Fatigue Effects During a Single Session of Automated Static Threshold Perimetry

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**Purpose.** To determine using a routine clinical program the time course of the fatigue effect in both eyes at a given examination, the influence of rest periods during the examination, and the differences in the fatigue effect between persons with ocular hypertension and age-matched normal subjects.

**Methods.** Perimetry was undertaken for both eyes of 20 normal persons and 20 persons with ocular hypertension using Program G1X (Interzeag AG, Schlieren, Switzerland) of the Octopus 1-2-3 perimeter. Global mean defect and loss variance were calculated for each of the eight individual stages and global SF was calculated for stages 5 to 8. The superronferior and nasotemporal hemifield indices and those for within and beyond 17° eccentricity were calculated separately to investigate the locus of the fatigue effect.

**Results.** Group mean mean defect and loss variance deteriorated over stages \( P < 0.001 \) and between eyes for both groups \( P < 0.001; P < 0.004 \). The deterioration in the mean defect was more marked peripherally \( P < 0.001 \) and inferiorly with age and group \( P < 0.001 \) whereas the localized loss was more pronounced peripherally \( P < 0.001 \), superiorly \( P < 0.010 \) and nasally \( P < 0.001 \). A 1-minute break during the examination of a given eye and a 3-minute break between eyes was insufficient to overcome the fatigue effect. The performance of the two groups was almost indistinguishable.

**Conclusions.** The deterioration in the visual field indices mean defect and loss variance challenges the currently accepted ideal length of a perimetric examination with the conventional algorithms. Confidence limits for the definition of abnormality with these algorithms should reflect the presence of the fatigue effect and be different for the second eye. Invest Ophthalmol Vis Sci. 1994;35:268-280

Automated perimetry has improved the reproducibility of clinical visual field testing when compared to manual techniques. Nevertheless, variability of response is common during and between examinations in all types of psychophysical tests.

The outcome of a visual field examination is influenced by optical factors such as pupil size, refractive error, and media opacities and by psychological factors. A learning effect, whereby sensitivity increases during and between perimetric examinations, has been demonstrated in normal subjects, in subjects with ocular hypertension and glaucoma and has been shown to be greater for peripheral rather than for central stimulus locations. A fatigue effect, whereby sensitivity decreases during an examination, has been demonstrated in normal subjects and in subjects with ocular hypertension, glaucoma, and optic neuropathy. This effect is more pronounced in areas adjacent to visual field defects and increases with increasing eccentricity and increasing age.

Fatigue effects have, in general, been investigated using repeated thresholding at selected stimulus locations. The outcome of fatigue on the complete field within 30° eccentricity for each eye is unknown. In addition, the influence on the fatigue effect of rest periods within and between examinations at a single session is also unknown.

It can be hypothesized that the within-eye learning and fatigue effects oppose each other during any given examination, and that the resultant effect changes...
with the frequency of follow-up examinations as the patient becomes more experienced in automated perimetry; that is, the learning component diminishes and the outcome becomes more influenced by the fatigue component. It can also be hypothesized that the resultant effect is different between the first and second eyes at the same visit. Nevertheless, despite the relative lack of information concerning the interaction between learning and fatigue effects within and between eyes, various criteria for abnormality have been proposed based on a difference in results between the two eyes. From data based on the asymmetry of the normal visual field, a lateral difference in mean sensitivity of 2 dB or more has been postulated to indicate abnormality before established field loss. A lateral difference in the mean sensitivity of persons with ocular hypertension has also been shown to predict the future onset of glaucoma.

The purpose of the study was threefold. By using subjects experienced in automated perimetry, we aimed to determine: the time course of the fatigue effect within the first and second eye at a given examination across the visual field out to 30° eccentricity, the influence of a rest period during the examination of a given eye, and whether any differences in the fatigue effect are present between persons with ocular hypertension and age-matched normal subjects. Such information might provide insight into the underlying basis for the asymmetry recorded between eyes at a given visual field examination.

METHODS

Sample

The sample comprised 20 normal subjects (9 men and 11 women), with a mean age of 67.2 years (SD 8.2) and 20 persons with ocular hypertension (8 men and 12 women), with a mean age of 66.5 years (SD 6.5). All had normal central fields, had previously experienced a minimum of 6 static threshold central visual field examinations with the Humphrey Field Analyzer Program 30-2, and were age-matched between the two groups. All had distance refractive errors of not greater than ±3.00 DS and/or ±2.50 DC, a visual acuity of 6/9 or better, normal media, and normal fundi.

