

Cognitive behavioral therapy: why is the computerized version necessary?

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The features of Psychosomatic Treatments

- Our department deals with psychosomatic diseases (somatic diseases whose onset and course are affected by psychological stress-related factors), eating disorders, panic disorders, mild depression, and so on.
- Treatments for these diseases require not only physical interventions (ex. drug therapy) but also modifications of self-care behavior.
- For that purpose, cognitive behavior therapies (CBT) are most commonly used.

The features of CBT

- CBT is claimed to be a representative “scientific psychotherapy”.
- “Scientific” means its principles and procedures must be experimentally validated.
- Each treatment is regarded as an experimental trial under the paradigm of “single-case experimental design”.
- However, problems and therapeutic factors are multiple and entangled in actual life.
- Many other factors than “scientific” interventions are necessary, which are usually taken into consideration on site in the name of “expertise”.

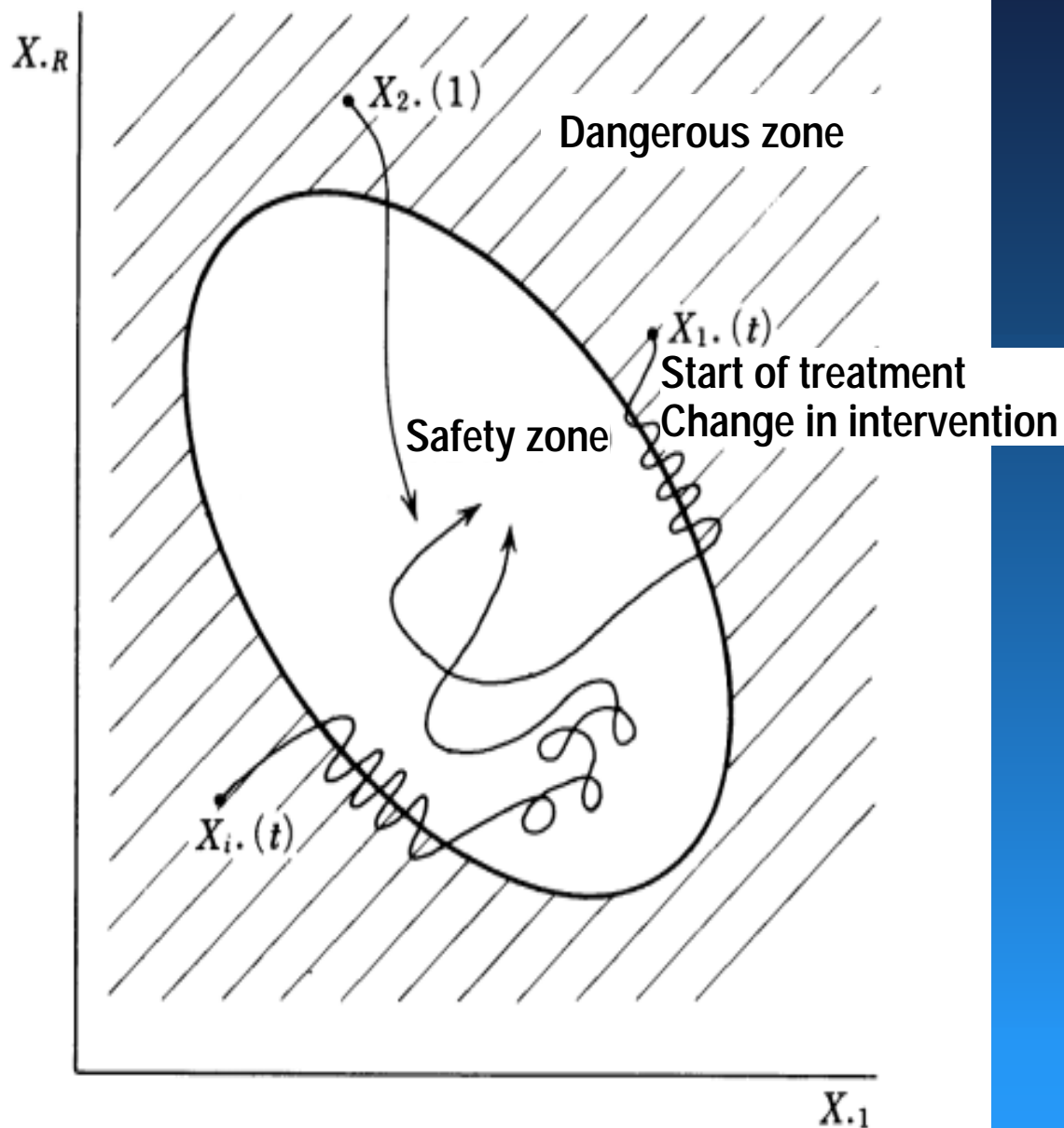
From “Science of CBT technique” to “Science of CBT treatment”

