Swingle Assessment Protocol by Vilistus

Version 1.0 November 2013

This assessment protocol is directly based on the work of Professor Paul G. Swingle, Ph.D., as outlined in his book "*Basic Neurotherapy: The Clinician's Guide*" and was designed[1] to run on the Vilistus-4 or Vilistus-8 Digital Sampling Units as supplied by Vilistus (http://www.vilistus.com).

The five locations Swingle uses for data collection are based on the 10/20 system of sites. The frequencies used are as defined in Professor Swingle's book and have been incorporated into this protocol.

Disclaimer:

This protocol is based on extensive work over a number of years by Professor Swingle and has been used successfully with hundreds, possibly thousands, of people.

However, it should not be the sole source of information used when planning neurofeedback for training purposes. Furthermore, it is not designed to be used as a clinical tool to diagnose neurological conditions.

All responsibility for its use rests with the practitioner.

It is extremely important that neither this protocol nor the information supplied by Vilistus is seen as sufficient information with which to practice skills pertaining to biofeedback and/or neurofeedback therapy. A number of books are listed on the Vilistus website; our recommendation for minimum reading would be:

- *A Symphony in the Brain* by Robbins, (which gives a general overview and history of the field of neurofeedback),
- *Getting Started with Neurofeedback* by Demos, (which is an introduction to the use of neurofeedback for clinicians),
- *Biofeedback for the Brain* by Swingle, (which is an introduction to his work for the general public and for clinicians)
- and most importantly, Prof. Swingle's book , *Basic Neurotherapy: The Clinician's Guide*, the latter only being available from him directly, (see http://www.swingleandassociates.com).

It cannot be emphasized strongly enough that this protocol must be used in conjunction with Swingle's book, *Basic Neurotherapy: The Clinician's Guide*.

1 With thanks to John Warren for his invaluable assistance in creating this implementation of the Swingle Assessment Protocol

This assessment assumes that you have at least a basic knowledge of neurofeedback; that you know and can find 10/20 sites; can attach electrodes confidently; understand the various bandwidths, (e.g. Alpha, Theta) commonly discussed and so forth.

Conducting the Assessment:

Having switched on the Vilistus and opened the Swingle Clinical Q protocol, the next steps are straightforward, assuming that you know how to find 10/20 sites. The Protocol was designed to be used with the Vilistus Dual Chanel Bi-polar sensor set, (two red active/positive sensors; one white common ground reference and oneblack negative/passive sensor, (the latter is a common reference for both of the active/positive sensors). If you are using a 5 sensor setup, place the passive sensor one at A1, the passive sensor two at A2 and the ground on the forehead, for example, at Fpz, (the actual location is not important).

Follow the instructions on the screen, pressing either "continue" to be taken to the next step in the process, (attaching the sensors or recording), or press "skip", in which case, the stage is missed out. If you make a mistake, you will have to start again at the beginning, although note that you can press "skip" until you are at the stage you wish to proceed from although you will have to print what you have assessed up to that point. When you reach the end of the protocol you will be prompted to press "Compute", upon which a Microsoft Office Excel Comma Separated Values File will be displayed on the desktop, which when opened, displays the values of results and isdescribed below.

The Protocol Output:

First you will see columns labeled from A to Q. Column A identifies the site, (Cz, F3 etc), and the condition, (Eyes Open or Eyes Close or Task 1 or Task 2). Note that if you have skipped over sections when carrying out the protocol, the data may not be present here. Columns B to I show the mean amplitudes in microvolts of the various frequency ranges, (Delta, Theta etc), for each site and condition used.

Column J shows Peak Frequency Alpha, which is the Alpha brainwave frequency, (8 to 12 Hz), which has, on average, the highest electrical amplitude. Research has demonstrated that it is associated with cognitive functioning.

Colum K shows Total Amplitude, which is the sum of the amplitudes of Theta, Alpha and Beta, (Columns C, D and E). Its importance is discussed in Basic Neurotherapy: The Clinician's Guide.

Column L shows Total Beta, which is the sum of Beta, (Column E) and HiBeta – Gamma, (Column F).

Columns M to Q show ratios between various frequency bands as indicated, for example, the Theta to Beta ratio. These were calculated by simply dividing the first figure by the second. For example, to find the Theta to Beta ratio at a particular site, divide the Theta value by the Beta value.

We shall now turn to Column A, Rows 21 to 39.

The Alpha Response, (rows 21 & 22), (e.g.) at Cz refers to the increase in Alpha from Eyes Open, (EO1) to Eyes Closed, (EC). The value is derived from the formula EC (i.e. its value

in microvolts) minus the EO1 value divided by the EO1 value multiplied by 100 to give a percentage change. A negative value indicates a decrease. Note that you may not arrive at exactly the same results as presented here because of the effects of using rounded figures, (an example of rounding is saying that 5.55 becomes 5.6).