Normal subjects had an intraocular pressure of less than 21 mm Hg, while the persons with ocular hypertension had a recorded intraocular pressure greater than 21 mm Hg on more than one previous occasion. Exclusion criteria comprised systemic conditions with known ocular involvement including diabetes, systemic medication with known central nervous system effects, neurologic or psychiatric illness, a history of eye disease, the use of pilocarpine topical eye treatment, and the use of contact lenses. Exclusion criteria for the normal group additionally included a positive family history of glaucoma in a first-degree relative and the use of any topical eye treatment. The tenets of the Deceleration of Helsinki were adhered to, informed consent was obtained from all subjects after the nature of the procedure had been fully explained and the study had approval from the Aston University Human Science Ethical Committee.

Perimetry

Perimetry was undertaken for both eyes of each participant using Program G1X of the Octopus 1-2-3 perimeter. The stimulus approximates to a Goldmann size III (0.564") and is generated by a broadband light-emitting diode (592 nm + 78 nm/- 32 nm at 10%) presented for a duration of 100 ms. The maximum stimulus intensity of 4000 apostilbs is referenced to a value of 0 dB. The background luminance is 31.5 apostilbs. The direct projection of both the stimulus and fixation target with the Octopus 1-2-3 ostensibly removes any perimetric stimulus for accommodation, thereby obviating any need for near correction. Program G1X thresholds 59 stimulus locations, including the fovea, out to an eccentricity of 28.3°. The program is divided into two phases. During Phase 1, all 59 locations are thresholded. Stimuli are presented, using a 4-2 bracketing strategy based on a starting intensity 4 dB brighter than the age-corrected normal values. The final threshold value is adjusted by ±1 dB depending on if the final stimulus is seen or not seen respectively. During Phase 2, the locations are rethresholded using a starting intensity equal to the Phase 1 results. Each Phase consists of four stages, with Phase 1 comprising stages 1 to 4, and Phase 2 comprising stages 5 to 8. The location of the stimuli in stage 1 are identical to those of stage 5, and likewise for stages 2 and 6, 3 and 7, and 4 and 8. The thresholding of all points in any stage is completed before the start of the ensuing stage.

The Octopus 1-2-3 perimeter was selected for three reasons. First, the stimuli are thresholded in a relatively random order with respect to eccentricity (Fig. 1) compared to the Humphrey Field Analyzer in which the seed point generation is inherently biased toward the thresholding of central stimulus locations earlier in the program. Second, the examination routine (Program G1X) is divided into two phases thereby providing a convenient means of assessing the effect of a within-examination rest period. Third, the two phases are each divided into four stages thereby providing a means of assessing within-examination changes in sensitivity.

The designated first eye for a given subject was randomly assigned. A rest period of 60 seconds was given to each subject at the end of Phase 1 and another 5-minute break was allowed before the examination of the second eye. The distance refractive correction was
FIGURE 1. The spatial arrangement of stimulus locations for each stage of the G1X examination (top left: stages 1 and 5; top right: stages 2 and 6; bottom left: stages 3 and 7; bottom right: stages 4 and 8).

employed throughout and the fields were performed by a single experienced perimetrist (CH). Mean pupil sizes were 4.25 mm (SD 0.80) and 4.05 mm (SD 0.60) for the first and second eyes, respectively, of the normal group and 4.40 mm (SD 0.9) and 4.60 mm (SD 1.0) for the first and second eyes, respectively, of the ocular hypertensive group.

Throughout the examination the Octopus 1-2-3 displays a rolling (ie, continually updated) value of the visual field indices on the monitor, which represent the field at any given time. The indices displayed during the examination are only an approximation, however, because they are derived from sensitivity values gathered both from completely and incompletely thresholded stimulus locations. As stimuli are presented at an initial value brighter than the expected threshold, the incompletely thresholded locations exhibit an apparent underestimation of sensitivity. This error in the displayed value is then compounded throughout each of the stages. The indices displayed on the instrument printout, however, are not subject to this error.

