Two Short Tests Fail to Detect Vigilance Decrements

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Summary: Deterioration in performance associated with decreased ability to sustain attention may be found in long and tedious task sessions. The necessity for assessing a number of psychological dimensions in a single session often demands “short” tests capable of assessing individual differences in abilities such as vigilance and maintenance of high performance levels. In the present paper two tasks were selected as candidates for playing this role, the Abbreviated Vigilance Task (AVT) by Temple, Warm, Dember, LaGrange and Matthews (1996) and the Continuous Attention Test (CAT) by Tiplady (1992). However, when applied to a sample of 829 candidates in a job-selection process for air-traffic controllers, neither of them showed discriminative capacity. In a second study, an extended version of the CAT was applied to a similar sample of 667 subjects, but also proved incapable of properly detecting individual differences. In short, at least in a selection context such as that studied here, neither of the tasks appeared appropriate for playing the role of a “short” test for discriminating individual differences in performance deterioration in sustained attention.

The present research was conducted as part of a candidate selection process for air-traffic controllers, a job position with high status and good salary. The number of tests in the battery employed for this selection process is relatively high. Given that they are usually applied in a single session, the need to develop short tests to assess abilities is obvious. Among the abilities that should be assessed for this particular job position is sustained attention.

Sustained attention can be considered to be the capacity for maintaining the focus of cognitive activity on a given stimulation source or task, without decrements in performance. In principle, neither the kinds of operations performed nor the kinds of abilities required by the task are too important. Sustained attention is an ability related more to persistence and active maintenance of task goals than with the task itself. A task is appropriate for assessing individual differences in sustained attention if its results show different amounts of performance decrements across individuals. From the assessment point of view, what is desirable is that these individual differences, manifested as differential deterioration in performance, appear early in the session.

In addition to the traditional difficulties of defining and measuring sustained attention in the specific case with which we are working, there is the additional problem that the candidates usually show characteristics different from other samples (Voskuil & Meyer, 1999), for example, abnormally high levels of performance during the selection process (Ackerman & Kanfer, 1993). These levels, closely related to the motivation level involved in the context, are probably quite inflated when compared to the levels the same candidates would present in the situations for which they are being selected, and to the capacity itself. This fact makes it even more difficult to obtain significant results in short periods. These special characteristics of our selection context suggest that one would be ill-advised to test the tasks with other samples and in other situations.

Sustained attention has traditionally been studied using boring tasks that consist, essentially, of detecting infrequent events in sessions of long duration. The most
interesting result has been the so-called vigilance decrement (VD). VD is a reduction in performance that appears with the passing of time. It has been studied since World War II, when deficits in the detection of signals by radar operators were observed. After observation periods of only half an hour, the performance of observers began to decline. As hit rate reduction is usually accompanied by a reduction in the false-alarm rate, there has been a debate as to whether this should be interpreted, in terms of signal detection theory (Green & Sweets, 1988), as changes in discrimination ability or, rather, as changes in response bias (Blanco, 1998). The hypothesis with the greatest current support is that VD is produced by a loss of sensitivity from a reduction in the processing resources devoted to the task (Parasuraman, 1979). A great deal of research has been devoted to studying the nature of this decrement and the factors that affect its appearance and size (see the meta-analysis by See, Howe, Warm, & Dember, 1995).

As was already pointed out, in applied contexts it is frequently necessary to assess individual differences in the ability to sustain attention or vigilance ability, operationalized as VD. However, the time needed for VD to show up is excessive, since VD does not clearly appear in a session until after 20–30 minutes, depending on the particular conditions, even though it is not rare to find subjects with significant decrements after only 15 minutes. This means that the tasks employed for assessing differences in VD are relatively long, so that there is an acknowledged need for shorter tasks, capable of diagnosing the trend of individuals to show VD.

In the present study two tasks that had been developed in very different contexts were selected as candidates to play the role of “short” tests for assessing VD: the Abbre-viated Vigilance Task (AVT) by Temple, Warm, Dember, LaGrange and Matthews (1996) and the Continuous Attention Task (CAT) by Tiplady (1992). The developers of the AVT claimed that this test is appropriate for detecting VD in general. Tiplady proposed the CAT as appropriate in a specific context (psychopharmacology), but its properties make it a good candidate as a short test for a more general use.

