c.c. PCA

Bial Interim Progress Report

Project title: **Examining the Conceptual Mechanism of DMILS Effects, PK or ESP?**

Project leader: **Prof. Deborah L. Delanoy**

Fohoc. Prof. NG
ew 01.02.13

Overview

The submission of this mid-term report has been substantially delayed by an on-going illness of the project leader, Deborah Delanoy (DD) and her change of employment which commenced half way into the twelve month period initially allocated to this project (1 April 1999 - 31March 2000). These factors impacted negatively upon those aspects of the study which only the project leader could conduct, namely the data analysis and writing-up of the project reports. However, the data collection itself was finished on schedule as it did not necessitate DD's physical (as opposed to intellectual) involvement. Thus the two researchers who comprised the project team, Claire Brady (CB) and Alison Roe (AR), collected all the data for the study.

Summary of Project Completion to Date

The computer programming (conducted by Zach McDermott and Paul Stevens of the Koestler Parapsychology Unit or 'KPU') was performed in early 1999 and, after thorough testing, was completed in March 1999. During the programming period, the project team, CB and AR, preceded with subject recruitment and the establishment of the required data bases. Data collection commenced in March 1999 and was completed by August 1999. The basic analysis of the primary results have conducted. Also, the DAT analysis, conducted by the Project Consultant, Dr. Edwin May, has been completed. The analysis of the questionnaire data and the final write-up of the project will be completed within the next two months.

Overview of Study Objectives

This project investigated the mechanism underlying the apparently success of a group of studies commonly referred to a DMILS studies, where DMILS refers to 'direct mental interactions with living systems (Braud & Schlitz, 1991; and Schlitz & Braud, 1997). DMILS studies can be characterisd as having three participant components: the receiver (or other living system), the agent and the experimenter (i.e., the person conducting the session; in DMILS studies, the experimenter may also serve as the agent). DMILS studies investigate the ability of the receiver to respond to the mental intentions of the agent, under conditions that preclude any currently recognised means

of sensory exchange. The DMILS interaction is assessed either by means of a behavioural response produced by the receiver or, more commonly, via psychophysiological responses of the receiver.

The most frequently used measure of agent/receiver interaction is the receiver's electrodermal activity (EDA), which is a basic measure of arousal levels. Most EDA DMILS studies have explored whether the receiver's EDA can reflect the agent's attempt to either calm or activate the receiver, with the agent's schedule of calm/activate periods being randomly or pseudo-randomly determined, and the receiver being blind to the agent's activity. The receiver's EDA responses to the remote agent's activate/calm intentions is the dependent variable employed in this study.

The DMILS interaction has traditionally been conceptualised as the agent influencing the receiver's responses via some psychokinetic (PK) mechanism. Thus in most of the early DMILS work conducted by William Braud and his colleagues, the agent is referred to as the 'influencer' and the receiver as the 'influencee' (Braud & Schlitz, 1991). A more recent review of the EDA DMILS studies (Schlitz & Braud, 1997) extends this PK conceptualisation such that DMILS studies are viewed as representing an analogue to healing research. However this assumption has never been fully tested.

An alternative intepretation of DMILS effects could involve receiver extrasensory perception (ESP) as opposed to agent PK. This receiver ESP model of DMILS effects would posit that the receiver gains information of the agent's intentions by means of ESP, and then regulates their responses accordingly. This interpretation is analogous to an ESP-mediated placebo model of healing effects.

Other interpretations of the DMILS effect can be derived from the 'experimenter effects' which have been so frequently observed and studied in parapsychological research (see White, 1977; and Palmer, 1986 for reviews of the 'experimenter effect'). The experimenter effect refers to the observation that some experimenters tend to obtain significantly positive scores in their psi studies while others tend to obtain psi study outcomes that do not deviate from chance expectations. However, there is still an ongoing debate as to how experimenter effects (EE) should be interpreted (e.g., Schmeidler, 1997; and Palmer, 1997). The two categories of EE most applicable to DMILS studies are the psychological EE and the psi-mediated EE. Psychological EE posit that some experimenters may get better results than others as they are more able to motivate their participants, inspire them to do well, increase their self-confidence within the experimental setting, and so on. The psi-mediated EE posits that the psi

source in the study may be the experimenter, in addition to or instead of the experimental participants. Thus, according to the psi-mediated EE, some experimenters produce more significant psi outcomes than others due to their being superior psi sources.

