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ANALYSIS OF SCORING PROCESS

Susan Pihl, Jussi Virkkala
BrainWork Laboratory, Finnish Institute of Occupational Health, Helsinki, Finland

Many aspects of sleep polygraphy have been studied since the introduction of Rechtschaffen and Kales, 1968. Many efforts have been used to make the scoring process automatic, but the human process of scoring has not been recorded to our knowledge. Our aim was to analyze the process of experienced sleep technologist (SP) scoring the full night polysomnography.

Materials and Methods
Ten normal male subjects underwent the whole night polysomnography. Their mean age was 43 ± 7 years, sleep efficiency (TST/TIB) 84 ± 6 % and the number of sleep transitions (215 ± 46). The sleep technologist scored the polysomnographies using Somnologica 2.0.2 software and the R-K scoring system with 30 s epochs. With the custom plug-in tool called Diary 1.0 (available at http://www.occuphealth.fi/users/jussi.virkkala) we were able to record the following variables: 1) time used in sleep stages before decision (pressing the keypad), 2) percentage of re-evaluations (change of decision about the stage), 3) percentage of previewed or reviewed epochs by scrolling before decision. If the epoch scoring took more than 10 seconds (break in scoring session), the epoch was excluded from the analysis.

Results
The mean scoring time for 8.6 ± 0.3 hours' recordings, with the exclusion of 10 seconds' breaks, was 16 ± 1 min. We found that scoring of S1 and S3 epochs was slower compared with other stages. Percentage of re-evaluations was greatest in S1, S3 and SREM. In S1 and SREM also scrolling occurred more often:

	S0	S1	S2	S3	S4	SREM
Average scoring time/epoch (s)	0.82 ± 0.16	1.31 ± 0.25	0.79 ± 0.07	1.21 ± 0.16	0.95 ± 0.38	1.00 ± 0.15
Percentage of re-evaluations	1.0 ± 1.3	5.8 ± 4.3	0.3 ± 0.3	6.3 ± 4.2	0.3 ± 0.6	7.1 ± 6.0
Percentage of scrolling	1.1 ± 0.7	7.6 ± 2.8	1.9 ± 0.8	2.7 ± 2.7	0.1 ± 0.3	6.2 ± 2.1

Generally the technologists have a personal opinion about the difficulties in making decisions in different sleep stages and scoring is a very individual and subjective process. On the other hand, the EEG activity has intrapersonal variations and the technologist must decide in each individual case what is person's typical alpha, delta and theta activity. For example, in healthy subjects the elderly persons' delta amplitude diminishes but is, however, delta activity. Our study showed that in normal subjects with recordings of high technical quality the scoring time can be around 16 minutes. We think that the increased scoring time and re-evaluations in S1 stage probably depend on the calculation of alpha proportion which must be less than 50 % in epoch. Similarly, in S3 the evaluation of delta waves (20-50 % in epoch) can increase the time of decision. Because of the rules of SREM scoring the percentages of re-evaluations and scrolling were high.

SCORING S1 AND S3 WAS SLOWER COMPARED WITH OTHER SLEEP STAGES

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Submitting Author: Susan Pihl
Address for correspondence: Topeliuksenkatu 41 Aa, FIN-00250 Helsinki, Finland

Tel. +358-9-4747 1 Fax. +358-9-588 4759 e-mail. susan.pihl@occuphealth.fi