Parasuraman and Davies (1977) proposed a classification of vigilance tasks in accordance with two criteria: successive versus simultaneous discrimination and high versus low rate of presentation, considering as high rates of 24 events/minute or higher. In their review they showed that VD appears most strongly in tasks requiring successive discriminations with a high rate of stimulus presentation. Parasuraman’s hypothesis (1979) is that VD is produced in tasks that demand greater effort, which are precisely those corresponding to this combination (see Blanco, Lamas, & Alvarez, 1992). The two tasks selected here would be classified in this category, although one of them (the CAT) is more demanding, as will be shown below. See et al. (1995) proposed the inclusion in Parasuraman and Davies’ classification system (1977) of a distinction between sensorial and cognitive tasks, a dimension acknowledged to be related to familiarity with the stimuli employed. In the present case the AVT is cognitive and the CAT sensorial, though with the presentation rate usually employed in them, the expected effect size of time on performance should be around 0.60 in both cases (see the meta-analytic estimations by See et al., 1995).

The AVT was designed for the detection of early appearance of VD. Temple et al. (1996) used a screen mask consisting of small circles, which remained constant throughout the whole session, while the stimuli appeared in the center of the screen (Figure 1). The participants’ task consisted of detecting the appearance of an O, the letter designed as target, and pressing a response key. In order to analyze the results, the 12-minute session was divided into six periods of 2 minutes each. The authors reported observing significant vigilance decrements over the session (VD).

The Continuous Attention Test (CAT) was developed by Tiplady (1985, 1988) as a short test of sustained attention. He was able to show that the results of this test are not influenced by extraneous factors, especially perceptual ones (Tiplady, 1992), and he recommends the test for assessing the effects of drugs on the maintenance of attention. The test was not designed to assess changes in the time domain, but rather to detect significantly diminished ability from the beginning of the session. It would appear that the test is indeed sensitive to differences in ability at the moment it is applied. Although our participants are normal and participate under normal conditions, we selected the CAT, given its interesting characteristics (see the analysis by Tiplady, 1992), as a candidate for assessing performance impairments over time. The task consists of the presentation of short-duration stimuli (100 ms) at an average rate of one every 2 seconds. One-sixth of the stimuli displayed are identical to the previous one. The participants’ task is to detect target trials, that is, those in which the display is identical to that of the previous one, and to press a response key. The task is cognitively more demanding than the AVT, for two reasons: First, in each trial of the CAT the stimulus has to be compared with a different one (presented in the previous trial), which must be retained in short-term memory, whereas in the AVT each display has to be compared with a target shape (the letter O), which remains constant throughout the task and is thus retained in long-term memory. Second, in the CAT the intertrial interval is variable. Although at first sight it might appear that the greater demand in the CAT should make us expect greater effects of individual differences in ability, the opposite
can also be argued. As proposed from attention models based on nonspecific and distributed processing resources (Kahneman, 1973), one cannot overassign resources—and certainly not for long periods of time—to tasks that are in themselves easy. This means that the easiest (and most boring) tasks may be more vulnerable to a diminished ability for sustaining attention. Even so, the CAT is considerably more difficult than the AVT, and it may be that fatigue effects will be stronger than the effect of boredom in the AVT.

Tiplady (1992) obtained a hit rate of 92% and a false-alarm rate of 0.55%. Despite the high average level of performance, we decided to include this task in our battery because we expected that, apart from its probable capacity for allowing discriminations (in the left tail) of subjects with low ability, it would probably also permit the discrimination of differences in impairment over the course of the test. Tiplady did not study this aspect of the problem, but for us it was crucial—more important than the level of performance shown at the beginning of the task.

Study 1

Materials and Method

Participants

Participants were 829 Spanish candidates for taking a course for the position of air traffic controller, 54% males and 46% females, all with normal or corrected-to-normal vision. Average age was 27.8 years (SD: 3.87). All participants were high-school graduates (67.5% university graduates).

Material

Tasks were administered in a large room with individual workplaces conveniently separated. They were administered on IBM-compatible computers and Philips 107-S, 17” monitors.

