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REACT   : Reaction Time Measure of Visual Field   (09/03/1997)   p. 1

Detects slowed response to visual stimuli in all quadrants of the display.
Respond w switch/joystick or mouse (requires DOS mouse driver) button.
Accurate (machine-speed independent) response times mapped in patient
comprehensible display.

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                              Purpose
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This procedure can be used to detect slowed response to visual
stimuli-either on the right or left side or both sides, as well as the
top, middle, and bottom. With eyes free to move, the procedure is a
'functional' visual field, more like everyday life than conventional
visual field measurement which involves fixation.   Immediate response
time feedback is reinforced by the final results, which include a map of
response speed to stimuli in various parts of the visual field. This
feedback, unlike any traditional visual field measurement procedure,
offers the patient information which may improve awareness of, and
ultimately insight into, their sensory loss.

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                              Materials
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Response Key:
The left mouse button, joystick 'fire'button, or a switch connected to an
interface for the joystick/game socket. Must be easy to activate and
reliably positioned so that the patient can respond as quickly as
possible.

The ENTER key is used to interrupt trials. This option is NOT announced
on the test screen, which must remain clear.

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                              Procedure
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In this program, the patient simply presses the mouse or joystick button
to "stop the runaway numbers" on the screen. The quicker the button is
pressed, the better the score will be.   The computer keeps track of where
on the screen the stimuli (numbers) were and the reaction times. Settings
can be adjusted so that there is a fixation point or, without one, the
patient may look anywhere on the screen.

You may choose the mouse button or joystick button as the response key.
Note that with a switch interface, you may use almost any momentary
contact switch. The 'Response' key = mouse button, the joystick 'fire'
button, or a switch plugged into an interface box. When using a mouse,
you must have DOS mouse software installed - often by running MOUSE prior
to running STARTCOG. Check with your local computer guru, if you don't
know what this means.

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When you select REACT from the program menu, you will be given an
opportunity to designate the ATTRIBUTES OF RESPONSE KEY #1 (Don't worry,
there is only one.) If the supplied information is not correct, type N in
response to the IS THE INFORMATION CORRECT? You will then be given
choices pertaining to the attributes listed on the screen. Some of these
are subjective. For example, if you are using a mouse button, you might
use the following:

SITE: FINGER
MOVEMENT: FLEXION
EFFORT (FORCE):   EASY
TYPE OF SWITCH: BUTTON
MOUNTED ON: MOUSE

If you would like to change the wording, you may select OTHER and type
in your change in the space offered - you will have to be succinct. Your
description of the response key will be included on the printout and saved
with the data. The description you enter will, however, not change the
operation of the program.

TEST YOUR RESPONSE KEY - Before the task begins, the computer needs to
know what will be the response key: At this point have the patient press
the button you plan to use: either the left mouse button, the joystick
"fire" button or a switch. If everything is in order, the press will be
confirmed and you can press ENTER to proceed.

What could go wrong at this point? The computer attempts to determine if
a mouse or switch is available and set up properly (usually a software
'driver' program has to be run, often automatically when your computer is
turned on). If you are not computer literate, you may need to have your
computer technician help out. If you are using a mouse, there must be a
DOS mouse driver installed. Just because there is a mouse and it works in
Windows, does not mean that there is a DOS driver installed. The mouse
has to be set up so it will work in DOS programs. Similarly, if you are
using the Notebook Gameport, there is a program NG which must be run prior
to STARTCOG. Again, your computer technician ought to be able to set
these programs up so that they are run automatically and you don't have to
think about them any more.

SETTINGS

The settings are described in detail below. You are offered the settings
which were last used. If you type A to accept the settings, you can
proceed quickly. If you would like the standard (initial) evaluation
settings, press R to Reset, then A to Accept the settings and proceed.
Finally, if you wish to change a setting, press C to Change. You will go
through the settings one-by-one. Press ENTER to retain a setting, or
follow the screen instructions to modify.