The results for each stage cannot be accessed by the instrument printer without the premature curtailment of the examination. The Phase 1 results were therefore documented photographically, under the room illumination of the examination using 125 ASA FP4 film without flash, while the patient rested between phases. The equations of Flammer$^3$ were used to recalculate the mean defect (MD) and loss variance (LV) corresponding to the end of each of the eight individual stages. The stimulus locations corresponding to each stage were identified from the G1X literature.$^{29-30}$ The Phase 2 results were calculated from the final printout, which displays the sensitivity values in terms of the mean of Phase 1 and Phase 2. The appropriate normal values necessary for the calculations were provided by the manufacturer (personal communication Interzeag AG, Schlieren, Switzerland). The short-term fluctuation was similarly calculated for
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Each of the stages 5 to 8. The time to complete each stage, the total number of stimulus presentations, and the number of catch trials were also recorded.

Primary Analysis

A repeated measures analysis of covariance was carried out separately for mean defect, loss variance, and short-term fluctuation with ocular condition as a between-subjects factor; stage, phase, and eye as within-subject factors, and age as a covariate. Where appropriate, the Greenhouse-Geisser correction was applied to account for the lack of compound symmetry due to the serial correlation between the repeated measures. In the case of the short-term fluctuation, which was only calculated during Phase 2, the within-subject factors were stage and eye. The analysis of covariance is an analysis of variance technique that was used in this study to correct for the effect of the differing ages within the sample. To account for accumulating Type I errors (the possibility of finding a significant difference for a particular parameter when no such difference actually exists) a Bonferroni correction was applied to the significance level. The conventional 0.05 level was divided by the number of analyses (3) and the outcome of statistical testing was considered to be significant only at the $P \leq 0.017$ level.
Secondary Analysis

To identify potential differences in the fatigue effect among hemifields, indices were calculated for each of the four hemifields. Separate analyses of covariance were then undertaken to identify for each index, differences between the superior and inferior hemifields and between the nasal and temporal hemifields. The influence of stimulus eccentricity was investigated by separately calculating the indices for locations within and beyond 17° eccentricity. An eccentricity of 17° was chosen to achieve an approximately equal distribution of stimulus locations between the two annuli: 31 stimuli were located inside 17° eccentricity and 28 stimuli were located beyond 17° eccentricity. The bias arising over the various stages from the inequality in the distribution of the stimulus locations between the two annuli (Fig. 1) was reduced by undertaking the analysis of covariance on the indices calculated cumulatively over stage. A Bonferroni correction was similarly applied both to the hemifield and annulus analysis: only tests significant at $P \leq 0.017$ are discussed.

RESULTS

Global Mean Defect

The MD was poorer (more positive) with increase in age ($P = 0.003$). The group mean MD for each eye of the normal and ocular hypertensive groups as a function of stage is illustrated in Figure 2. The group mean MD was poorer (more positive) in the second eye ($P < 0.001$) regardless of diagnosis and declined (became more positive) over stage ($P < 0.001$) for both groups.

FIGURE 4. Bar charts of superior (open bars) and inferior hemifield (closed bars) mean defect (dB) against stage for the normal (top left: first eye; top right: second eye) and ocular hypertensive subjects (bottom left: first eye; bottom right: second eye). Error bars represent 1 SEM.
The deterioration in the group mean MD over stage was 2.57 dB and 2.44 dB for the first and second eyes of the normal group, respectively. The corresponding deterioration for the ocular hypertensive group was 2.14 dB and 2.33 dB. The decline over stage was greater over Phase 1 than over Phase 2 (p < 0.001). The group mean MD was worse (more positive) in Phase 2 compared with Phase 1 (P < 0.001) and this difference was more pronounced for the ocular hypertensive group (P = 0.009) with the difference between groups increasing with increase in age (P = 0.012).

**Global Loss Variance**

The LV increased (worsened) with increase in age (P = 0.004). The group mean LV for each eye of the normal and ocular hypertensive groups as a function of stage is illustrated in Figure 3. The group mean LV was larger in the second eye (P = 0.007) regardless of diagnosis. It was greater in Phase 2 compared with Phase 1 (P < 0.001). Group mean LV declined over stage (P < 0.001) for both groups. The deterioration in the group mean LV over stage was 4.29 dB\(^2\) and 7.23 dB\(^2\) for the first and second eyes respectively of the normal group and 5.32 dB\(^2\) and 6.02 dB\(^2\) for the ocular hypertensive group. The decline in sensitivity over stage was greater in the normal group compared to the ocular hypertensive group (P = 0.012).