Abbreviated Vigilance Task (AVT). This is a vigilance task lasting 12 minutes, divided (unnoticeably for subjects) into 6 periods of 2 minutes each. Throughout the task a screen mask formed of small empty circles remained as a background (see Figure 1). The circles were 1 mm in diameter and between one circle and another there was an horizontal distance of 2.5 mm and a diagonal one of 3 mm. The vertical distance between the lines of circles was also 2.5 mm. At a viewing distance of 40 cm from the screen, the circles subtended 0.14° of visual angle, and the distances between the circles subtended 0.36° and 0.43° of visual angle, horizontally and diagonally, respectively. The letters subtended 1.15° and 0.64° vertically and horizontally, respectively. Participants had to pay attention to the appearance of uppercase letters in the center of the screen. The letters could be “O,” “D” or “reversed-D” (mirrored); they remained on the screen for 40 ms. Stimuli were presented at a constant rate of 57.5 stimuli/min. The stimulus that the participants had to detect (the target) was the letter “O.” The sequence of stimuli was randomly varied for each participant, with the restriction that the probability of appearance of the target was 0.20, and of each distractor, 0.40. Participants were to indicate the presence of the target by pressing a key on the mouse. Responses to a stimulus were to be performed during the interstimulus interval following that stimulus. The responses emitted during the interstimulus interval following an “O” were registered as “hits,” while those emitted at any other time were registered as “false alarms.” Hit and false alarm rates were calculated, as was the nonparametric sensitivity index A’, using the Grier’s formula (1971). These indices were calculated for each of the 2-minute periods into which the session was divided, for the test as a whole, and for the combination of the last five intervals (see Results section below).

Continuous Attention Test (CAT). This is a sustained attention test lasting 8.5 minutes, divided (unnoticeably for subjects) into two halves in order to study changes in performance over the session. Each stimulus was constructed from an underlying pattern of 3 x 3 cells, four of them illuminated and five remaining dark, and was shown for 100 ms (Figure 2). The interstimulus interval was variable, ranging from 1.5 to 2.5 s, with an average of 2 s. Each stimulus was built by taking the previous one and passing one of the cells from illuminated to dark, and another one from dark to illuminated, with the exception...
of the target trials. On target trials the same stimulus was presented, without changes, as in the previous trial (1/6 of the trials). The participants’ task was to detect repetitions, pressing a key on the mouse each time the display was identical to the previous one. 241 displays were presented, so that there were 240 comparisons (40 target trials and 200 nontarget trials). The sequence was divided into groups of six consecutive displays, one of them being randomly selected as the target trial, so that the target trials were homogeneously distributed throughout the session. Hit and false alarm rates were calculated, as were the Pigache (1976) error index and the nonparametric sensitivity index $A'$, again through use of Grier’s formula (1971). These indices were calculated both for the whole session and for each half of the session.

**Procedure.** Participants took part in a single session of about 3 hours, with 14 tasks. Six of them were measures of diverse cognitive abilities and 8 were personality tests. Within the order of administration of this battery, the CAT and the AVT were included as the 6th and 8th tests, respectively.

**Results**

Table 1 shows the results for AVT, delineated according to the 2-minute periods, plus the results for the test as a whole. Statistics corresponding to the hit and false-alarm rates and the nonparametric index $A'$ are included. The results resemble, in general, those of the easy discrimination condition of Temple et al. (1996).

Three within-subjects analyses of variance were carried out, with the six periods as the levels of a single factor, significant effects being found for hit rates $[F(5, 4125) = 17.35, p < .001]$ and false alarms $[F(5, 4125) = 14.96, p < .001]$, but not for the $A'$ index $[F(5, 4090) = 1.837, p < .11]$. When the same analyses were repeated, but including only the last 5 periods, the same significant effects were obtained [hits, $F(4, 3300) = 24.034, p < .001$; false alarms, $F(4, 3300) = 3.50, p < .01$; $A'$, $F(4, 3276) < 1$, n.s.]. The effect size between intervals 2 and 6 is 0.02.

As a measure of change we calculated the individual slopes of the regression line of performance over the periods 2–6, in index $A'$. These values have a mean of 0.0022 and standard deviation 0.085. The values of these slopes do not seem appropriate for discriminating differences in change rates, given that their variability is very small and they show a strong ceiling effect, as is clear in the skewness index (the slope calculated on the group performance averages is virtually null: 0.0005).

Table 2 summarizes the results of CAT, delineated according to the two halves of the test, and the results for the test as a whole. Statistics corresponding to the hit and false-alarm rates, the error index of Pigache, and the $A'$ index are included. Our results are very similar to those of Tiplady (1992), who found means of 36.8, 1.1, and 0.091 in hits, false alarms, and error index, respectively.

