognitive psychology, that has been found useful for explaining individual differences in intelligence, is the concept of processing resources. It has been traditionally assumed that the amount of processing resources available to a person is limited, and therefore the ability to perform several simultaneous tasks is restricted (Kahneman, 1973; Navon & Gopher, 1979). Furthermore, cognitive tasks differ in the amount of resources required for performing them successfully, and it is reasonable to assume that higher order thinking and reasoning tasks are characterized by their demands for flexible processing resources. Thus, individual differences in the amount of available resources, and the ability to allocate them among various components of a task may account for individual differences in problem solving and general intelligence. This idea is examined in this study by utilizing the dual task paradigm, which has been used extensively in attention research to study the limitation of the cognitive system. In particular, we attempt to examine individual differences in dual task performance that are unaccounted for by performance on single tasks, and their relationships with measures of general cognitive ability.

Hunt (1980) suggested that the factor of attentional resources is central in many cognitive tasks, and therefore has the best potential of tapping general intelligence (or Spearman's g factor). Indeed, several researchers have adopted the dual task paradigm to study the relationships between intelligence and performance on complex cognitive tasks (e.g., Fogarty & Stankov, 1982; Roberts, Beh, & Stankov, 1988; Roberts, Beh, Spilsbury, & Stankov, 1991; Stankov, 1983). Several studies (Fogarty, 1987; Fogarty & Stankov, 1982, 1988) used both a set of single tasks (e.g., tone discrimination, recall of letter sequences), and a set of dual tasks. Typically, inferences regarding tasks loading on general ability were derived in these studies, from results of factor analyses. The conclusions drawn from these studies were not consistent, and while earlier studies (e.g. Fogarty & Stankov, 1982; Stankov, 1983) concluded that dual task performance is loaded more heavily on general intelligence than the single tasks comprising it, later studies (e.g., Fogarty, 1987; Fogarty & Stankov, 1988) did not support this conclusion. Fogarty and Stankov (1988) proposed that the discrepancy in the results may reflect the nature of the cognitive tasks used in the different studies. Dual tasks, composed of single tasks that are strongly loaded on general intelligence, will be relatively less loaded on this factor, and vice versa. They also suggested that, when the competing tasks are highly similar, the general factor loading of the dual task is likely to decrease.

Studies that used independent measures of intelligence, or general ability typically concluded that performance on dual tasks better predicts intelligence than does performance on single tasks. For example, Stankov (1988) used the WAIS-R as an independent measure of intelligence, and conducted three experiments in which participants performed both single and dual tasks. He concluded that dual-task performance was more strongly correlated with the WAIS-R than performance on the single tasks. Stankov (1988, 1989) interpreted these findings in terms of task complexity and efficiency of encoding, rather than in terms of limited processing capacity. The main basis for this interpretation was the fact that in several experiments no decrements in performance were observed in the competing-task conditions. Roberts et al. (1988) manipulated task complexity both by varying the amount of information processed in each task and by introducing single as well as dual task conditions. Their results clearly indicate that the relationship between RT and the Raven Progressive Matrix Test depends on task complexity. These correlations tend to increase as a function of the amount of information processed, and for any given level of information, they are higher for dual than for single tasks. These findings were also interpreted in terms of task complexity, but the authors suggested that a distinction should be made between different types of complexity: Varying the number of reaction choices within a given task constitutes a manipulation of difficulty, whereas an implementation of competing tasks is regarded as a qualitative, complexity-proper, manipulation.

The results reviewed above, suggest that the dual task paradigm provides an efficient method for capturing individual differences in intelligence, and reflects the importance of the ability to divide attention, which is basic for efficient cognitive functioning.