**Global SF**

The SF was unaffected by increase in age (P = 0.081). It was similar between the two eyes (P = 0.061) regardless of group (P = 0.891) and the alteration over stage was not statistically significant (P = 0.066).

**Hemifield Mean Defect**

The group mean superior and inferior hemifield MD for each eye of the normal and ocular hypertensive groups as a function of stage is illustrated in Figure 4. Both hemifield MDs were poorer (more positive) with increase in age (P = 0.002). The inferior hemifield MD was poorer than the superior hemifield (P < 0.001) and this difference was greater with increase in age (P = 0.009). Both hemifield MDs deteriorated over phase (P < 0.001). Although the differences were not statistically significant overall (P = 0.1993), the trend was to
a greater deterioration over stage of the inferior hemifield compared to the superior hemifield. The difference in the pattern of deterioration between the two hemifields increased with increase in age ($P < 0.001$) and was greater for the ocular hypertensive group ($P < 0.001$) particularly as age increased ($P < 0.001$). The group-age effect was more pronounced in the second eye ($P = 0.009$). The difference between hemifield MDs over stage was also more pronounced for the first phase ($P < 0.001$). In contrast, although both the nasal and temporal hemifield MDs (Fig. 5) deteriorated with age ($P = 0.003$), over stage ($P < 0.001$) and phase ($P < 0.001$), with the deterioration over stage increasing with increase in age ($P = 0.007$) and between eyes ($P = 0.002$), there was no difference in the magnitude of the deterioration between hemifields ($P = 0.644$).

**Hemifield Loss Variance**

The group mean superior and inferior hemifield LVs for each eye of the normal and ocular hypertensive groups as a function of stage is illustrated in Figure 6. Both hemifield LVs deteriorated with increase in age ($P = 0.003$), over stage ($P < 0.001$), particularly in the second eye ($P = 0.012$), and over phase ($P < 0.001$). The deterioration in the superior hemifield LV over stage was greater than that of the inferior hemifield ($P = 0.010$). The group mean nasal and temporal hemifield LV for each eye of the normal and ocular hypertensive groups as a function of stage is illustrated in Figure 7. The two hemifields again deteriorated over stage ($P < 0.001$) and phase ($P < 0.001$). The deterioration in the nasal hemifield LV over stage was greater than that of the temporal hemifield ($P = 0.001$) and the difference between the hemifields over stage was different between phases ($P < 0.012$).

**Hemifield SF**

The nasal hemifield SF deteriorated over stage compared to the temporal hemifield SF ($P = 0.002$); no effect, however, was found for the superior and inferior hemifield SF regardless of eye, age, or group.

**Central/Peripheral Mean Defect**

The cumulative central and peripheral MDs (Fig. 8) deteriorated with increase in age ($P = 0.010$) and were

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**FIGURE 6.** Bar charts of superior (open bars) and inferior hemifield (closed bars) loss variance (dB$^2$) against stage for the normal (top left: first eye; top right: second eye) and ocular hypertensive subjects (bottom left: first eye; bottom right: second eye). Error bars represent 1 SEM.
greater in the second eye \((P = 0.001)\). They increased over stage \((P = 0.001)\) and this increase was more pronounced for the normal group \((P = 0.006)\). They also increased with increase in age for both groups \((P = 0.002)\) but particularly in the elderly normal group \((P = 0.015)\). The MDs were more pronounced (worse) in Phase 2 \((P = 0.001)\). The peripheral MD deteriorated more over stage compared to the central MD \((P < 0.001)\); the changes in the indices over stage were more pronounced in Phase 1 \((P < 0.001)\). The difference between the MDs was also greatest in Phase 2 compared with Phase 1 \((P < 0.001)\) and this difference was greater for the normal subjects \((P = 0.008)\) particularly as age increased \((P = 0.009)\). 

Central/Peripheral LV

The cumulative central and peripheral LVs (Fig. 9) deteriorated over stage \((P < 0.001)\), in the second eye \((P = 0.013)\) and with increase in age \((P = 0.008)\). The peripheral LV was greater compared to the central LV \((P < 0.001)\) and this difference became more marked over stage \((P < 0.001)\) and phase \((P < 0.001)\) with the differences over stage being more pronounced for Phase 2 compared to Phase 1 \((P < 0.001)\).