These two potential EE are preliminarily explored in this study. The psychological EE, when applied in a DMILS context, would stress the importance of the psychological orientation of the receiver. The psychological EE involves not only the receiver's motivation to succeed in the task and their confidence of being able to be successful, but also their orientation and openness to the agent and/or the agent's interaction schedule. The traditional DMILS design stresses the mutuality of the DMILS task, i.e., the agent and the receiver are involved in a mutually open, giving and receiving interaction. By varying the role of the agent in this study, the way in which the subject's orientation to the agent may affect the outcomes of the different conditions will be explored.

One means of effecting a possible psi-mediated EE in DMILS studies is explained by Decision Augmentation Theory or 'DAT' (May, Utts, & Spottiswoode, 1995a; and, May, Spottiswoode, Utts, & James, 1995b). Applied to DMILS studies, a DAT mechanism would require the experimenter, who chooses when to initiate the data collection of the receiver's response, to use their precognition (i.e., ESP of a future event), to determine when the receiver's naturally fluctuating responses will best match the agent's intentions. The experimenter then starts the data collections period such that the receiver's responses will correspond with the agent' intentions.

This study examines which conceptual mechanism (ESP or PK), or combination thereof, is most appropriately applied to DMILS effects. Also, it seeks to initiate preliminary exploration of the possible role of psychological and psi-mediated EE in producing DMILS outcomes. This is accomplished by systematically varying the role of the agent in four different conditions, thereby utilising a 2 x 2 experimental design. If the study obtained a positive DMILS outcome, the findings would substantially advance our understanding and interpretation of DMILS effects and their potential applicability.

Overview of Study Design and Procedures

Design:

The study has 120 sessions, with 120 participants each contributing one session as a receiver. The electrodermal activity of the sensorially isolated receivers are measured to assess whether their arousal levels corresponds to the calming or activating intentions of the agent. The receiver is unaware of (i.e., 'blind' to) the agent's

schedule of calm/activate intentions throughout the data collection period. One experimenter (either CB or AR) conducts each session, and acts as the agent during the data collection period.

There are four conditions that systematically vary the presence or absence of an agent during the experimental session.

Condition 1 mimics the standard EDA DMILS protocol (Braud & Schlitz, 1989). The receiver will be fully informed that the agent will be attempting to alternatively activate or calm their EDA, according to a randomised schedule which will be presented to the agent via a monitor display.

Condition 2 does not use an agent, although the agent's instructions (the schedule of calm and activate periods) are still displayed on a monitor screen, as if there were an agent present. The receiver knows that there will be no agent before the start of the data collection period.

Condition 3 has an agent actively trying to send activating and calming intentions to the receiver, but the receiver is unaware as to whether or not there is an agent. Similarly, the experimenter is blind as to whether or not they will be acting as the agent during all their interactions with the receiver, prior to the start of the data collection period.

Condition 4 does not use an agent, although the agent's instructions (the schedule of calm and activate periods) are still displayed on a monitor screen, as if there were an agent present. The receiver does not know whether or not there is an agent viewing and attempting to convey the instructions. Similarly, the experimenter is blind as to whether or not they will be acting as the agent during all their interactions with the receiver, prior to the start of the data collection periods.

Experimental Design:

	Agent Present	No Agent
Receiver Informed	Condition 1	Condition 2
Receiver Uniformed	Condition 3	Condition 4

The choice of condition for any given session was controlled by a pseudo-random computer program. The program would select one of the four conditions, such that within 120 session there would be 30 sessions each in both condition one and condition two, with the choice of condition three and four being entirely random (e.g., not constrained by a pseudo-random program limiting each condition to 30 sessions, to ensure that the experimenter was blind to condition prior to the actual data collection period).