Goals of the present study

The present study was designed to further explore the relationship between the ability to efficiently allocate processing resources among competing tasks and general ability, measured by a standard aptitude test. Unlike most previous research focusing on this issue, which used the proportion of correct answers as the dependent variable, the present study used RT measures. This allows for the use of simple tasks and therefore provides a better method for measuring resource allocation. First, we wish to examine whether the ability to allocate resources is a stable and distinct ability. To achieve this goal, we used two types of dual tasks, as well as repeated measurements on each. This allowed us to examine test-retest reliability of the dual task performance, as well as stability of the RT measures across different single and dual tasks. In addition, we examined the extent to which performance on the dual task could be explained by performance on the single tasks comprising it. Our hypothesis was that it is precisely the marginal between-individual variation in dual task performance, that cannot be accounted for by the single task, which should be of interest as far as individual differences in general intelligence are concerned. Thus, we examined the extent to which this variation is reliable, and how it relates to a measure of intellectual ability. We also examined whether performance on the dual task can account for the individual differences in general ability beyond the single tasks comprising it. Finally, we examined the effects of practice on the relationship between performance on the dual task and general ability.

METHOD

Participants: Fifty undergraduate students (33 females and 17 males) were recruited through advertisements posted on the two major campuses of the Hebrew University. Their age ranged between 19 and 29, with a mean of 23. All of them took the Psychometric Entrance Examination (PET) required by all Israeli Universities as one of the admission criteria, and gave their consent that its results will be used for the purpose of this study. The students were paid for their participation. The data of one male participant were lost due to a technical problem, so all data analyses are based on 49 participants.

Instruments and tasks: All facets of the experiment were controlled by an IBM PC computer, including the presentation of the stimuli and the measurement of RTs. Two dual tasks were used in this study, such that each was composed of two single cognitive tasks. The first dual task consisted of a lexical decision (LD) task and an asterisk decision (AD) task, and the second dual task consisted of categorical (CD) and asterisk decision tasks. Thus, all in all, three single cognitive tasks were used (LD, AD, and CD). Each single task included 32 trials, and each dual task included 64 trials. Each trial began with the sign "+" presented at the center of the screen for 200 ms. This was needed to focus the participant's eyes to the center of the screen and to signal the beginning of a new trial. 300 ms after the "+" sign disappeared, the target stimulus was presented at the center of the screen for 100 ms. The screen was then masked until the participant responded by pressing one of two alternative keys. 700 ms after the response was given, the "+" sign reappeared to signal the beginning of a new trial. Different target stimuli were used in the different tasks, and different responses were required:

Lexical decision task: The target stimuli were 32 5- Hebrew-letter-strings. Half of them were meaningful words in Hebrew and half were non-words. All strings were adopted from previous lexical decision experiments (e.g., Frost, Katz, &Bentin, 1987). The order of the 32 stimuli was randomly determined for each participant. Participants were requested to make lexical decisions (word/non-word) by pressing one of two keys.

Asterisk decision task: The target stimulus was a white rectangle (20 mm x 5 mm), presented at the center of the screen, with a blinking asterisk located 60 mm from its center. The asterisk was presented for 30 ms in one of four possible locations: Above, below, to the right, or to the left of the rectangle. The screen was then masked for 50 ms, followed by a word describing the location of the asterisk (e.g., "above"). Participants were required to respond as quickly as they could by pressing a yes key if the description was true, and a no key, if it was false. The description was true in half of the 32 trials.

Categorical decision task: The target stimuli were 32 meaningful 4-5 letter words in Hebrew, half of which referred to a profession. The participants were required to respond yes if the word described a profession, and no, if it did not. All the profession words were typical and frequent instances of the profession category, and all the other words were frequent instances of other categories. All words were adopted from Henik and Kaplan (1989).

The dual task composed of LD and AD (LD+AD): The target stimuli were 64 Hebrew-letter strings (5 letters each), with a blinking asterisk located 60 mm from the center of each string. The asterisk was placed above, below, to the left, or to the right of the letter sequence, and was blinking for 30 ms. Half the strings were meaningful words in Hebrew and the others were non-words. Participants were instructed to make a lexical decision about these letter strings, and as soon as they responded, a word describing the position of the asterisk appeared at the center of the screen. At this point participants had to respond as quickly as possible by pressing a yes key, if the description was true, and a no key, if it was false. The description was true for half of the "word" trials, and for half of the "non-word" trials. Thus, two RT measures were extracted from the dual task, one for its LD component and the other for its AD component.

