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# **Table and figure legends**

**Table 1**

This table gives an overview of the automated sleep staging over from 1987 until 2017. Latest publication of Dereymaeker et al. is still in print. Abbreviations: Gestational age (GA), Post Conceptual age (PCA) [weeks of age at birth + weeks of age since birth], Post Menstrual age (PMA) [ GA + chronological age], Active sleep (AS), Quiet sleep (QS), Wake (W), Rapid Eye Movement (REM), Heart rate variability (HRV), Area under the curve (AUC). Citations top to bottom: [18], [19], [20], [21], [22], [23], [13], [52], [24], [12], [25], [26].

**Table 2**

The HRV features are derived from the Task Force [30] and comments are added from neonatal studies.

**Table 3**

This Table presents the unscaled heart rate variability features for active sleep (AS) and quiet sleep (QS) as median, inter quartile range (IQR) and [25th, 75th] percentiles. For feature abbreviations please see Table 2.

**Figure 1**

Percentage of active and quiet sleep of the total sleep time over the gestational age. Active sleep at low gestational age is dominant with around 80% it lowers to around 58% until term age. Vice versa, at low gestational age quiet sleep is less strong represented with around 18%. It increases over the course of development to around 32% at term age. The data is accumulated from several publications, published in [7].

**Figure 2**

The brute force method creates subsets with feature combinations of only one feature (1th generation) up to combinations of n features (nth generation). Thereby, features in each subset are not repeated (e.g. F1, F2, F1 ) and the order is ignored (F1,F2 = F2,F1). Afterwards, all created features are evaluated for their perfomrance and the feature set with highest performance is chosen. The sequential forward search (best first) adds in each iteration one feature to the chosen subset, finds the highest performance in this iteration and continues to the next iteration. Finally, the subset with the overall highest performance is chosen to proceed.

**Figure 3**

The “Receiver-Operating-Characteristic” for the eight fold leave one out cross validation of SVM sleep state separation. Patient 8 showed only active sleep and therefore this data was included in testing and training, but the ROC could not be calculated.

**Figure 4**

The Receiver Operating Characteristic (ROC) for the eight fold leave one out cross validation of the Support vector machine (SVM) sleep state separation. Here we used adapted missclassification penalty value pairs for parameter C to counter class imbalance. Patient 8 showed only active sleep and therefore this data was included in testing and training, but the ROC could not be calculated.