Alpha Blocking (rows 25 & 26), refers to the extent that the Alpha level, after having had the Eyes Closed, (i.e. EC) returns to the level prior to having eyes closed, (i.e. EC1). Basically, is EO2 approximately the same as EO1? With some people, EO2 does not return quickly to the same amplitude of Alpha as EO1, and the implications of this are discussed in Swingle's book. The formula is EO2 minus EO1 divided by EO1 multiplied by 100 to give a percentage figure.

Regarding the EO and Cognitive tasks, (rows 27 to 30): Cognitive Task 1 consists of counting back from 100 in units of 17. An alternative task might be reading. The task you choose will depend on the problem – whether it's reading comprehension or short term or working memory. The task should be carried out quietly to avoid (as far a possible) any artifact. The formula is EO2 minus Task 1 divided by Task 1 multiplied by 100 to give a percentage figure.

The EO/Task 2, (optional), (rows 32 to 35), was designed to be used with sound CD's developed by Professor Swingle, (see his book Basic Neurotherapy and look at his website), although any task could in fact be used. Harmonics represents the amount of change in Theta or Alpha at sites Cz or O1 . The formula for detecting change under this condition is EO2 minus Task 2 divided by Task 2 multiplied by 100 to give a percentage figure.

Note:The resulting statistic indicates whether Theta or Alpha has increased or decreased under the influence of the condition, (harmonic sound or whatever). Be clear that if the figure is positive, then the EO condition has more of the bandwidth under consideration, (i.e. alpha or theta), than under the Harmonic sound condition. This might be desirable if you are using Omni to reduce Theta, (i.e. Theta has gone down with the Harmonic sounds). However, if you were using Professor Swingle's Mozart tape to increase Alpha frequencies, you would hope to see a negative number, i.e. Alpha has increased using the Harmonic. Professor Swingle's advice is that use of the sound is helpful if that the change is 5% or greater.

Note that in his book, Professor Swingle refers to the "Alert" CD of sounds to reduce Theta. The "Alert" CD, has, (as of 2013), been replaced by the Omni CD .

Regarding F3 to F4 differences, (rows 37 to 39): Professor Swingle prefers to subtract the smaller number from the larger number so that you always have a positive figure, i.e. the first figure taken would be larger than the second figure. The formula for detecting change under this condition is therefore F3 minus F4 divided by F4 multiplied by 100 to give a percentage figure – assuming F3 is larger than F4. If it is not, simply reverse the figures.

sEMG

Having looked at all this information, the information can be considered against the information provided in the Appendices of Professor Swingle's "*Basic Neurotherapy*" or the

Pro Forma supplied by Vilistus to identify results that are out of the normal range and which can be discussed with the client to help identify treatment protocols.

It might be asked why the results sheets do not also provide the probes, as indeed, some systems do, (e.g. as developed by the Biofeedback Foundation of Europe for the Infiniti range of instruments).

The statistics to do this are reasonably straightforward, but the reason this was decided against was as follows: Professor Swingle carries out all the calculation manually. He has stated in workshops that this gives him first hand experience with the numbers and greater insight into the assessment than merely reading a set of implications.

Although the basic calculations have been provided, (which prevents basic numerical errors), we feel that, by completing the Pro Forma and looking through the information and completing the form, this gives a much greater insight into the assessment that would not be obtained by having the probes provided.

Two further points should be mentioned. First, the Vilistus program is designed to minimize 3 forms of artifact:

- **Electrical wiring** has a frequency of 50Hz in Europe and Asia, (60Hz in the U.S.A.). Therefore, this is a potential source of artifact in the data. Vilistus leads attempt to minimize this by, for example, shielding the leads.
- **Signal quality** is checked to ensure that there is an adequate signal being received and that it is not alternating from thetop to bottom of the allowed range, (railing).
- **sEMG**, (surface electromyography) or muscle signals can produce a reading that is mistaken for the EEG reading. Vilistus leads have a secondary filter on the EEG cable to detect EMG.

In short, the Vilistus leads and software attempt to minimize artifact. If there are indications of artifact that is detected, the timer on the protocol deletes the whole epoch of time, (15 seconds) and begins again. This is easily observed when running an assessment. Overall, the 15 seconds of data recorded should be, as far as is humanly possible, artifact free.

Second, when Professor Swingle records an assessment, he views the raw data on the screen at all times. This is particularly important with reference to Alpha blocking because some clients, upon closing their eyes, initially produce a burst of Alpha which is more or less immediately blocked. Professor Swingle has suggested that when this occurs, it may indicate that closure of the eyes can increase or indeed cause, unwelcome imagery. This issue is discussed in his book. It is easy enough to add another Instrument on which to observe the signal, (go to Instruments then Time Series and select which Instrument to use).

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