The dual task composed of CD and AD (CD+AD): Sixty four 4 or 5 letter words (half of which related to a profession) were used as target stimuli, with a blinking asterisk located 60 mm from their center. The asterisk was placed above, below, to the left, or to the right of the words and was blinking for 30 ms. The participants were required to respond yes if the word described a profession, and no, if it did not. As soon as they responded, a word describing the position of the asterisk appeared at the center of the screen. At this point participants had to respond as quickly as possible by pressing a yes key, if the description was true, and a no key, if it was false. The description was true for half of the profession words, and for half of the other words. Again, two RT measures were extracted for this dual task (one for its CD component and the other for its AD component).

Procedure: The experiment was conducted in two sessions separated by 3 to 5 days, and in each session participants completed the various tasks in groups of five. Participants were randomly divided into two equal-sized groups (Group 1, and Group 2) which differed in the order of the single tasks. The first session was composed of two stages (A and B), separated by a 3 hours interval, during which participants completed another, unrelated test. During each stage, participants completed two single tasks (LD and AD), followed by the LD + AD dual task. The second session was also composed of two stages (C and D), with a 5 min. interval between them. Stage C was identical to A. In stage D participants were first presented with CD as a single task, and then performed the CD + AD dual task. In each administration of the tasks different stimuli were used. A description of the research design and procedures is displayed in table 1.

Insert Table 1 about here

Measures used in this study: The principal measure used for both the single and the dual tasks was reaction time (RT). For the LD and CD tasks, RT was measured, in ms, from onset of the target stimulus to the participant's key press. For the AD task, RT was measured from onset of the word describing the location of the asterisk to participant's response. For the LD and CD tasks, only RTs to positive responses (i.e., words in the LD task, and profession-category words in the CD task) were analyzed. In all cases, only RTs for correct responses were included in the analysis. Errors were also recorded, but error rate was small (ranging between 0.02 and 0.08, for the single tasks and between 0.02 and 0.03, for the dual tasks) and no reliable individual differences in this measure were obtained. Therefore analyses of error rate will not be reported.

The scores on the Psychometric Entrance Examination (PET) were adopted as measures of general ability for this study. This test consists of three sub-tests: Verbal reasoning, Quantitative reasoning and English. All sub-tests are based on multiple-choice questions, and the number of correct responses on each sub-test is translated into a unified scale ranging from 50 to 150, with a mean of 100 and a standard deviation of 20, computed on the basis of the original (1984) norming group, which included all applicants to all undergraduate programs in the 6 Israeli universities in that year. The overall PET score is based on a weighted average of the sections' scores, such that the weights of the verbal and quantitative reasoning scores are 40% each, and the weight of the English score is 20%. The final PET score is translated into a scale ranging from 200 to 800, with a mean of 500 and a standard deviation of 100. A more detailed description of PET can be found in Beller (1994). According to this article, the average internal-consistency of the total PET score (based on Kuder-Richardson formula #20) is .95, and its average test-retest reliability is .90. The range-corrected predictive validity of the total PET score for predicting Grade Point Average (GPA) on the first year of college ranges from .40 to .54. The mean and standard deviation of the total PET score, computed across participants of this study, were 660.8 and 63.6, respectively (as compared with a mean of 555.5 and a standard deviation of 94.5 computed across all 44669 applicants to Israeli universities in the year of the study). Thus, it is clear that the present sample is very selective.

RESULTS

For each administration of each task, a median RT was computed for each participant across all trials for which correct responses were given. The means of these median RTs, computed across participants, for each administration of the LD and AD tasks, are displayed in Figure 1.

Insert Figure 1 about here

Inspection of Figure 1 reveals that response time, in the LD task, was longer under the dual task than under the single task condition. These increases in RT were statistically significant (using t-tests for repeated measures) in each administration of the LD task, but the differences gradually decreased with practice (from 162.4 ms in the first administration to 58.6 ms, in the third). This reduction can be attributed to the fact that performance on the lexical decisions under dual task condition was affected by practice much more than under single task condition. In the CD task, RTs were very similar to those obtained in the third administration of the LD task (the average median RTs were, 543.5 ms and 599.1 ms under the single and dual task conditions, respectively) and the RT increase in the dual task, involving CD, amounted to 55.6 ms, which is also similar to the results of the third administration of the LD dual task. Performance on the AD task, on the other hand, showed almost the opposite trend, and it seems to be facilitated when the AD task was combined with an additional task. This is not surprising because in the dual task, the asterisk is presented together with the letter sequence and the information about its location can be processed while the lexical decision is being performed. Thus, when the word describing the asterisk's location is presented, the participant has already made a decision about its location, and the response can be made immediately. In addition, Figure 1 indicates that for the

AD task, more pronounced practice effects were observed under the single than under the dual task condition.