INITIAL COMMENTS

You are given two lines in which you can type comments. This may include
special conditions, such as type of glasses worn, specific instructions,
current medications, etc. Patient remarks are often illuminating. Avoid

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using quotation marks (single quotes are ok).

Comments are optional. Press ENTER when you are ready to proceed.

READY to begin?

Press ENTER when ready to proceed. If you set the "Trials started by
..." to "UNWARNED" (see Settings below), trials will continue at random
intervals. You can press ENTER again to interrupt them. This option is
"hidden" - there is no prompt on the screen, since in REACT it is
important to have a clear screen. You might want to press ENTER and
interrupt the trials in order to explain something to the patient, to
adjust the switch placement, to erase an invalid trial, or to exit the
procedure altogether. After you press ENTER, you will be given options to
select.

The first two trials of REACT are considered practice and are not
counted. If you interrupt the practice trials, you will not be given the
option to Erase or Exit the task. Complete the practice trials before
attempting to exit.

Typically, REACT should be run several times in an evaluation: each
run takes about 2.5 mins. First, repeating the procedure is the best way
to clarify any ambiguity or inconsistency in the findings. Second, one
should systematically investigate factors, such as

Eyes free to move vs. Eyes fixated
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This factor gives information about how well the individual uses eye
movements to compensate for the loss

Normal viewing contrast vs. Low contrast
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This factor can reveal 'depressions' (reductions or relative losses) in
the visual field. Not all impairments are absolute, as is connoted by the
term field 'cut'. Reduced contrast can be accomplished subjectively by
reducing the contrast setting on the computer monitor, e.g., turn it down
so that the patient just barely can see the print, then turn it up
slightly. A standardized reduction of contrast in REACT is accomplished
using Life Science Associates' Contrast Reduction Spectacles. Be sure to
note in the comment section which condition is being used.

Without distraction   vs. With distraction (verbal)
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While the formal visual field is not supposed to be influenced by
attentional factors, in the real world visual response may be markedly
affected by inattention. In recent years the concept of "Useful Field of
View" has become very useful, especially in clarifying the constricted
visual awareness of some older drivers.

The sensitivity of REACT in measuring reaction time gives an
opportunity for unprecedented mental chronometry: Just a fleeting thought
will cause one's "number" to go up by 10 or 20! (.10 to .20 sec).
Actually, in studies of distraction with college students, Matheson found

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increases were limited to about .20 sec. overall. Clinically, some
patients show large increases with distraction.

Incidentally, the best distraction is having the person answer
questions promptly about personal information of special concern.

Binocular   vs.   Monocular
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Monocular fixated fields most closely parallel formal visual field
measurement procedures. If both eyes exhibit losses in the same
locations, the pattern is "homonymous." Homonymous visual field losses
suggest neural injury beyond the optic chiasm in the visual pathways.

If these losses include the entire left or right half, then it is
"hemianopic." (Hence, the term "homonymous hemianopia." Incidentally,
"hemianopsia" is a variant of "hemianopia" and experts vary on which is
"correct," but some people have strong views on the matter.

Losses limited to a quarter of the visual field are
adrantanopic." A blind spot, surrounded by intact vision, is called a
"scotoma." Every neurologically normal eye has a "physiological blind
spot" or scotoma corresponding to where the optic nerve leaves the retina.
This is "temporal" (on the outside, not the nasal side) about 1/8 th of
the distance off center (12 to 20 degrees of visual angle) and about the
size of a fist at arm's length. There is a complete and abrupt loss.

Dynamic vs. Stable
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This factor is poorly understood, but vision scientists recognize two
major types of visual system - one of which is more tuned to dynamic
information, e.g., changes in visual field, than to the presence or
absence of a visual stimulus (stable/static information). In the real
world, the visual field is often dynamic because the environment changes,
but also the individual moves within the environment as well. In driving,
dynamic fields are the usual state of affairs; stable fields would only be
relevant when stopped, as at an intersection, reading a sign.

