THE TETRAX TTT (TESTING THE TESTER) WIZARD

INTRODUCTION

The Tetrax TTT Wizard is an abbreviated method to demonstrate to the user the meaning of the Tetras Parameters by testing himself on the platforms , carrying out a simple experiment guided by systematic instructions.

The objective of the experiment is to demonstrate the function and meaning of the main Tetrax parameters , by instructing the user to stand on the platforms and to assume artificial postures , which systematically demonstrate how aberrant body sway and experimentally induced changes in foot pressure are transformed by the Tetrax software into visible deviant algorithms and graphics on the Tetrax Diagnostic Output.

For such purpose two persons will have to participate in the experiment , one who operates the computer , and supervises the experiment and the other who performs the postural artifacts, with the obvious possibility to change roles. The experimental demonstration consists in three consecutive artificial Tetrax Examinations, each Examination dedicated to a different basic parameter. Within each of the three examination sets 4 to 5 of the 8 Tetrax positions will be dedicated to a specific , clearly defined artificial posture. The performance on each position will be saved and its posturograhic expression hereafter be viewed, inspected and interpreted using the Tetrax output graphics and statistics, as explained by systematic e guidelines. Obviously the original meanings of the 8 positions , as defined by the Tetrax protocol, will be invalid in the context of this experiment, serving only as ad hoc designations of each artificial postural performance.

The following basic Tetrax Parameters will be exemplified :

EXAMINATION (1) WEIGHT DISTRIBUTION AND WEIGHT DISTRIBUTION INDEX

EXAMINATION (2) FOURIER SPECTRAL ANALYSIS

EXAMINATION (3) SYNCHRONIZATIONS

The parameter of STABILITY will not be demonstrated by a specially designed maneuver. Its variations will be intrinsically visible in the context of the other examinations .

For the purpose of the experimentation the following auxiliary materials must be available:

(a) "The Stony Bag". A little bag of nylon or tissue 10 x 10 cm to be filled with little stones and tightly closed, to prevent the stones to fall out, when standing on it.

(b) 4 equal weights of at least 5 kg which can be conveniently placed on each of the four Tetrax platforms.

(c) A Wooden Danish Shoe with a thick sole .

(d) A metronome (optional)

General Note: You have to complete the whole experiment of artificial postures, before saving the results and inspecting them. .

All positions to be taken WITHOUT SHOES, (stockings permitted) unless instructed otherwise.

EXPERIMENT NO 1

Objective of Demonstration

WEIGHT DISTRIBUTION AND WEIGHT DISTRIBUTION INDEX (WDI)

Position NO Stand normally and relaxed, eyes open. This position should serve as neutral and natural base of reference**.**

Position NC Put excessive weight on toes, but without totally lifting heels off rear plates (A, C).

Position PO Put excessive weight on left heel, by leaning back on your left side

Position PC Put the "Stony Bag" on the left toe platform (B) and stand on all four plates (including platform B which causes some discomfort).

Position HR Take the Stony Bag off platform B, place the two Tetrax Elastic Pads on all the four platform, and put the stony bag back on top of the part of the elastic pad which covers plate B. . Now stand on all four plates .

Position HL Put the four equal weights on each of the four plates. Don't stand on the platforms , but "test" the weights the full time of 32 seconds.

NOW SAVE YOUR DATA

INSPECTION AND INTERPRETATION OF RESULTS OF EXAMINATION (1)

RETRIEVE EXAMINATIOIN (1))

Position NC

Put excessive weight on toes, almost standing on tip toes, but without totally lifting heels from rear plates (A, C).

GRAPHICAL SUMMARY SHEET

Row WD: Note that the upper two small squares, designating toes, have darkened The lower two squares, designating heels, will be white, eventually show asterisks, indicating excessive WITHDRAWL of weight from heels.

NUMERICAL SUMMARY SHEET On Column (2) Row WD you can read the exact percentages of excessive weight , or excessive withdrawal of weight on the toes and heels respectively. You may compare these percentages to those in the adjacent column (3), showing the normal values.

NORMATIVE GRAPH On the sliding column featuring the 22 Tetrax Variables go to TOES, then to HEELS. You will see how relative to position NO (your normal performance) the graph has jumped up for toes and dropped steeply for heels respectively, demonstrating the abnormal displacement of weight. On the y axis you may read the value of the deviations. Also note that your performance on NC is remote from the Mean Value, marked by the heavy black line, as well as far beyond the area of normal performance delineated by the two red dotted lines, which designate plus one and minus one Standard Deviation., respectively.