Central/Peripheral SF

The cumulative central and peripheral SFs deteriorated over stages 5 to 8 \((P = 0.009)\). Peripheral SF was greater than central SF \((P < 0.001)\) and this difference decreased over stage \((P < 0.001)\).

Catch Trials

The number of fixation losses, false-positive responses and false-negative responses obtained was minimal and insufficient to warrant any form of analysis.

DISCUSSION

The results indicate a progressive overall depression of the hill of vision during the course of the examination, together with localized loss (ie, a shape change). The performance between the two groups was almost indis-
The depression was similar between the nasal and the temporal fields but more marked in the inferior field than the superior field whereas the localized loss was more pronounced in the superior and nasal fields. The changes were also greater in the peripheral region. In general, the shape difference was more exaggerated for the second eye but the components of the shape change varied differently between the two groups. When considered overall, the results suggest a sinking together with a steepening of the hill of vision. This finding is compatible with earlier studies that have found a preferential fatiguing effect of the peripheral stimulus locations. The change in LV, however, may also reflect additional shape changes that are independent of eccentricity.

The decline in the visual field indices over the eight stages can be attributed to fatigue. The increase in information arising from the increase in the number of thresholded stimulus locations cannot account for this change. The visual field indices express, for a given number of stimulus locations, the difference between the measured sensitivity and that of the established normal values and as such should approximate to zero in the normal field. Any change in the visual field indices must therefore represent a real change in sensitivity and not an artifact caused by the progressive inclusion of thresholded values from additional stimulus locations.

The precise pattern of the decline in sensitivity may be contaminated by the difference between the number of central and peripheral stimulus locations over stage (Fig. 1). From Figure 1, it can be seen that the number of peripheral stimulus locations is greatest for stage 2 (Phase 1) and for stage 6 (Phase 2). However, in stages 3 to 4 and 7 to 8, respectively, the proportion of central to peripheral locations is approximately similar. Fatigue effects are greater for peripheral stimulus locations. Therefore, the results could be subject to an artifact in that a greater reduction in sensitivity could occur between stages 1 and 2 and particularly between stages 5 and 6 (phase 2) due to the difference in the proportion of central to peripheral stimuli. However, the data show little evidence of this.
The fatigue effect was investigated for a given number of completed stimulus locations. An alternative experimental design would have been to study the fatigue effect for a predefined and fixed time. In this study each stage of Program G1 was considered to be an ordinal categorical variable, i.e., stage 1, stage 2, stage 3, etc. The time to complete all 8 stages, expressed cumulatively as a function of eye and of group, is given in Table 1. The examination time was longer for the persons with ocular hypertension ($P = 0.046$). It was greater in the second eye regardless of group ($P = 0.004$) and the difference between eyes increased with increase in age ($P = 0.016$). The maximum between-stage difference (at the end of stage 8) for the within-eye between-group comparison was 0.77 minutes, whereas that of the within-group between-eye comparison was 0.66 minutes. The duration of each individual stage, however, was such that any between-stage analysis was considered to be clinically acceptable for all between-phase, between-eye, and between-group comparisons.

The poorer sensitivity in Phase 2 compared to Phase 1 reinforces the finding of a decline in sensitivity over stage. It would also suggest that a 1-minute break between phases at best only retards the progressive decline in sensitivity. In addition, the poorer sensitivity in the second eye would suggest that a between-examination break of 3 minutes is insufficient to overcome the between-eye transfer of the fatigue resulting from the examination of the first eye. The difference in the starting point of the staircase procedure might have influenced the magnitude of the threshold estimation between the two phases. However, the starting position of the staircase relative to the threshold influences the efficiency of threshold determinations but not the accuracy.33

The results with the Octopus 1-2-3 compare favorably with those of Searle et al12 who used the Humphrey Field Analyzer with normal subjects previously naive to automated perimetry. They thresholded 30 stimulus locations in each eye over each of three successive 5-minute test periods at each of two exami-
The deterioration being greater in the second eye. Sensitivity declined progressively over time at each examination. In contrast, our results do not agree with those of Marra and Flammer. In their study, using the Octopus perimeter, sensitivity remained stable both in trained and inexperienced normal subjects and cataract and glaucoma patients for the repeated thresholding of three stimulus locations in one eye for a period of 5 to 8 minutes. The use of fewer stimulus locations may explain the contradictory findings of Marra and Flammer. Interestingly, the use of fatigue as a provocative diagnostic test for glaucoma has been proposed but has proved to be unreliable because of the considerable overlap of results between normal subjects and glaucoma patients. Indeed, between-eye differences in sensitivity of up to 9 dB for a given location have been reported in normal subjects.