The stable vs. dynamic variable is offered as an interesting variable
to explore. Clinical research is needed before firm conclusions can be
drawn.

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                              Settings
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  1...Attributes of Resp Key 1   Default value: n/a

     Finger / Flexion / Easy / Button / Mouse - Put fuzzy velcro spot on
     left mouse button ('Response' key). Patient must press the button
     reliably. Use dominant hand, unless injured.

  2...Instructions   Default value: No

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Instructions can be conveyed during practice. Stimulate the person to respond very fast. Erase practice trials or start over if you notice a warm-up effect.

3...Test Pattern   Default value: STANDRD

Each pattern has .TST. STANDRD.TST is a butterfly shape. Also supplied are BIGRING.TST. One can create other patterns, as needed.

4...Trial Started by   Default value: UNWARNED

Rarely is this changed. Alternatives are CUED (trial is preceded by a warning signal) and EXAMINER STARTS trial

5...Mode of Testing: Eye(s)   Default value: Moving freely

Moving freely is more 'functional' and allows person to compensate. It is cognitively easier and so is the best condition with which to begin. Alternative: FIXATED - This is most like conventional visual field testing procedures.

6...Eye(s) Tested   Default value: Both

Both is more natural and recommended to begin with. Both would be contraindicated if person has diplopia (double vision). When testing with eyes fixated, you would use monocular mode: either LEFT or RIGHT eye.

7...TARGET   Default value: DYNAMIC

Dynamic (standard) = numeric counter which advances very rapidly so that the pixels are moving and flashing continuously. Alternative (experimental): STABLE - a plus symbol appears and remains displayed until response is made.

8...Time to initiate response   Default value: 2

Two seconds is useful in all but blatantly lethargic individuals, in which case one might go to 5 or at most 10 sec. If this is too long, people with field losses will wait long times for positive trials.

9...When time limit is exceeded: Default value: NoFeedback

Best for evaluations. There is always some feedback if the patient notices the number reached by the counter after each trial. With feedback, computer pauses between trials.

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11...RESPONSE   Default value: L Mouse

     The left mouse key is usually easy for the patient to operate easily
     and reliably. Put a velcro dot on the L Mouse button to facilite
     this.

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                                    Results
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NOTE: If printed output was selected when you first started the COGREHAB
programs, then
(1) the printout will contain whatever is displayed on the screen.)
(2) you may pause the display by pressing the <SPACE> bar. Freezing the
display is useful for discussing the results with the patient

The REACT results includes:

Results screen 1: Response times by screen location.
The first display is a map of the response times to stimuli in different
parts of the video display. Encourage the patient to review this chart
when it is displayed at the end of the task.

NOTE: the information contained in this display is not preserved and
saved in the disk data file. It is strongly recommended that you print
and save it, even if you use the <PRT SCR> key to get a 'screen dump.'

Results screen 2: Quantitative summary.
(This information IS saved on the disk data file.)
The tables summarize response times for different portions of the
display: Right vs. Left, Center vs. Periphery, Top vs. Bottom (least
interesting). Mean (Average) and Median (middle-most) scores are
complemented by minimum and maximum and the standard deviation
(variability) of the response times. False alarms are also reported. If
FA's are present, they may invalidate the response times – anyone can
respond quickly by responding frequently without concern for responding at
the correct time.

Results screen 3: a trial by trial bar graph of response times.
These bars are marked L or R to indicate what side of the display the
trial was on. Practice and fatigue effects can often be seen on the trial
by trial displays.

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                               Clinical Findings
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Clinically, REACT is simple to understand and offers immediate feedback.
To enhance the feedback message, some clinicians find it useful to have
the individual scan the display of results for scores greater or equal to
.4 sec. Ask them to count how many are on the left and how many are on

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the right side. An occasional delay in responding may simply reflect a
brief lapse of attention. Repetition is always in order before drawing
any other conclusion.