- Although CBT techniques can be regarded as scientific, CBT treatment processes cannot be claimed as scientific.
- To overcome this situation, Hayashi's contention (1993) are very useful that every treatment should be regarded as optimal control of a subject's somatic and psychological states considering his/her quality of life (QOL).
- “Expertise” will also be formulated as much as possible as measurable variables in this paradigm.

A Subject's state in the process of treatment

$$Y_i(t) = f(P_i, E, O, t) +$$

- $Y_i(t)$: multidimensional measures of treatment outcome
- P_i : personal factors such as character, psychological states, and disease states
- E : exogenous factors such as environment and circumstances
- O : operation (intervention) such as medical and psychological treatments and strategies for improving QOL
- t : time
- : measurement error or intrinsic variations



An example of optimal control

The difference from conventional functional behavior analysis

- This paradigm is more mult-dimensional, process control-oriented, and inductive.
- The emphasis is placed on the re-assessment during the control process rather than the initial assessment.
- The gathered data are used to better treat a subject, but at the same time, they are stored and analyzed to obtain generalizable evidence about the similar treatment processes.

Conditions to realize “Science of CBT treatment”

- To specify as many measurable therapeutic and outcome variables as possible, and to monitor and store their data during the treatment.
- To analyse such data to obtain generalizable evidence about the treatment processes.
- However, there have been no relevant methods except preliminary paper-and-pencil diaries of subjective symptoms.
- Thus, the computerized version with EMA and real-time monitoring methodologies is necessary!