NON NORMATIVE – PLOT 4 PLATES

Before inspecting this graphic , attention must be paid to the ***scaling moderator*** *Window with two small dot windows on the left, to be checked in turn)*

When on modus NORM, the values on the y axis are standardized, i.e. being fixed to a limit of 34 % of maximal weight visible on the graph, independently of the subject's performance

When on modus AUTO, the program adapts the values on the y axis to the individual performance of the subject. Hence the values on the y axis are plotted on a flexible scale of weight percentages , ensuring that the examinee's performance will be optimally visible

Modulator NORM. Note that the toe traces B, D are high up on the graph, eventually partly entirely not visible , because you your weight placement on toes may have exceeded the 34 % plotting limit .

When you switch to *Modulator AUTO* , these toe traces will duly appear, due to the enlarged scope of weight percentages on the y axis, displaying the values of the abnormal weight distribution. The extremely diminished weight on the heel traces on A, C is visible, irrespective of the scaling modus , but is obviously better depicted by modus AUTO.

NON NORMATIVE – PLOT COP (Plot Center of Pressure)

Self explanatory

Position PO

Put excessive weight on left heel, by leaning back on your left side

GRAPHICAL SUMMARY SHEET

On row WDI note, that the left lower square is darkened, indicating excessive weight on the left heel . Eventually on one of both upper squares (toe plates) may show asterisks , showing excessive weight withdrawal from these foot parts.

NUMERICAL SUMMARY SHEET

Note excessive weight on column 2, row A.

NORMATIVE GRAPH

Inspect variable A. Note the raise of the graph and read the percentage of excessive weight on the left heel by inspecting the scale on the y axis.

You may continue to inspect Non Normative , Plot 4 Plates and Plot COP. Results need no explanation.

Position PC

Put the "Stony Bag" on the left toe platform (B) and stand on all four plates

GRAPHICAL AND NUMERICAL SUMMARY SHEET

Note that abnormal weight shifts have occurred, mainly that weight has been withdrawn from the left toe plate (B) , where the stony back has caused you pain. (We have faked an "injury" to the left toe). Your "compensatory strategy" will be individual. You might shift most of your weight on the right foot, or on both heels, or diagonally on the right heel. On the other hand , you may have excessively withdrawn weight from one foot part, which will be manifest by an asterisk on the Graphical Summary Sheet.

Position HR

Standing on pads whilst Stony Bag is placed over the area of platform (B)

GRAPHICAL AND NUMERICAL SUMMARY SHEET

Compare the weight distributions on Positions PC and HR. Notice that the extreme weight withdrawal from plate B has become more moderate, as well as the "compensatory" weight compensations on the other plates. This response demonstrates that deviant weight distribution patterns , due to pain in the lower extremities (in most cases linked to orthopedic problems), will improve when standing on pads

Position HL

Put the four equal weights on each of the four plates

The objective of this maneuver is to demonstrate the function of the parameter WDI (Weight Distribution Index) This parameter is a measure of the deviation of the individual weight percentages on the 4 plates from a theoretical Mean of 25 % , which means " equal weights on all four plates" . In practice such a "base line " [performance can only be produced by an inanimate object, such as four equal weights, or a heavy prism whose base would cover all the four platforms etc.

GRAPHICAL SUMMARY SHEET

Notice that on the WDI row there is an asterisk, demonstrating the extremely low value of WDI

You will also see also an asterisk on the row of ST (Stability) showing that the four weights are indeed extremely stable.

The asterisks appearing in the Fourier Section, as well as the black "Synchrony" rectangles will be easy to interpret, after you have performed Experiments 2, and 3.

NUMERICAL SUMMARY SHEET

Notice that the rows indicating weight percentages show on all the four plates. nearly equal values close to 25

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NON NORMATIVE PLOT 4 PLATES

Notice the equidistance of the 4 traces from the 4 respective base lines.
NON NORMATIVE PLOT COP

The graph will show a single almost invisible dot at the cutting point of the x,y axes

NORMATIVE GRAPH

Go to parameter WDI and inspect the progress of the performance line throughout the positions NO, NC, PO, PC, HR, HL . Notice that the normal value of the parameter WDI is around 4 – 5. (red solid line) and that the lowest values produced by a human subject never drop to zero. (Lower red dotted line) Now view the positive deviances on positions NC, PO, PC, HR and the steep drop to zero on HL produced by the inanimate object. .