REACT is very sensitive to verbal distraction and our data with college
students showed that median reaction times with disctraction rarely
exceeded .2 sec over the value expected without distraction.

When REACT is done with reduced visual contrast, one can diagnose
partial reductions (relative field losses). Even with markedly reduced
contrast, one would not expect reaction times to increase by more than .1
to .2 sec.

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                         Normative Findings
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Most of the normative data come from college and professional school
students. The primary dependent variable was the median or average
reaction time on central, left and right side stimuli. Standard
deviations ranged from .01 to .04 sec.

Young adult norms on eyes free to move with normal contrast respond
consistently within .25 to .27 sec (Touro - R. Engle, C. Hall). These
scores were maintained consistently over 6 trials of practice (NYU - R.
Anand). Low contrast may add .10 sec (Touro - R. Engle) and verbal
distraction about .20 sec. (Adelphi - Matheson). With eyes fixated,
responding was about .05 sec. longer than with eyes free to move (Touro -
N. Sidle).

Older (avg. age = 75 yrs.) persons (drivers, living at home) respond to
central trials in about .32 sec with a standard deviation of about .05 sec
(Touro - C. Hall). We do not yet have normative information for older
persons' responses to peripheral stimuli.

Measure	Mean	StDev	Cutoff
REACT : Center average N = 20: 27.4 yrs Source: C. Hall	0.25	0.04	0.33
REACT : Center average N = 20: 75 yrs Source: C. Hall	0.29	0.06	0.42
REACT : Center, reg contrast N = 20: 22+23 yrs firefighters Source: R. Engle	0.24	0.01	0.27
REACT : Center, low contrast N = 20: 22+23 yrs firefighters Source: R. Engle	0.35	0.04	0.43
REACT : Center, fixated N = 20: 21-31 yrs students Source: N. Sidle	0.25	0.04	0.33
REACT : Center, free to move	0.21	0.04	0.28

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N = 20: 21-31 yrs students   Source: N. Sidle

REACT   :   Center median   0.24   0.02   0.29
N = 20: 27.4 yrs   Source: C. Hall

REACT   :   Center median   0.28   0.04   0.37
N = 20: 75 yrs   Source: C. Hall

REACT   :   % False alarms   1.59   2.97   7.53
N = 20: 27.4 yrs   Source: C. Hall

REACT   :   Left average   0.26   0.03   0.32
N = 20: 27.4 yrs   Source: C. Hall

REACT   :   Left median   0.26   0.03   0.31
N = 20: 27.4 yrs   Source: C. Hall

REACT   :   Left, reg contrast   0.26   0.01   0.28
N = 20: 22+23 yrs firefighters   Source: R. Engle

REACT   :   Left, low contrast   0.38   0.04   0.46
N = 20: 22+23 yrs firefighters   Source: R. Engle

REACT   :   Left, fixated   0.26   0.03   0.31
N = 20: 21-31 yrs students   Source: N. Sidle

REACT   :   Left, free to move   0.20   0.03   0.26
N = 20: 21-31 yrs students   Source: N. Sidle

REACT   :   Right average   0.26   0.03   0.33
N = 20: 27.4 yrs   Source: C. Hall

REACT   :   Right median   0.25   0.03   0.30
N = 20: 27.4 yrs   Source: C. Hall

REACT   :   Right, reg contrast   0.25   0.01   0.27
N = 20: 22+23 yrs firefighters   Source: R. Engle

REACT   :   Right, low contrast   0.35   0.04   0.44
N = 20: 22+23 yrs firefighters   Source: R. Engle

REACT   :   Right, fixated   0.26   0.03   0.32
N = 20: 21-31 yrs students   Source: N. Sidle

REACT   :   Right, free to move   0.21   0.04   0.28
N = 20: 21-31 yrs students   Source: N. Sidle

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                             Miscelleneous
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This program does not run under Windows. You must exit Windows
completely, or, in Windows 95, set the properties of the shortcut to force
the program to run in DOS mode with a maximized window.