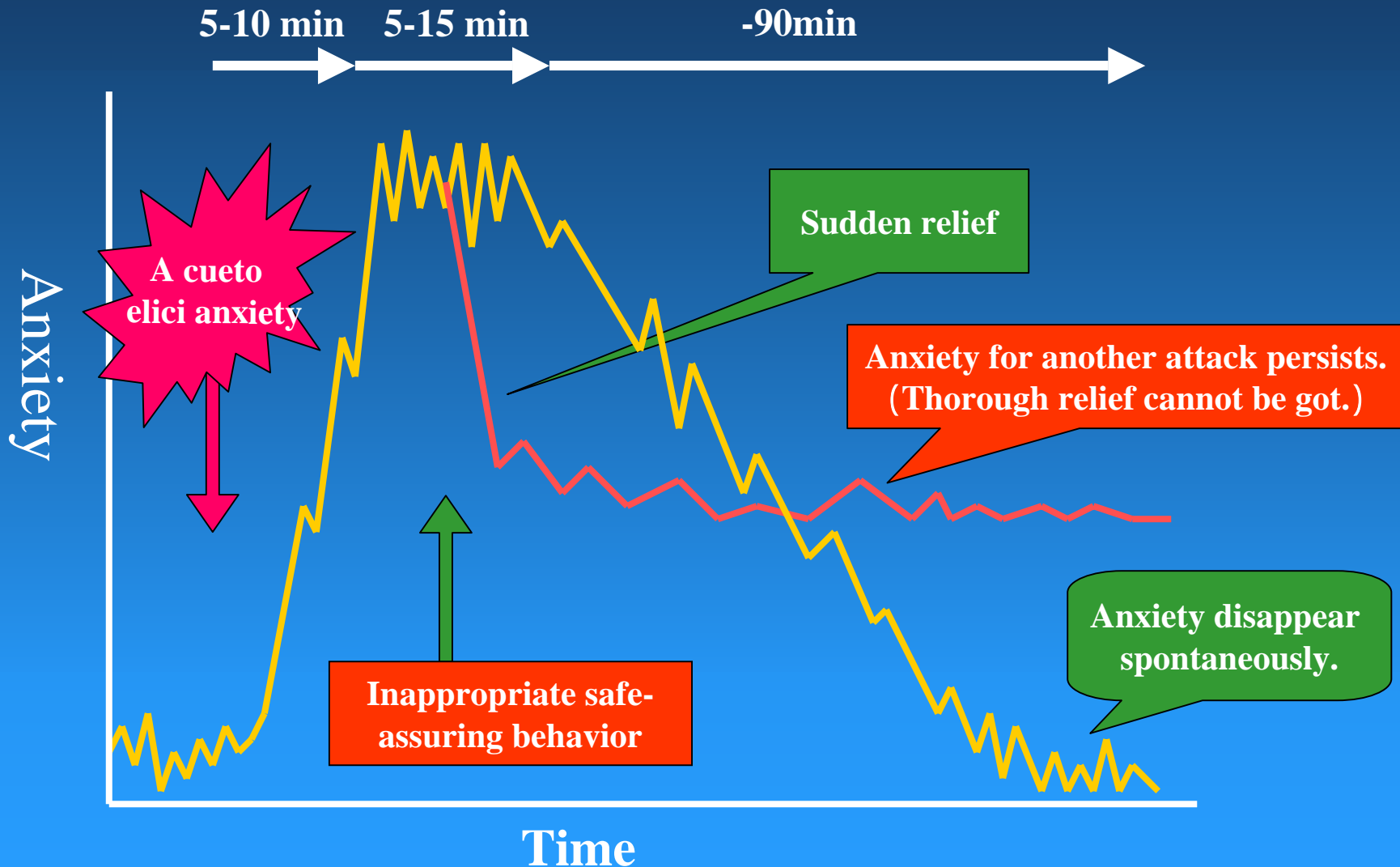
The study plan of “Mobile Co-therapist”

- “Mobile Co-therapist” would be one module of Mobile Nurse Project.
- It aims to develop a system of pushing forward “Science of CBT treatment” in the field of psychosomatic medicine.
- It does not necessarily intend to deliver CBT by a mobile computer alone.
- The targeted diseases will be tension-type headache, bulimia (overeating version of eating disorder), panic disorder, and so on.

Three steps in developing a “Mobile Co-therapist” module

- 1) To gather multi-demensional time-series data befor, during, and after the CBT treatment of targeted patients, and to develop data analysis methods to extract features of each disease.
- 2) To develop an algorithm for delivering process control of each disease using the outcome measures obtained above, and to incorporate a software for intervention in Mobile Co-therapist.
- 3) To develop data analysis methods to obtain generalizable evidence about the treatment process of each disease, and to improve an intervention software based on the results.