Reliability of the RT measures

The LD and AD tasks were administered three times, both as single tasks and as components of the dual task. This allows for an estimation of the test-retest reliabilities of the RT measures based on these tasks, as well as the correlations between performance on single and dual tasks. These correlations, which are displayed in Table 2, indicate that test-retest reliabilities for RT measures derived from dual tasks are slightly higher than those based on single tasks, and that no differences in reliability between the LD and AD tasks emerge.

Insert Table 2 about here

Stability and distinctiveness of the specific individual differences in the dual task performance

To analyze the specific variance reflecting individual differences in performing the dual task, we first regressed the average RT obtained for the two components of the dual task on the RTs obtained in the individual administrations of these tasks. The percent of dual-task RT variance accounted for by the single-tasks RTs increased with practice, from 45%, in the first administration of the LD-AD dual task, to 62%, in its third administration and to 71% for the CD-AD dual task. Second, we computed for each participant, on each administration of each task a residual score based on the regression functions described above. The residual was defined as the difference between the actual mean RT obtained in the dual task and the predicted mean RT, on the basis of the regression of the dual task on the single tasks. The standard deviations of these residuals were 82.9, 56.8 and 56.8, in the first, second and third administrations of the (LD-AD) task, respectively, and 53.4 for the CD-AD dual task.

To examine whether these residual scores reflect stable individual differences, rather than error variance, the correlations between the residual scores on the various administrations of the dual tasks were computed. The correlations obtained for two consecutive administrations of the LD-AD dual task were .52 and .54, and the correlation computed between the residual scores of the third administration of the LD-AD and the CD-AD task was .72. These correlations indicate that performing two simultaneous tasks contains a stable distinctive component.

The relationships between performance on the dual task and measures of general cognitive ability

Scores obtained by the participants on the Psychometric Entrance Examination (PET) were used to examine the relationships between performance on the dual task and measures of general cognitive ability. The correlation coefficients between the RT measures, derived from the various administrations of the single and the dual tasks and the PET total score were computed. These correlation coefficients, which were corrected for range restriction[1] (Pearson, 1903), are displayed in Table 3. The correlations of the two components of the LD-AD dual task were larger (in absolute values) than the respective correlations obtained for the single tasks, but these differences were statistically significant (using a t-test for comparing correlation coefficients in correlated samples, see McNemar, 1962) only for the LD component in the first administration of the tasks. This pattern was not obtained when the two components of the CD-AD dual task were compared with the respective single tasks.

Insert Table 3 about here

Next, we computed the range-corrected correlations between the residual scores obtained from the 3 administrations of the LD-AD dual task, as well as the residual score obtained from the CD-AD dual task and the total PET score. These correlations were, –0.55, -0. 33, -0.13, and –0.09, for the first, second and third administrations of the LD-AD dual task, and the CD-AD dual task, respectively. The relationship between residual RTs, which reflect the distinct ability to perform the dual task, and PET was statistically significant only in the first administration of the dual task (in this administration, the residual score was significantly correlated with the English and Quantitative sub-tests of PET, as well as with the total PET score). The gradual reduction in the correlation between residual RT and PET score may reflect the fact that with practice the dual task becomes less dependent on resources (more automatic), and individual differences in this ability decrease.

In addition, we performed multiple regression analyses for predicting the total PET score from the RTs derived from the two components of each administration of each dual task and from the respective two single tasks. These analyses were performed in two steps. In the first, the two RTs derived from the single task were entered into the regression equation, and in the second step the RTs derived from the two components of the dual task were entered. The results of these analyses are presented in Table 4.

