DK-II SCORING SYSTEM

Stage 0

An epoch is classified as Stage 0 if it is composed of at least 30 seconds of eight through twelve cycles per second occipital activity with a minimum amplitude of 20 microvolts.

Comment Ia. Eight through twelve cps is a generally accepted frequency band for alpha activity. As with all class intervals of this type, it is understood that the upper and lower limits of the class is .5 more or less than actually stated. Thus, eight through twelve is understood to include $7\frac{1}{2}$ up through $12\frac{1}{2}$ cps. If a subject has a very low or very high frequency occipital activity, then this gives a basis for making a minor exception to count other than eight through twelve cps for Stage 0.

Comment Ib. A minimum occipital activity of 20 microvolts is required for Stage 0. This requirement assumes two conditions exist if Stage 0 is to be classified reliably. First, the subject is known to show a resting occipital alpha of 20 microvolts or better. Second, the electrodes used to detect occipital activity have been placed at least three Cm apart.

Comment II. It is not economical to count each wave which might fall into the Stage 0 category. The counting of seconds of eight through twelve cps activity is based upon seconds which contain dominantly this picture. That is, if between two one second marks in the EEG one finds a dominance of eight through twelve cps 20 microvolt activity, then the entire second is counted as one second rather than adding up parts of seconds. This notion of dominance is used throughout the scoring system and means "more than 50%."

Stage 1

An epoch is classified as Stage 1 if it contains less than 30 seconds of eight through twelve cycles per second twenty microvolt occipital activity and no more than one well defined spindle or K-complex.

Comment Ia. Less than 30 seconds of eight through twelve cps 20 microvolt occipital activity is typically obtained in one of two ways: first, and most frequently, the EEG decreases in amplitude and increases in frequency giving the record a flat appearance. Second, the frequency may slow to four through seven cps and show an increase in amplitude. Either of these two situations will produce less than 30 seconds of 20 microvolt eight through twelve cps activity.

Comment Ib. A scorer is typically cued to begin looking for the beginning of Stage 1 when either the resting alpha pattern starts to become less regular and looks randomly distributed throughout an epoch or when some high amplitude suddenly flattens to give a low voltage fast pattern.

Comment IIa. The condition of "well-defined" is met when a scorer recognizes an activity of frequency, amplitude, and wave form which has obtained, in some high agreement between him and his co-workers as to nomenclature. In short, an ill-defined activity is one which has a high probability of being called something else by ones' co-workers. If an activity is "technically" such-and-such or "almost" so-and-so, it is not relevant to this scoring system.

Comment IIb. A range of 13 to 16 cps is taken for spindle activity. If an activity falls within this frequency band and is of highest amplitude on parietal leads as compared to occipital leads, then it is called spindling. Where amplitude and frequency are indistinguishable by comparing parietal and occipital activity, then an activity is called spindling if it has a spindle shape.

Comment IIc. The K-complex is difficult to describe without recourse to pictures of several varieties of this activity. In general, this activity is a single complex wave which stands out from the dominant EEG picture. One can expect at least 100 microvolts of amplitude and more often as much as 200 microvolts. At the peak of the curve a slight notch may appear, or, as the complex drops below baseline a 13 to 16 cps activity may appear. The only reliable method of building up a clear picture of K-complexes is to watch an EEG as it is obtained from a resting subject who is being stimulated at random intervals with noise.

Comment III. The general idea in scoring for Stage 1 is to be conservative on one's estimation of what the EEG looks like. Using this idea, one obtains the highest reliability by waiting until the picture is quite clear-cut before judging the onset of Stage 1 or its termination. Slight, questionable changes are not used as a basis for classifying an epoch as Stage 1.

Stage 2

An epoch is classified as Stage 2 if it contains at least two well defined spindles or two K-complexes or one of each, and no

more than twelve seconds of one to three cps 20 microvolt or better slow waves.