The means of the two halves were compared for four dependent variables, obtaining significant effects for all

### Table 1. Results (means and standard deviations) in the Abbreviated Vigilance Test (AVT) in study 1.

<table>
<thead>
<tr>
<th></th>
<th>Hit rates</th>
<th>False alarm rates</th>
<th>A'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval 1</td>
<td>.9785 (.069)</td>
<td>.025 (.119)</td>
<td>.985 (.082)</td>
</tr>
<tr>
<td>Interval 2</td>
<td>.9788 (.063)</td>
<td>.015 (.103)</td>
<td>.989 (.113)</td>
</tr>
<tr>
<td>Interval 3</td>
<td>.9823 (.067)</td>
<td>.013 (.093)</td>
<td>.990 (.070)</td>
</tr>
<tr>
<td>Interval 4</td>
<td>.9784 (.068)</td>
<td>.012 (.089)</td>
<td>.989 (.076)</td>
</tr>
<tr>
<td>Interval 5</td>
<td>.9760 (.069)</td>
<td>.011 (.084)</td>
<td>.989 (.062)</td>
</tr>
<tr>
<td>Interval 6</td>
<td>.9730 (.082)</td>
<td>.010 (.081)</td>
<td>.987 (.087)</td>
</tr>
<tr>
<td>Whole task</td>
<td>.9794 (.062)</td>
<td>.015 (.089)</td>
<td>.987 (.072)</td>
</tr>
<tr>
<td>Intervals 2–6</td>
<td>.9797 (.063)</td>
<td>.012 (.086)</td>
<td>.988 (.072)</td>
</tr>
</tbody>
</table>

### Table 2. Means and standard deviations of several variables in the Continuous Attention Test (CAT) in study 1.

<table>
<thead>
<tr>
<th></th>
<th>Hits</th>
<th>False alarms</th>
<th>Error index</th>
<th>A'</th>
</tr>
</thead>
<tbody>
<tr>
<td>First half</td>
<td>18.58 (2.39)</td>
<td>2.83 (4.93)</td>
<td>.128 (.186)</td>
<td>.950 (.074)</td>
</tr>
<tr>
<td>Second half</td>
<td>18.74 (2.21)</td>
<td>1.97 (5.34)</td>
<td>.102 (.168)</td>
<td>.959 (.066)</td>
</tr>
<tr>
<td>Whole task</td>
<td>37.32 (4.24)</td>
<td>4.80 (9.63)</td>
<td>.115 (.168)</td>
<td>.955 (.066)</td>
</tr>
</tbody>
</table>
them [hits, \( t(834) = -2.548, p < .02 \); false alarms, \( t(834) = 6.966, p < .001 \); Pigache’s index, \( t(834) = 6.441, p < .001 \); A’, \( t(834) = -5.003, p < .001 \)]. The correlations between the values in the two halves in these four variables were .694, .758, .799 and .771.

Discussion

Strong negative skewness is found in the two tests because of a marked ceiling effect that allows good discrimination, by the left tail, only for subjects with low ability for the task. Specifically, in the AVT the average value in A’ in the first two intervals – which we can use as an index of the basic ability – corresponds to the 11th percentile. In the CAT the average value in A’ in the first half, which can also be used to assess the basic ability, corresponds to the 32nd percentile.

Once we have the guarantee that the ability necessary for reaching virtually perfect performance level is low, we can study the changes over the course of the test, as indicators of differences in the ability to sustain attention.

With respect to changes over the session, our findings are as follows. In the AVT there are small, though significant, changes in both hit and false alarms from the second observation period onwards. However, when the data are analyzed using a sensitivity index that combines the two rates, such as index A’, the decrement in sensitivity (negative slope) is not found to be significant. It is clear that there is, in fact, a change in the response criterion, which becomes more conservative. The only discordant result is that from the first observation period. We believe that the poor performance in this period is due to participants’ adjustments to the new task. Given that we did not include a warm-up or habituation stage, the first interval may have fulfilled this role. We therefore reanalyzed the data, discarding those of the first interval. However, in this reanalysis we did not obtain significant effects for sensitivity, nor does the analysis of the individual slopes in these five intervals indicate that the slopes are a viable index for reflecting individual differences in VD.