The important contribution of the WDI to postural diagnosis is the detection of **postural stiffness**, manifest in excessively LOW, close to zero WDI. Postural stiffness you cannot be fake, although you might try.. But in light of the above explanations, you may easily imagine the protocol of such a postural deviation, which is only detectable by the Tetrax System.

After concluding this inspection of Experiment 1, you may have a look at the Stability Index over the positions you have faked. The most convenient way to view the changes is on NORMATIVE GRAPH , checking ST. Probably positions NC, PO, PC ,HR and HL will indicate de-stabilization, unless you are smart and have mobilized good compensatory forces. Note the improvement of Stability on HR as compared to PC caused by reducing the effect of the painful stimulus The four weight experiment (HL) will obviously demonstrate excessive stabilization.

EXPERIMENT NO 2

Objective of Demonstration

FOURIER SPECTRAL ANALYSIS OF POSTURAL SWAY

Position NO Stand normally and relaxed, eyes open. This position should serve as neutral and natural base of reference**.**

Position NC Experimenter claps his hands at a rhythm of 1 beat each 1 ½ seconds**.** ***I.e. Coun*t: *twenty one and* (clap), *twenty two and* (clap)*……*.**.**Examinee stands on plates and sways at this rhythm in ante-posterior direction, i.e. each beat is one deviation from the vertical pose frontally or backwards.

Alternatively a metronome may be used, swaying at 0.3 Hz, i.e. swaying to and fro within 3 seconds.

Position PO Experimenter claps his hands at a rhythm of 2 beats per second**.** ***I.e. Coun*t: *one (clap, clap) , two (clap , clap) ……*.**.**Examinee stands on plates and sways at this rhythm in ante-posterior direction, i.e. each beat is one deviation from the vertical pose frontally or backwards.

Alternatively a metronome may be used, swaying at 1.0 Hz, i.e. swaying to and fro within 1 second.

Position PC Examinee stands on plates . Try to shiver and tremble as fast and effectively you are able to do.

NOW SAVE YOUR DATA

INSPECTION AND INTERPRETATION OF RESULTS OF EXAMINATION (2)

RETRIEVE EXAMINATIOIN (2))

NON NORMATIVE PLOT 4 PLATES

Only modus NORM to be used

Compare successively positions NO, NC, PO, PC and note the increase of the sway frequency from position to position

NON NORMATIVE PLOT FOURIER 4 PLATES

Only modus 5 Hz to be used

Compare successively positions NO, NC, PO, PC

On position NO (*Normal performance*) , the peak of the graph is close to the y axis, i. e the strongest intensity is that of very slow sway around 0.02 – 0.03 Hz, as shown on the x axis, designating the frequency ranges.

On position NC (*faking drunkenness, peripheral vestibular irritation*) the peak of the graph has moved to the right, indicating intensification of sway at 0.3 Hz.. as shown on the x axis.

On position PO (*faking dysfunction of the somato-sensory feedback from the muscle system of the lower extremities*) the peak of the graph has moved further to the right indicating intensification at 1.00 Hz as shown on the x axis.

On position PC (*faking dysfunction of the central nervous system, brain injury, cerebral or cerebellar pathology*) intensification of sway has spread far to the right into the range of very fast sway, close to tremor. Eventually also the lower frequency range may have been intensified, as you have faked a more or less "pervasive" disturbance of postural sway.

GRAPHICAL SUMMARY SHEET

Compare successively positions NO, NC, PO, PC

The upper part of the Summary Sheet presenting the Fourier Spectrum will show increased darkening at the range F2-F4 on position NC. On positions PO and PC also the higher frequency ranges will darken.

The Stability Index circle will probably be black on NC and PO. On PC it might eventually be brighter, because although you shivered and trembled you could have been able to be relatively stable.

NOPRMATIVE GRAPH

Compare successively the graphs of the 8 Frequency bands (F1 to F8) and note the pattern of intensification on each of them , comparing the 4 experimental positions, NO, NC., PO, PC. Results of inspection are self explanatory. Presented in a different format. they will be congruent with the information already obtained by the previous exploration of data.