Real-life intervention and data storing for agoraphobia (1): Scaling of anxiety



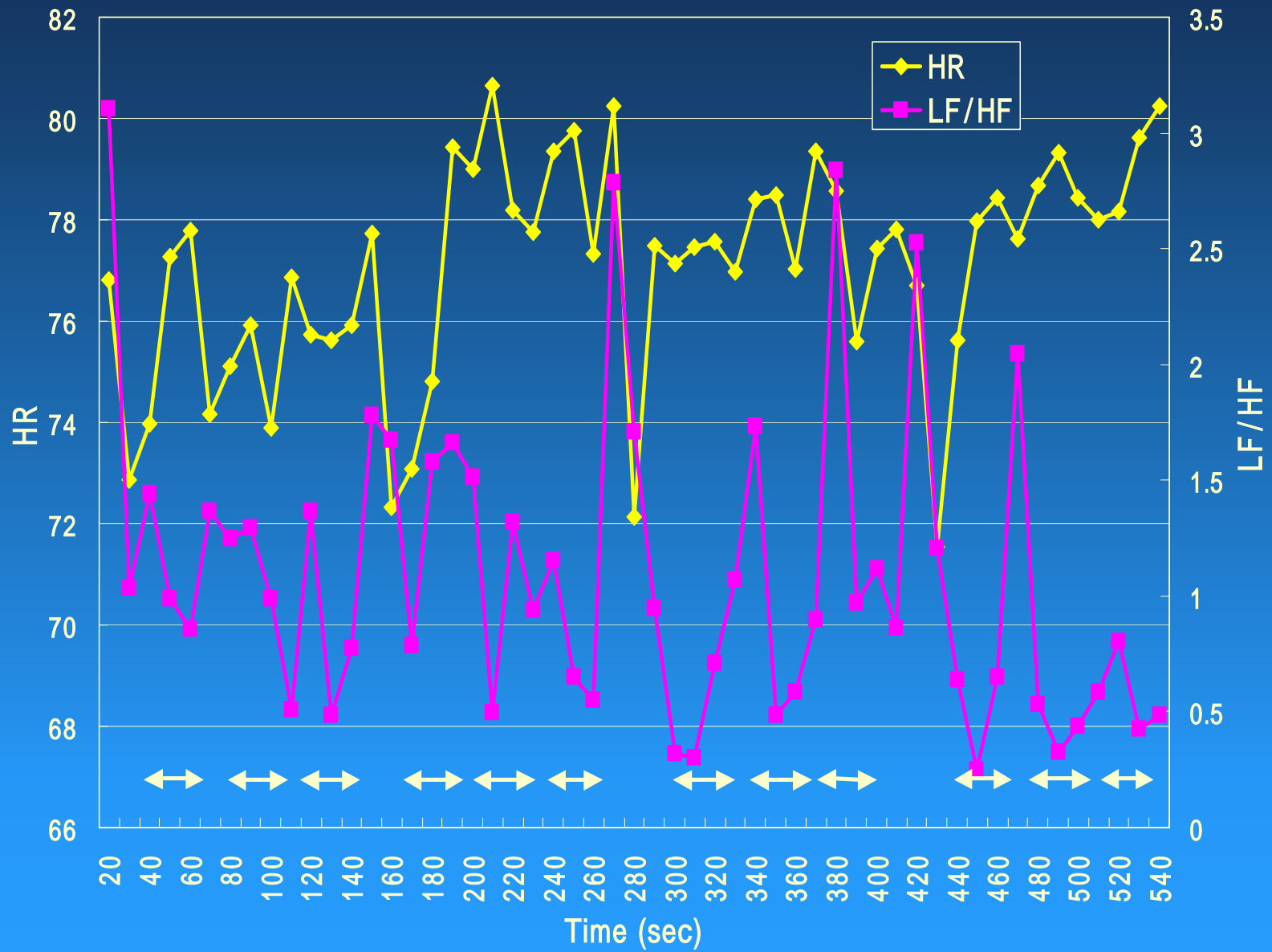
Real-life intervention and data storing for agoraphobia (2): Stress inoculation training

- It is a representative CBT procedure using self-instruction during four consecutive steps in real-life situations such as preparation for the task, devising coping behavior, performance monitoring, and self-reinforcement.
- To show a prompting message and the list of appropriate self-instructions to be selected in each step.
- To popup the screen of “scaling of anxiety” in the performance monitoring step.