Comment I. Stage 2 includes a wide range of EEG activity. One epoch may show from two to ten spindles without a single K-complex. Another epoch may show both spindles and K-complexes. Still another epoch may show spindles, K-complexes, and slow waves. Within an epoch there may be short one to four second bursts of slow wave activity with spindling between each burst. Even with this wide range of activity, the scorer needs to be cued to respond only when one of two events occur: (1) two well defined spindles or K-complexes which mark the onset of Stage 2, and (2) the occurrence of more than twelve seconds of one to three cps 20 microvolt slow waves.

Comment IIa. The criteria for well defined spindles or K-complexes have already been commented on. To reiterate, an activity should be called spindling or a K-complex only when one feels the probability is high for his co-workers to recognize and call the same activity by the same name.

Comment IIb. At least 20 microvolts of amplitude is required before a one to three cps activity can influence the scoring of Stage 2. This 20 microvolt requirement prevents a scorer from taking into account baseline sways and slow recoveries of the EEG pens. This does not mean all 20 microvolt one to three cps activity is counted, but rather an activity must have 20 microvolts plus a number of other characteristics to influence the scoring.

Comment IIc. When K-complexes appear within the one to three cps band the scorer must exercise considerable caution in order to avoid calling this activity slow waves. In short, if an activity is clearly recognized as a K-complex it is not also called a slow wave.

Comment IIIa. Activity in the one to three cps band is most reliably recognized by reading the frontal and central channels and ignoring the parietal and occipital traces. This means that when an epoch appears to have some one to three cps 20 or better microvolt activity in it, the scorer should direct his attention to the frontal and central traces.

Comment IIIb. The end of Stage 2 is marked either by the disappearance of spindles, K-complexes, and slow waves or by an increase in slow wave activity. The scoring criteria specifically states Stage 2 epochs contain not more than 12 seconds of one to three cps waves. Note that this requirement is based on seconds which contain dominantly one to three cps activity.

Stage 3

An epoch is classified as Stage 3 if it contains at least thirteen seconds of one through three cycles per second 20 microvolt or better activity but less than thirty seconds of this activity.

Comment I. One through three cycles per second is one generally accepted band for delta activity. A 20 microvolt requirement is placed on delta activity in order to avoid a frequent error commited

when a particularly compulsive scorer begins to read baseline sways and delays in pen recovery as delta. Save for this minimum amplitude requirement, however, amplitude does not enter into scoring for delta activity.

Comment IIa. The beginning of Stage 3 is observed by counting one to three cps dominant seconds. But, the end of Stage 3 is reached in one of two ways: (1) the one to three cps count may fall below thirteen seconds, or, (2) there may occur thirty or more seconds in which one to three cps activity is dominant. To terminate a string of Stage 3 epochs in the latter way, the scorer must count one to three cps dominant seconds.

Comment IIb. Frontal and central traces alone are read for one to three cps activity. These will typically show, for a Stage 3 epoch, obvious slow activity with a faster 14-16 cps background. Frequently this background activity is obviously spindling and in other cases the background activity is of a lower three to five cps variety. It is important to avoid including K-complexes into either the count of one to three cps dominant seconds.

Stage 4

An epoch is classified as Stage 4 if it contains at least 30 seconds of one through three cycles per second 20 microvolt or better activity.

Comment I. At least thirty one to three cps dominant seconds are required to classify an epoch as Stage 4. This activity is read from the frontal and central channels alone even though at times

one to three cps activity dominate all traces.

Comment II. The experienced scorer, once he is sure at least thirty seconds of one to three cps dominate activity exists in several successive epochs, can rapidly score Stage 4 epochs by making sure the first thirty seconds of an epoch is one to three cps dominant. If this is the case, then the remaining thirty seconds can be scanned rapidly.

Comment III. Stage 4 is terminated in one way only: the occurrence of an epoch with less than thirty one to three cps dominant seconds. In many cases this termination is abrupt as when a large body movement is made. In a few cases the dominant one to three cps activity drops below 30 but there are more than thirteen one to three cps dominant seconds present. In this case one would score for Stage 3.