Insert Table 4 about here

These results reveal that the distinct PET variance accounted for by the two components of the dual task was statistically significant only in the first administration of the LD-AD task. It is also interesting to note that none of the multiple correlations based on the RTs derived from the two single tasks was statistically significant.

DISCUSSION

The first goal of this study was to examine the reliabilities of RT measures derived from both single and dual tasks. The range of test-retest reliabilities, computed across the different administrations of the tasks in this study, was .57-.90 for single tasks, and .72-.86 for dual tasks. Although these ranges do not seem to differ substantially from those reported by Roznowski (1993), the lower bounds obtained in this study are larger than those reported in previous studies (.57 vs. .44 and .30 reported by Roznowski, 1993 and Rose & Fernandes, 1977, respectively). In particular, the stabilities of RTs obtained from dual tasks seem promising and their lower bound is .72.

A more central goal of this study was to examine whether the ability to divide attention among competing tasks represents a distinctive dimension of individual differences, or whether it could be accounted for by performance on the constituent single tasks. The results show that, although a fairly large proportion of the dual task variance can be accounted for by the single tasks (between 45% and 70%), a substantial proportion of the residual variance is not an error variance. Rather, the correlations between the residuals of two consecutive administrations of the dual tasks range between 0.52 and 0.72. These correlations indicate that performing two simultaneous tasks is a stable and distinct cognitive ability.

It is difficult to determine whether this distinctive factor represents encoding efficiency, or the ability to deal with task complexity, as argued by Stankov (1988, 1989), or whether it represents the ability to allocate resources among competing tasks. Stankov's arguments were based, to a large extent, on studies showing no decrements in performance under the dual-task relative to the single-task condition. In the present study, however, clear decrements in performing the main tasks (lexical decision, and categorical decision) under the dual-task condition were obtained. Although these decrements were more pronounced in the first administration of the dual task, they were still significant during the third and fourth administrations. Performing the secondary task (the asterisk decision) was facilitated in the dual-task condition, but as explained earlier, this reflects the nature of the dual task.

The pattern of the correlations between RT measures derived from the single and dual tasks and measures of general cognitive ability, obtained in this study, indicates that the individual differences in performing the dual tasks are not only stable across tasks and administrations, but are also related to general cognitive ability (at least in the initial administration of the dual task). This study joins several previous studies in demonstrating that performance on dual tasks is more strongly correlated with measures of general intelligence than performance on single tasks (e.g., Fogarty & Stankov, 1982; Stankov, 1983, 1989).

However, this conclusion must be treated cautiously because the advantage of the dual task, as a predictor of general ability, was observed only on its first administration and it dissipated with practice. The conclusion that the distinct ability to perform the dual task on its initial administration is related to general ability relies also on the regression analysis. This analysis demonstrated that the RTs derived from two components of the first LD-AD dual task add significantly to the proportion of PET score variance accounted for. It is also supported by the correlations between the residual RT score and PET. These correlations are quite high in the first administration of the dual task, and tend to decline with practice. These results imply that the unique ability to perform the dual tasks (the ability that cannot be predicted from performance on single tasks) may become more automatic and less controlled with practice.

This interpretation is consistent with other aspects of the present results. First, average RTs to the LD in the dual task condition decrease dramatically from the first to the second administration (from 715 ms. to 602 ms.). Second, the correlation between the two components of the dual task gradually increases from .40 in the first administration to .70 in the fourth. Thus, performing the dual task becomes easier with practice and the interference between its components becomes less severe. In addition, individual differences in RT under dual task conditions decrease with practice and performance on the dual task becomes better predicted by the single tasks comprising it.

Our results are also consistent with the conclusions of Ackerman (1987), who suggested that initial performance on tasks that depend on processing resources is more strongly related to general ability than subsequent performance. Posner (1973), as well as Spelk, Hirst and Neisser (1976) demonstrated that performance on dual tasks and the ability to efficiently allocate resources among competing tasks depend on practice. Practice tends to reduce individual differences on such tasks (see also, Shaffer, 1974), and therefore their relationships with measures of general ability decrease. The effects of practice on the relationship between dual task performance and general cognitive ability questions the applicability of dual tasks for personnel selection and classification, but further research is required to determine the predictive validity of dual tasks for various job-related criteria.