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The reason for this requirement is that this program involves precision
timing which WINDOWS (an inherently timesharing/multitasking program
environment) does not do well. We have opted to maintain the program's
timing over the convenience of running in Windows. However, we regret
this inconvenience and continue to seek a better solution.


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                            References
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Gianutsos,R & Suchoff,IB (1997)
  Visual fields after brain injury: Management issues for the
  occupational therapist. In M. Scheiman (ed.) Understanding and
  managing vision deficits. Thorofare, NJ: Slack Inc.

Gianutsos,R (1991c)
  Visual field deficits after brain injury: Computerized screening.
  Journal of Behavioral Optometry,2(6),143-150.

Gianutsos,R (1997a)
  Vision rehabilitation following acquired brain injury. In M. Gentile,
  Functional Visual Behavior: A Therapist's Guide to Evaluation and
  Treatment Options. Bethesda,MD: American Occupational Therapy Assn.
  (301 652-2682)
Gianutsos,R&Grynbaum,B (1983)
  Helping brain-injured persons to contend with hidden cognitive
  deficits. International Rehabilitation Medicine,5,37-40.

Gianutsos,R&Matheson,P (1986)
  Disorders of visual perception. In M. J. Meier, L. Diller, & A. L.
  Benton (Eds.), Neuropsychological Rehabilitation. London: Churchill
  Livingstone. (Published by Guilford Press in US)

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                    Variables Saved in *.CUM Disk File
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Note: The information below is for use in reading the saved data into a
      spreadsheet, such as Quattro Pro. With this information one can
      identify what each measure represents. These procedures are some-
      what technical, but useful for comparing performance across sessions.

Seq	Variable	Description	I/D	Chrs		Example
1	TASK	PROCEDURE NAME	I	8	D	REACT
2	NAME	LAST NAME	I	10	D	DOE
3	1ST	FIRST INITIAL	I	1	D	J
4	WHEN	DATE/RUN NO.	I	8	C	05079501
5	THGP	THERAPIST/GROUP	I	8	D	RG\TBI

6	INP1	INPUT (RESP) KEY 1	I	35	D	LEVER\MEDIUM\RFINGER
7	COMM	COMMENT	I	76	D	DIAGNOSIS/SPEC COND
8	INIT	INITIATED BY	I	1	D	U(=unwarned)
9	EYE	EYES TESTED	I	1	D	Left,Right,Both
10	FIX	FIXATED/MOVING FREELY	I	1	D	Fixated,Movingfreely
11	TIME	TIME LIMIT	I	3	C	2 (SEC)
12	PCTFA	FALSE ALARM PERCENT	D	4	C	
13	DIS	DISPLAY TEST PATTERN	I	2	D	
14	NC	N CENTER	I	2	C	5
15	NP	N PERIPHERAL	I	2	C	16
16	CAVG	CENTER AVERAGE	D	5	C	
17	TLAVG	TOP LEFT AVERAGE	D	5	C	
18	TRAVG	TOP RIGHT AVERAGE	D	5	C	
19	BLAVG	BOTTOM LEFT AVERAGE	D	5	C	
20	BRAVG	BOTTOM RIGHT AVERAGE	D	5	C	
21	TLMDN	TOP LEFT MEDIAN	D	5	C	
22	TRMDN	TOP RIGHT MEDIAN	D	5	C	
24	BLMDN	BOTTOM LEFT MEDIAN	D	5	C	
25	BRMDN	BOTTOM RIGHT MEDIAN	D	5	C	
26	CTIM	CENTER TIME	D	3	C	
27	TLTIM	TOP LEFT TIME	D	3	C	
28	TRTIM	TOP RIGHT TIME	D	3	C	
29	BLTIM	BOTTOM LEFT TIME	D	3	C	
30	BRTIM	BOTTOM RIGHT TIME	D	3	C	