Brain Waves Information

Delta (0.1 to 3 Hz)

The lowest frequencies are ***delta***. These are less than 4 Hz and occur in deep sleep and in some abnormal processes also during experiences of "empathy state". Delta waves are involved with our ability to integrate and let go. It reflects unconscious mind.

It is the dominant rhythm in infants up to one year of age and it is present in stages 3 and 4 of sleep.

It tends to be the highest in amplitude and the slowest waves. We *increase* Delta waves in order to decrease our awareness of the physical world. We also access information in our unconscious mind through Delta.

Peak performers *decrease* Delta waves when high focus and peak performance are required.

However, most individuals diagnosed with Attention Deficit Disorder, naturally *increase* rather than decrease Delta activity when trying to focus. The inappropriate Delta response often severely restricts the ability to focus and maintain attention. It is as if the brain is locked into a perpetual drowsy state.

Another way to look at Delta is to imagine you are driving in a car and you shift into 1st gear....you're not going to get anywhere very fast. So Delta would represent 1st gear.

Delta (0.1-3 Hz): Distribution: generally broad or diffused may be bilateral, widespread
Subjective feeling states: deep, dreamless sleep, non-REM sleep, trance, unconscious
Associated tasks & behaviors: lethargic, not moving, not attentive
Physiological correlates: not moving, low-level of arousal
Effects of training: can induce drowsiness, trance, deeply relaxed states

Theta (4-8 Hz)

The next brainwave is ***theta***. Theta activity has a frequency of 3.5 to 7.5 Hz and is classed as "slow" activity. It is seen in connection with creativity, intuition, daydreaming, and fantasizing and is a repository for memories, emotions, sensations. Theta waves are strong during internal focus, meditation, prayer, and spiritual awareness. It reflects the state between wakefulness and sleep. Relates to subconscious.

It is abnormal in awake adults but is perfectly normal in children up to 13 years old. It is also normal during sleep. Theta is believed to reflect activity from the limbic system and hippocampal regions. Theta is observed in anxiety, behavioral activation and behavioral inhibition.

When the theta rhythm appears to function normally it mediates and/or promotes adaptive, complex behaviors such as learning and memory. Under unusual emotional circumstances, such as stress or disease states, there may be an imbalance of three major transmitter systems, which results in aberrant behavior.

Back to our car example, Theta would be considered 2nd gear. Not as slow as 1st gear (Delta) but still not very fast.

Distribution: usually regional, may involve many lobes, can be lateralized or diffuse;
Subjective feeling states: intuitive, creative, recall, fantasy, imagery, creative, dreamlike,

switching thoughts, drowsy; "oneness", "knowing"
Associated tasks & behaviors: creative, intuitive; but may also be distracted, unfocused
Physiological correlates: healing, integration of mind/body
Effects of Training: if enhanced, can induce drifting, trance-like state. If suppressed, can improve concentration, ability to focus attention

Alpha (8-12 Hz)

Alpha waves are those between 7.5 and 13(Hz). Alpha waves will peak around 10Hz. Good healthy alpha production promotes mental resourcefulness, aids in the ability to mentally coordinate, enhances overall sense of relaxation and fatigue. In this state you can move quickly and efficiently to accomplish whatever task is at hand. When Alpha predominates most people feel at ease and calm. Alpha appears to bridge the conscious to the subconscious.

It is the major rhythm seen in normal relaxed adults - it is present during most of life especially beyond the thirteenth year when it dominates the resting tracing.

Alpha rhythms are reported to be derived from the white matter of the brain. The white matter can be considered the part of the brain that connects all parts with each other.

Alpha is a common state for the brain and occurs whenever a person is alert (it is a marker for alertness and sleep), but not actively processing information. They are strongest over the occipital (back of the head) cortex and also over frontal cortex.

Alpha has been linked to extroversion (introverts show less), creativity (creative subjects show alpha when listening and coming to a solution for creative problems), and mental work.

When your alpha is with in normal ranges we tend to also experience good moods, see the world truthfully, and have a sense of calmness. Alpha is one of the brain's most important frequency to learn and use information taught in the classroom and on the job.

You can increase alpha by closing your eyes or deep breathing or decrease alpha by thinking or calculating.

Alpha-Theta training can create an increase in sensation, abstract thinking and self-control.

In our car scenario, Alpha would represent neutral or idle. Alpha allows us to shift easily from one task to another.

Distribution: regional, usually involves entire lobe; strong occipital w/eyes closed
Subjective feeling states: relaxed, not agitated, but not drowsy; tranquil, conscious
Associated tasks & behaviors: meditation, no action
Physiological correlates: relaxed, healing
Effects of Training: can produce relaxation
Sub band low alpha: 8-10: inner-awareness of self, mind/body integration, balance
Sub band high alpha: 10-12: centering, healing, mind/body connection

Beta (above 12 Hz)

Beta activity is 'fast' activity. It has a frequency of 14 and greater Hz. It reflects desynchronized active brain tissue. It is usually seen on both sides in symmetrical

distribution and is most evident frontally. It may be absent or reduced in areas of cortical damage.
It is generally regarded as a normal rhythm and is the dominant rhythm in those who are alert or anxious or who have their eyes open.
It is the state that most of brain is in when we have our eyes open and are listening and thinking during analytical problem solving, judgment, decision making, processing information about the world around us.
Beta would represent overdrive or hyperdrive in our car scenario.

The beta band has a relatively large range, and has been divided into low, midrange and high.
Low Beta (12-15 Hz), formerly "SMR":

Distribution: localized by side and by lobe (frontal, occipital, etc)
Subjective feeling states: relaxed yet focused, integrated
Associated tasks & behaviors: low SMR can reflect "ADD", lack of focused attention
Physiological correlates: is inhibited by motion; restraining body may increase SMR
Effects of Training: increasing SMR can produce relaxed focus, improved attentive abilities,

Midrange Beta (15-18 Hz)
Distribution: localized, over various areas. May be focused on one electrode.
Subjective feeling states: thinking, aware of self & surroundings
Associated tasks & behaviors: mental activity
Physiological correlates: alert, active, but not agitated
Effects of Training: can increase mental ability, focus, alertness, IQ

High Beta (above 18 Hz):

Distribution: localized, may be very focused.
Subjective feeling states: alertness, agitation
Associated tasks & behaviors: mental activity, e.g. math, planning, etc.
Physiological correlates: general activation of mind & body functions.
Effects of Training: can induce alertness, but may also produce agitation, etc.

Gamma (above 36 Hz)
Gamma is measured between 36 44 (Hz) and is the only frequency group found in every part of the brain. When the brain needs to simultaneously process information from different areas, its hypothesized that the 40Hz activity consolidates the required areas for simultaneous processing. A good memory is associated with well-regulated and efficient 40Hz activity, whereas a 40Hz deficiency creates learning disabilities.
Gamma (40 Hz):
Distribution: very localized
Subjective feeling states: thinking; integrated thoughts
Associated tasks & behaviors: high-level information processing, "binding"

Physiological correlates: associated with information-rich task processing
Effects of Training: not known