Although Temple et al. (1996) claimed to have obtained VD, their results are not very clear. They find, for example, a significant increment in performance in the 6th interval. They attribute this to the fact that subjects knew the duration of the task and intensified their effort and involvement with the task as the end of the session approached. However, this difference could also be a "normal" (random) size fluctuation at these levels of performance.

In the CAT we obtained significant differences between the two halves of the session, but in the opposite direction to what was expected. That is, the participants not only did not show VD, but appeared to improve from the first to the second half. We believe this to be due, as in AVT, to poorer performance in the first few trials, because of the need to adjust to the task. Given that the session was separated into only two periods, we do not have enough comparative information to diagnose the appearance of significant decrements in performance over the course of the test. This result converges with those of other authors (e.g., Carro & Orgaz, 1998).

In short, while AVT did not show itself to be capable of discriminating individual differences in VD in a period of 12 minutes, with regard to the CAT we are still left in doubt as to whether it might be capable of doing so. Remember that while the AVT was 12 minutes long, the CAT lasted only 8.5 minutes. We therefore decided to include CAT in the selection process for the next cohort, though in a slightly lengthened version and with a few practice trials. The results are reported in Study 2.

Study 2

Materials and Method

Participants

The sample was made up of 667 Spanish candidates for the same job position. 50.1% were males and 49.9% females, all with normal or corrected-to-normal vision. Average age was 28.28 yrs. (SD 4.34). All participants were at least high-school graduates (62.5% university graduates).

Material

As in Study 1.

Continuous Attention Test (CAT). The changes made to the task were as follows: In order to familiarize the participant with the task, a short practice stage was included, made up of 12 trials (two sequences of six trials, each with a target trial). After participants had received feedback about their performance during the practice stage, the assessment stage began, with the same design as in the previous study, but with twice the duration, i.e., 481 displays divided (unnoticeably for subjects) into four blocks for studying the appearance of changes in performance. Thus, in each block there were 20 target trials and 100 nontarget trials (plus the first trial, in the first block). Hit and false-alarm rates were measured, as was the non-parametric index of sensitivity A’, again by means of Grier’s (1971) computational formula. These indices were calculated both for the test as a whole and for the
Results and Discussion

Results are summarized in Table 3, which shows the mean and standard deviation in number of hits and false alarms and index A', for each block of trials and for the test as a whole. Values of the individual slopes of performance levels have a mean of –0.000592 and a standard deviation of 0.0006. Comparisons of the means in A' were carried out between the four blocks using a within-subjects analysis of variance, obtaining significant effects at an α level of 0.05 \[ F(3,1998) = 3.306; \] \[ p < .02 \]. However, although statistically significant, the effect size is very small. This is because of the anomalous high power of the test. Furthermore, with a standard level of significance as 0.01 it is not statistically significant.

Given that the main goal of this research was to diagnose individual differences in the capacity for sustained attention, that is, for maintaining performance level, the slope value should not be accepted uncritically. The selected participant must show a high level of performance from the beginning of the session, but we also need to assess the ability for maintaining this high performance level. We thus decided to reanalyze the data taking only the subjects with high performance and eliminating those who failed to reach a minimum level of performance in the first block. Taking as a basis the results of the previous study, those of Tiplady and pilot tests, we decided to set the minimum requirement at A' ≥ 0.90. This criterion was reached by 637 subjects (91.1%). The results of these subjects appear in Table 4. Their individual slopes have a mean of –0.00201 and a standard deviation of 0.0095 (the slope on the means is –0.0022). Correlations between the values in the four blocks range between 0.443 and 0.728 in hit rates, between 0.525 and 0.874 in false alarm rates, and between 0.454 and 0.728 in the A’ index.

Comparisons were made of the means of A’ between the four blocks through a within-subjects analysis of variance, with significant effects being found \[ F(3,1908) = 14.377; \] \[ p < 0.001 \].

As in the previous study, we again found a strong negative skewness. With regard to the changes over the course of the session, we believe that the warm-up stage contributed to an improvement on the test. We obtained, at the group level, a significant decrement in performance. However, the decrement was very small, reaching statistical significance only because the very high sample size gave great power to the test. Effect size, between blocks 1 and 4, was 0.20.