EXPERIMENT NO 3

Objective of Demonstration

SYNCHRONIZATION

Position NO Stand normally and relaxed, eyes open. This position should serve as neutral and natural base of reference**.**

Position NC Sway in an exaggerated way in the lateral plane (from left to right)

Position PO Sway in an exaggerated way forwards – backwards

Position PC Perform a circular sway as good as you can without stumbling off the plates

Position HR Put on the wooden shoe on your left foot and stand with both feet on the platforms.

NOW SAVE YOUR DATA

INSPECTION AND INTERPRETATION OF RESULTS OF EXAMINATION (3)

RETRIEVE EXAMINATIOIN (3)

NUMERICAL AND GRAPHICAL SUMMARY SHEETS TO BE INSPECTED CONCOMITANTLY

On GRAPHICAL SUMMARY SHEET click **Position NO** , producing the NUMERICAL SUMMARY SHEET of **NO**, and inspect the six lowest rows designating the six synchronizations AB (heel-toe left foot), CD (heel-toe right foot), AC (heel to heel) , BD (toe-toe) and the two diagonals (AD, BC). Note that AB, CD have negative values indicating compensatory synchronization , whilst AC, BD have positive values. The diagonals are negative. Note also that the values of the scores are around 700-800 , whether positive or negative. *This pattern of synchronization is normal, produced by the predominant, slight ante-posterior sway of a healthy person, standing in relaxed pose. I.e. Body weight is displaced smoothly from heel to toe of each foot, whilst heels and toes are charged to support the body concomitantly when moving forwards and*

backwards. You be aware check this pattern by intensively introspecting your sway, whist repeating position NO (without standing on the plates).

Go back to GRAPHICAL SUMMNARY SHEET and by click on NC proceed to analyze **Position NC** on the Numerical Summary Sheet., which reflects your postural response whilst swaying laterally, i.e. an extremely deviant sway pattern, which is a clear sign of postural pathology, when occurring in a natural setting. Note that the direction of the synchronization values of AB, CD has inverted and became positive, with a similar inversion appearing on AC, BD, which have turned negative. The diagonals have remained unchanged.

Go back to GRAPHICAL SUMMARY SHEET and notice than on NC the 2 pairs of synchronization rectangles designating AB CD and AC BD respectively have darkened into black, indicating the extreme deviant synchronization pattern

Now inspect **Position PO** on the NUMERICAL SUMMARY SHEET and see that the direction of AB, CD, AC, BD values has remained "normal" (as on NO) but their values have considerably increased to around 900. You have swayed in the basically natural ante-posterior direction, but in an exaggerated fashion. I.e. you have "over" synchronized, manifest in the increased synchrony values

Go back to GRAPHIUCAL SUMMARY SHEETY and notice that the respective synchrony rectangles have remained white, possibly an asterisk appearing on one of them, indication "over synchronization" , clinically observed in anxiety states and/or postural stiffness in essentially non pathological subjects.

Position PC (circular sway) – obviously most unnatural - produced DE-synchronization, manifest on the Numerical Summary Sheet in LOW synchronization values, with a tendency to droop towards zero. ON the GRAPHICAL SUMMARY SEET rectangles will darken, indicating pathological deviation.

Position HR (left foot in wooden shoe with thick soles) . On the NUMERICAL SUMMARY SHEET synchrony values of AB (left heel-toe synchrony) and ONLY AB will lower, and the respective rectangle on the GRAHICAL SUMMARY SHEET may darken. I.e. the thick sole of the shoe prevents the synchronization movements ofg the foot to be picked up by the left platforms, and hence artificially produces a moderate left foot de-synchronization.

NON NORMATIVE PLOT COP

Inspecting successively the experimental positions you will visualize the various sway patterns, which you have faked. Results are self explanatory

NON NORMNATIVE PLOT LAT/AP

Notice the increased lateral sway on positions NC and PC.

NORMATIVE GRAPH

Inspect the performance on ST (Stability) . Whilst on NC, PO and PC Stability will be deviant, it may return to normal on HR (Standing with the wooden shoe). This because a moderate de-synchronization, as that produced by the shoe , might not necessarily cause de-stabilization.

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