Two interpretations may be offered for the finding that dual task performance is not completely accounted for by performance on the single tasks comprising it, and that the distinct ability to perform the dual task (at least in its initial administration) is related to general cognitive ability: First, the interpretation offered by Stankov (1988, 1989) that individual differences in the dual task performance reflect differences in cognitive strategy, such that high ability individuals learn more rapidly to choose efficient strategies to deal with the dual task. Second, these individual differences may reflect differences in attentional resources. With experience tasks become familiar and therefore require less resources, but high ability individuals may be capable of allocating resources efficiently (or may have more resources), even when first encountered with the dual task, while low ability individuals acquire this ability only with practice. The second interpretation may better fit the present results, because in contrast to the findings reported by Stankov (1988, 1989), clear decrements in performance were observed under the dual task conditions, relative to the single tasks.

Another interesting feature of the present results is the use of PET, which is a measure of the ability to use an educationally-acquired knowledge, or a measure of crystallized intelligence. Most previous studies that examined the relationships between RT measures derived from cognitive tasks and intelligence used measures of fluid intelligence (e.g., Raven's Progressive Matrices Test). In their summary of research on the relationships between measures of mental speed and intelligence, Stankov and Roberts (1997) concluded that these measures correlate only with fluid, but not with crystallized intelligence (see also, Roberts et al., 1991). Our results indicate that this conclusion is not necessarily true, and at least RT measures derive from dual task conditions correlate with crystallized intelligence.

Summary and conclusions.

The present study focused primarily on the relationships between performing dual tasks and general cognitive ability. Unlike most previous studies, measuring individual differences in dual task performance, we used response time as a measure of performance on both single and dual tasks. This allows for measuring individual differences, even with elementary tasks and makes our study relevant to the vast literature dealing with the relationships between elementary cognitive tasks and general intelligence, not only in the dual task context (see, Jensen, 1998). We showed that RT measures, particularly those derived from dual-task conditions, are sufficiently reliable. Moreover, the results demonstrated that dual-task performance is not completely accounted for by individual differences in performance on the constituent single tasks, and that the distinct attribute of dual task performance (at the early stages of practice) is related to general cognitive ability. This result implies that the unique ability to perform the dual tasks may become more automatic and less controlled with practice, and thus its relationship with general cognitive ability decreases.

Future studies should be conducted to examine the generalizability of the present results across populations, measures of general ability and measures of dual-task performance. It would be also important to examine relationships between dual-task performance and general cognitive ability in an unselected sample. In addition, it would be interesting to examine whether initial performance on dual tasks can be used to predict various job-related criteria, and whether the predictive validity of the dual task performance depends on the nature of the validation criterion. For example, it is possible that performance on dual tasks is valid for job-related criteria, which require workers to perform more than one thing at a time, but not for other types of criteria.

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Footnotes

1. Correction for range restriction was needed because the present sample included university students who were admitted on the basis of a composite score, composed of PET and the average Matriculation score, with equal weights. Thus, the standard deviation of the total PET score in the sample was 67.3% of the standard deviation in the general applicant population. However, all statistical tests performed on correlation coefficients were based on the uncorrected coefficients, because significant tests for range-corrected correlations are unavailable.

Table 1: A description of the research design and procedures.

First session:		
Stage A:	<u>Group 1</u>	<u>Group 2</u>
	Single task: LD	Single task: AD
	Single task: AD	Single task: LD
	Dual task: LD+AD	Dual task: LD+AD
3 hours interval		
Stage B:	<u>Group 1</u>	<u>Group 2</u>
	Single task: AD	Single task: LD
	Single task: LD	Single task: AD
	Dual task: LD+AD	Dual task: LD+AD

3 to 5 days interval

Second session:		
Stage C:	<u>Group 1</u>	<u>Group 2</u>
	Single task: LD	Single task: AD
	Single task: AD	Single task: LD
	Dual task: LD+AD	Dual task: LD+AD
5 min break		
Stage D:	<u>Group 1</u>	<u>Group 2</u>
	Single task: CD	Single task: CD
	Dual task: CD+AD	Dual task: CD+AD

Table 2: Test-retest correlations between median RTs derived from single and dual task conditions, and within-administration Correlations between median RTs in single and dual tasks.