Conclusions

Neither of the tests selected, the AVT or the CAT, permitted us to attain our goal of detecting decrements in sustained attention in a short period of time. In the case of the CAT we even used a version of more than 16 minutes’ duration. Tiplady (1992) did not claim that this test can detect VD in normal subjects. However, we explored here that possibility. In the case of the AVT, our results contradict the conclusions of the authors, who claimed that this test can detect VD in general.

While in their meta-analysis See et al. (1995) reported as typical an effect size of time on performance of 0.60, with the tests and durations used here the effect size did not exceed 0.20. However, the samples in the studies included in the meta-analysis were not made up of subjects as motivated as those in our own sample. Thus, our main conclusion is that, at least in selection contexts such as ours, with highly motivated subjects, we are still lacking “short” tests with which to assess individual differences in sustained attention.

Table 3. Means and standard deviations in several variables, for each block of trials, in the Continuous Attention Test (CAT) in study 2.

<table>
<thead>
<tr>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hits</td>
<td>18.69</td>
<td>18.45</td>
<td>18.41</td>
<td>18.10</td>
</tr>
<tr>
<td></td>
<td>(2.19)</td>
<td>(2.14)</td>
<td>(2.26)</td>
<td>(2.60)</td>
</tr>
<tr>
<td>False Alarms</td>
<td>2.77</td>
<td>1.51</td>
<td>1.40</td>
<td>1.31</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.82)</td>
<td>(3.54)</td>
<td>(3.10)</td>
</tr>
<tr>
<td>A'</td>
<td>.974</td>
<td>.976</td>
<td>.976</td>
<td>.972</td>
</tr>
<tr>
<td></td>
<td>(0.045)</td>
<td>(0.032)</td>
<td>(0.034)</td>
<td>(0.036)</td>
</tr>
</tbody>
</table>

Table 4. Means and standard deviations in several variables in the Continuous Attention Test (CAT), for subjects with values in A’ higher than 0.90 in the first block.

<table>
<thead>
<tr>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hits</td>
<td>19.04</td>
<td>18.60</td>
<td>18.55</td>
<td>18.28</td>
</tr>
<tr>
<td></td>
<td>(1.30)</td>
<td>(1.87)</td>
<td>(2.04)</td>
<td>(2.34)</td>
</tr>
<tr>
<td>False alarms</td>
<td>2.27</td>
<td>1.27</td>
<td>1.15</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td>(2.84)</td>
<td>(2.05)</td>
<td>(2.56)</td>
<td>(2.51)</td>
</tr>
<tr>
<td>A’</td>
<td>.982</td>
<td>.979</td>
<td>.978</td>
<td>.975</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.026)</td>
<td>(0.028)</td>
<td>(0.032)</td>
</tr>
</tbody>
</table>
The differences between size effects may be due to characteristics of the samples. Participants in our studies were strongly motivated, and the role of motivation in performance has frequently been underlined. Indeed, Smith (1966) suggested that the vigilance decrement currently found in vigilance experiments results from merging the scores of conscientious subjects with those individuals who lack commitment and dedication to the task. Even so, there are only a few experimental studies in which the effect of motivation on sustained attention and vigilance has been tested.

For example, using monetary rewards as incentive, Sipowicz, Ware, and Baker (1962) showed how paid subjects performed substantially better than nonpaid volunteers in sustained attention. However, other studies found no effect of this kind of motivation (Bergum & Lehr, 1964). More recently, Tomporowski, Simpson, and Hager (1993) found that subjects who received monetary incentives to participate in a laboratory test of attention and memory showed (slightly but significantly) better sustained attention performance than those whose incentive was course credits and those who were simply asked to participate. The authors proposed that non-monetary incentives to participate may result in poor performance. The same research team (Tomporowski & Tinsley, 1996), studying the effect of age on sustained attention, carried out a set of two experiments, the first of them using monetary reward as an independent variable. No differences were found between older and younger rewarded subjects in a continuous digit-matching vigilance test, but a significant vigilance decrement was found in younger non-rewarded subjects.

Using a different kind of motivation, Warm et al. (1974) showed the role of performance efficiency feedback in enhancing the quality of subjects’ vigilant behavior, even if the data supplied to subjects is false. Furthermore, Dember, Galinski, and Warm (1992) found an effect of the illusion of choice between hard and easy versions of the task on sustained attention. These results point to the importance of intrinsic motivation in vigilance performance.

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References


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