COMPUTER SYSTEM FOR MINIMIZING BODY DYSFUNCTIONS INDUCED BY JET TRAVEL OR SHIFT WORK

BACKGROUND OF THE INVENTION

The present invention relates to the fields of chronobiology, circadian regulatory biology, and computer systems, and, more specifically, to a computer system for reducing the effects of physical and mental dysfunction associated with phase changes caused by shift work or travel from one time zone to another, commonly known as "jet-lag".

The symptoms referred to as "jet lag" are due not to fatigue, as is commonly believed by laypersons, but to a lack of synchronization between certain organs acting as "body clocks" and external stimulus from the environment. Particularly, jet-lag symptoms can result from either shift work, where an individual is changing his normal working hours, or from travel from one time zone to another. The fields of Chronobiology and Circadian Regulatory Biology focus on the nature of "body clocks" and the biochemistry and anatomy of circadian clocks in higher organisms, including man. Learning how to "reset" these clocks has been a central aim of research in this field, as discussed in *Overcoming Jet Lag*, Ehret, C. F. and Scanlon, L. W., Berkley Publishing, New York, 1983; *The Effects of Jet Lag on Sports Performance*, Sasaki, Takashi, p.417–432 (Japanese/-Soviet Volleyball Performance Study) in *Chronobiology—Principals and Applications to Shifts in Schedules*, Editors L. E. Scheving & F. Halberg, Sijthoff & Noordhoff, Alphen aan den Rijn, Netherlands, 1980; and "*Recent Studies Relative to the Airlifting of Military Units Across Time Zones*", Graeber, R. Curtis, (Rapid Deployment Force Jet Lag Study), p.353–370 in *Chronobiology—Principals and Applications to Shifts in Schedules*, Editors L. E. Scheving & F. Halberg, Sijthoff & Noordhoff, Alphen aan den Rijn, Netherlands, 1980.

This research relates to resetting the body's clocks with the help of several selected "zeitgebers" (from the German for 'time givers'). These zeitgebers regulate or shift the phase of a circadian rhythm, and can, as their name implies, act as "time givers". For example, the application of the prescription drug alpha-methyl-para-tyrosine (A.M.T.) clearly and predictably resets the circadian systems. Numerous other zeitgebers have also been shown to affect circadian rhythms. These zeitgebers include, for example, light, exercise, food, and such commonly used non-prescription drugs as caffeine, theophylline, and theobromine (found in coffee, tea, and cocoa). The type of food and the times that these foods are ingested are critical in determining how to properly stimulate certain "body clocks". The proper introduction of external stimuli such as light, physical and mental activity, the ingestion of natural chemicals such as caffeine, and a feast-fast meal cycle, can be effectively used to correct the disturbance of body rhythms.

The techniques described in *Overcoming Jet Lag* require the use of multiple zeitgebers and take advantage of the naturally occurring "circadian oscillations in energy reserves". In the pre-flight days, the techniques focus on alternately building up and depleting glycogen energy reserves by the use of a special diet which prepares the body's clocks for resetting. During a four day pre-flight program, the traveler feasts one day, fasts the next day (indicated by day*), feasts again, and fasts again on the final day (indicated by day**) before phase shifting to a new time zone. The traveler then breaks the final fast with breakfast time at his destination (B.T.F.W.B.D.T.). In the unusual case of anticipated extraordinary caloric demands on either of these days (such as by an athlete during training on day*, or even more unlikely on day**), then the "fast day" may be designed to look almost like a "feast-day" for one not-in-training, since the aim at the end of each respective "fast day" is to nearly, but not completely, deplete the available glycogen reserves for that day, to be restored either with "Feast" after day*, or with B.T.F.W.B.D.T. after day**.

However, one difficulty with the practical application of present Chronobiology theory is that no integrated, reliable, and automatic mechanism has been developed for dealing with rule conflicts, compromises or impossibilities, such as when a recommended sleep phase is interrupted by a flight departure or arrival.

For an individual seeking a consistent and integrated schedule of activities for a particular trip, these prior art publications are usually not adequate. There is a practical limit to how many examples can be given in a book, understood by the reader, and extrapolated to other situations. Even when an example is pertinent, the recommendations are often ambiguous or even in conflict with the traveler's schedule or personal preferences. Most individuals have personal preferences for meeting times, meal times, and sleep times which are not addressed by the examples or the general techniques of the prior art.

One solution might be to consult with an expert. It is, however, costly and difficult, even for the chronobiotechnically astute expert to rigorously apply the general and often complex theory to formulate and recommend a correct schedule of activity for a particular trip. This is especially true for multiple destination flights involving several stops through multiple time zones, flights that do not have the preferred departure and arrival times, or for travel across the International Date Line.

What is needed is a system for formulating, in response to any specific input of travel plans and personal preferences, a consistent and integrated schedule of activities and countermeasures applicable to the conditions of modern transmeridional jet travel to reduce the effects of jet lag. It is desirable that this system be compatible with an airline reservation system that is capable of recommending specific flights at the time of booking.

SUMMARY OF THE INVENTION

The present invention incorporates an expanded and integrated theory of Chronobiology and Circadian Regulatory Biology into a rule-based computer system. The computer system provides consistent recommendations in response to a traveler's itinerary, work schedule, and personal preferences for sleep times and meal times, despite the interrupted environment of trans-time zone jet travel, with stops, layovers, plane changes, etc. The preferred embodiment of the present invention includes a programmed general purpose computer, an input keyboard, a cursor positioning input device, an output display terminal and printer, and databases of time zone, daylight savings information, and flight information. Although the preferred embodiment is adapted for providing recommendations for minimizing body dysfunctions induced by jet travel, the invention is also applicable to minimizing body dysfunctions induced by shift work.