The genesis of the fatigue effect is unclear. Ganzfeld blanket or the Troxler phenomenon, due to the suppression of eye movements and the subsequent formation of a stabilized retinal image, have been proposed. The Troxler phenomenon results in a preferential fading of the peripheral visual field and is frequently reported by patients undergoing routine perimetric examination. This hypothesis is consistent with the greater deterioration in MD and LV for the more peripheral region of the visual field. The underlying mechanism can be explained by an increase in the size of a receptive field when presented with a motionless stimulus. The shape change in the superior field might be associated with upper lid ptosis although no obvious reduction in palpebral aperture size was noted on the video monitor. However such loss is small relative to the decline in sensitivity of the inferior field. Psychological factors such as vigilance may also influence perimetric fatigue.

The increase in the visual field indices mean defect and loss variance in a time-related manner, particularly for the second eye, challenges the currently accepted ideal length of a perimetric examination. The use of alternative and faster measurement strategies, such as the dynamic strategy of the Peristat 433 perimeter, RIOTS (real-time interactive optimized test sequence) and FASTPAC seem to be a clear and logical direction for the development of automated perimetry in the future. Experience with FASTPAC in normal subjects and those with glaucoma suggests that the thresholding algorithm exhibits an approximate 40% reduction in examination time at the expense of an approximate 30% higher short-term fluctuation compared to the standard 4-2 dB algorithm, fatigue factors notwithstanding. The goal should obviously be to produce reliable and reproducible thresholding algorithms that avoid redundancy and fatigue. Alternatively, if the conventional algorithms are to be utilized then confidence limits for the definition of abnormality should reflect the order effect and be different between the two eyes.

### Key Words
automated perimetry, visual field, Octopus 1-2-3, fatigue, ocular hypertension

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### References

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**Table 1. Test Time for all Eight Stages of Program G1 Expressed Cumulatively as a Function of Eye and of Group**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Normals</th>
<th>OHTs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st eye</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.86 ± 0.26</td>
<td>2.86 ± 0.27</td>
</tr>
<tr>
<td>2</td>
<td>5.22 ± 0.29</td>
<td>5.32 ± 0.36</td>
</tr>
<tr>
<td>3</td>
<td>7.18 ± 0.32</td>
<td>7.40 ± 0.49</td>
</tr>
<tr>
<td>4</td>
<td>9.33 ± 0.45</td>
<td>9.67 ± 0.68</td>
</tr>
<tr>
<td>5</td>
<td>10.74 ± 0.56</td>
<td>11.19 ± 0.76</td>
</tr>
<tr>
<td>6</td>
<td>12.16 ± 0.58</td>
<td>12.58 ± 0.84</td>
</tr>
<tr>
<td>7</td>
<td>13.14 ± 0.69</td>
<td>13.74 ± 0.90</td>
</tr>
<tr>
<td>8</td>
<td>14.78 ± 0.97</td>
<td>14.93 ± 0.92</td>
</tr>
</tbody>
</table>

| 2nd eye | | |
| 1 | 2.78 ± 0.20 | 2.92 ± 0.29 |
| 2 | 5.21 ± 0.35 | 5.48 ± 0.41 |
| 3 | 7.31 ± 0.49 | 7.60 ± 0.48 |
| 4 | 9.55 ± 0.63 | 10.01 ± 0.77 |
| 5 | 10.98 ± 0.65 | 11.65 ± 0.91 |
| 6 | 12.42 ± 0.73 | 13.11 ± 1.11 |
| 7 | 13.63 ± 0.83 | 14.29 ± 1.27 |
| 8 | 14.82 ± 0.93 | 15.59 ± 1.46 |

Time values are given in minutes (mean ± SD).
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