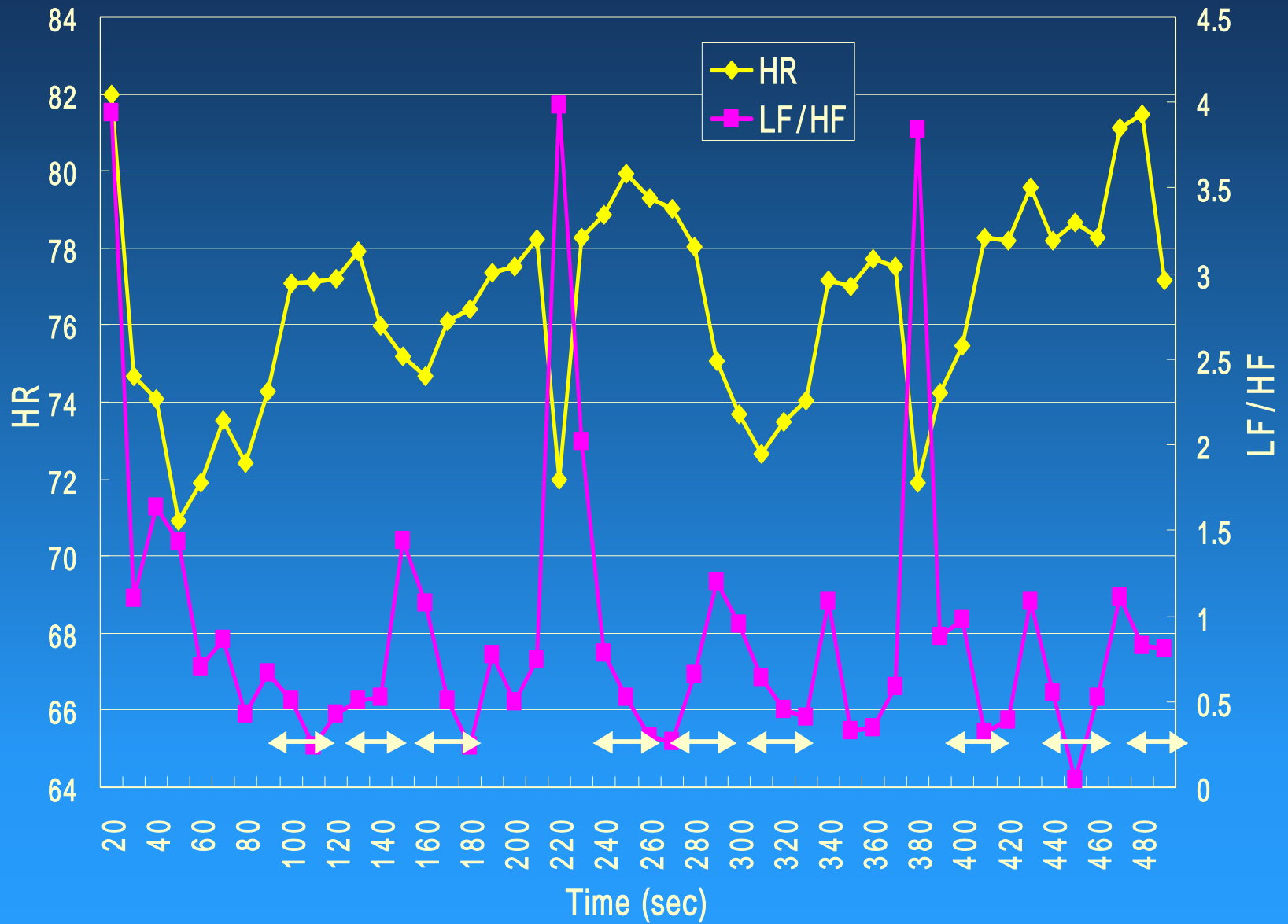
A case of virtual exposure treatment for agoraphobia

- 29y.o., Female, Office worker
- Diagnosis: Panic disorder with agoraphobia
- C.C.: Unable to board an airplane, an express train. Unable to ride in a car on a highway.
- Exposure to feared situations via a head-mount display giving motion picture and an speaker-equipped couch giving stereo sound and vibration.
- Monitoring several physiological parameters including HR and HR variability calculated by complex demodulation method during treatment sessions.