		Different administrations			Same administration	
Task	Administrations	two single tasks	two dual tasks	dual and single tasks	Dual and single tasks	
LD	I-II	.69	.74	.53, .67	I	.54
	I-III	.57	.76	.43, .53	II	.77
	II-III	.72	.77	.72, .64	III	.65
AD	I-II	.74	.76	.42, .56	I	.54
	I-III	.55	.72	.41, .63	II	.66
	II-III	.90	.87	.60, .76	III	.73

Table 3: Range corrected correlation coefficients between PET scores and median RTs derived from the dual tasks and the single tasks:

Task	Administration	Median RTs derived from the single tasks	median RTs derived from the dual tasks	t(46) for testing the difference between the two correlations
LD	First	-.03	-.44*	2.03*
	Second	-.19	-.28	1.10
	Third	-.24	-.24	0.67
AD	First	-.34	-.55*	0.66
	Second	-.48*	-.52*	0.02
	Third	-.39	-.41	0.11
CD	Forth	-.46*	-.37	-0.62
AD	Forth	-.36	-.34	-0.22

* Statistically significant before range correction (p< .05)

The significance of the differences was computed on the correlation coefficients before the Range correction.

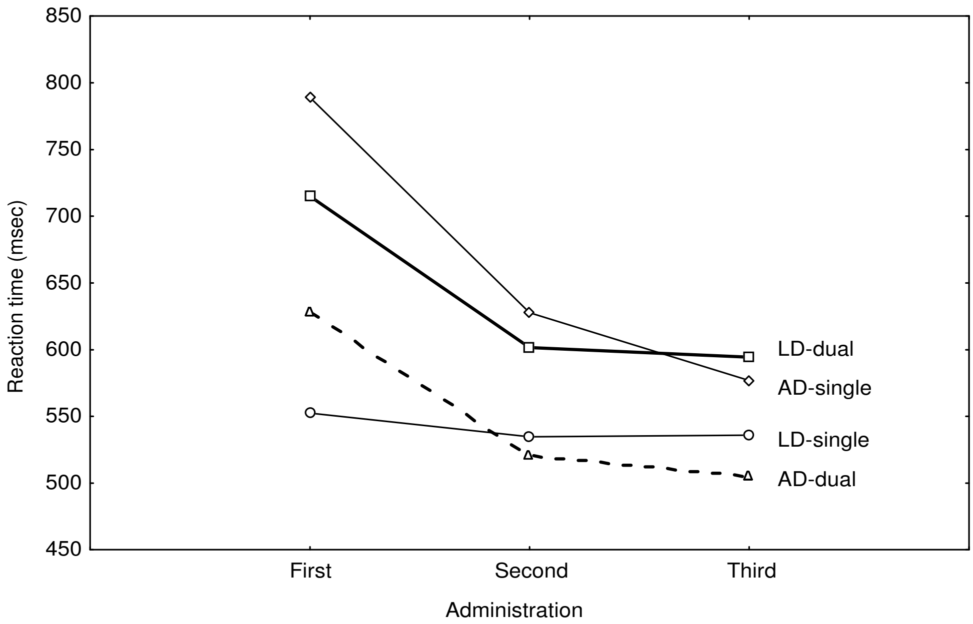
Table 4: Multiple regression analyses for predicting the PET score from the RTs derived from the two single tasks (step one) and for the two components of the dual task (step two), for each administration:

Task	Administration	R^2 for the two single tasks (step one)	Marginal R^2 for the two components of the dual task (step two)	F(2,44) for Marginal R^2
LD+AD	First	.059	0.140	3.88*
LD+AD	Second	.113	0.049	1.29
LD+AD	Third	.068	0.016	F<1
CD+AD	Forth	.102	0.006	F<1

* Statistically significant ($p < .05$)

Figure Captions

Figure 1: Average median RTs for the various administrations of the LD and AD tasks as single and dual tasks.


850
800
750
700
650
600
550
500
450
Reaction time (msec)
First
Second
Third
Administration
LD-dual
AD-single
LD-single
AD-dual