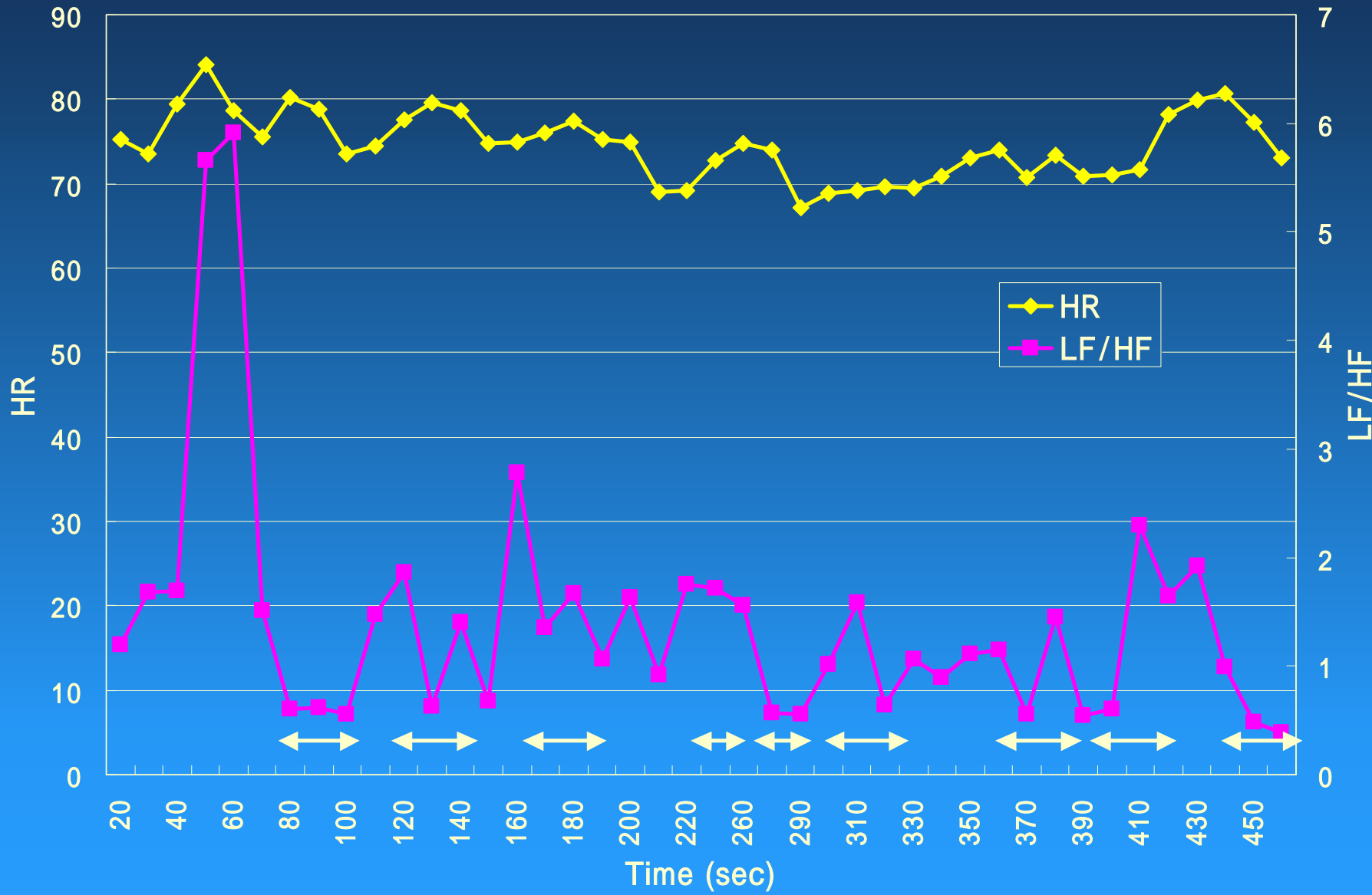
The 4th Session (The 2nd Treatment Session)



The 5th Session (The 3rd Treatment Session)



The 7th Session (The 5th Treatment Session)



Summary

- I presented the new paradigm for CBT assessment and the reason for the necessity of computerised version of CBT.
- The computerised version will enable us not only to better treat a subject but also to store and analyse the data gathered during CBT treatment to obtain generalizable evidence about the similar treatment processes.
- For that purpose, the development of relevant EMA methodologies and of effective time-series data analyses, and installment of them in the Mobile Nurse would be mandatory.