As in the typical EDA DMILS procedure, there is a 20 minute EDA data collection period. During the data collection period there are 20 agent interaction periods, each of 30 seconds duration, consisting of 10 'activate' periods and 10 'calm' periods. The activate and calm periods occur in a pseudo-randomised order. The randomisation is via a computer program that is initiated when the data collection period is started by the experimenter (who in all sessions, also serves as the agent). The interaction periods are interspersed with 40 'rest' periods, each of 30 seconds duration.

Regardless of whether an agent is used in a session, a monitor display in the agent's room conveys the interaction instructions, i.e., the word 'rest' appears at the bottom of the monitor during the rest periods, the word 'activate' during the activate periods and 'calm' during calm periods. A trace of the on-going EDA activity of the receiver is displayed on the upper part of the monitor screen, above the calm/activate/rest instructions.

During the 20 minute data collection period, the receiver is alone in an acoustically and electromagnetically shielded room; they can obtain no information about the schedule of interaction instructions presented on the agent monitor. During the data collection period, receivers are asked to remain in an alert, passive, but labile state, so that their EDA will be able to fluctuate in accordance with the remote interaction instructions. If they wish, they may view a randomly changing display to keep them occupied during the data collection period.

Setting and Equipment:

The study was conducted in the KPU laboratory facility located in the Psychology Department at the University of Edinburgh. The KPU lab is located on the second floor of the department, which is housed in a substantial Georgian building, of solid construction. The agent's room is located approximately 30 meters from the receiver's room, on a different level of the building. The agent's room contains a monitor that displays condition instructions, interaction instructions, and the on-going trace of the receiver's EDA.

The receiver's room is one of six rooms located within an 'experimental suite'. The treble walled, double-doored receiver's room has acoustic, vibration and electromagnetic shielding. Inside the receiver's room, the receiver sits in a comfortable, padded chair. A monitor can be viewed by the receiver which relays a randomly changing, 'screen-saver' display. Receivers' EDA is measured by a J & J I-410 system, and all data is stored on computer.

Two further rooms were used by the experimenter to control the equipment used in the session. One of these rooms, located in close proximity to the agent's room, contained the computer equipment that controlled the study, including the randomisation procedures that chose condition and the interaction schedule. The experimenter would use this room to prepare the equipment before the start of a session, to receive information regarding session condition and to initiate the data collection. The other experimenter control room was located in the experimental suite, next door to the receiver's room. The psychophysiological monitoring equipment was kept in this room, and here the experimenter would ensure that the equipment was recording the receiver's EDA correctly, immediately prior to starting a session.

Participants:

The sessions were conducted by CB and AR; both are very experienced in conducting these studies having previously served as experimenters in an 80 session EDA DMILS study (Delanoy, Morris, Brady & Roe, 1999).

120 participants were recrutited to take part in the study. They were largely drawn from the existing KPU participant pool, with additional participants being recruited from the general public as needed, via advertisements and posters. Before being chosen to take part in the study, all participants completed the KPU 'Participant Information Form' (PIF) and the NEO-FFI personality inventory. Only participants who were judged to have an open attitude towards DMILS effects, as determined by their PIF responses, were asked to participate.

Procedure:

Immediately before the participant arrives for a session, the experimenter sets-up the computer program which controls the data collection, the various monitor displays and the randomisation procedures. At this time, the DMILS computer program will pseudo-randomly select which of the four possible conditions will be used in the session. The computer will tell the experimenter whether it is an 'informed' or 'known' (condition 1 & 2) or 'uninformed' or 'unknown' (condition 3 & 4) session. If it is a 'known' condition, the computer will inform the experimenter as to whether there will or will not be an agent; if it is an 'unknown', the experimenter will not be informed as to whether there will be an agent. This enables the experimenter to provide all needed information to the participant, without breaking any required 'blinds'. Thus, both the experimenter and other participant definitely know that there will or will not be an agent only if condition one or two was chosen by the randomisation program. If conditions three or four were selected, neither the experimenter nor the participant (receiver) know whether an agent will be conveying information to the receiver during the data collection period. For these conditions, the

experimenter informs the participant that they (the experimenter) may or may not be acting as the agent during the session, but that the interaction instructions will be presented upon the monitor regardless of agent presence and their EDA may respond to the instructions in either situation.

Prior to the data collection period, the experimenter and participant discuss the procedure (per above). The session is fully described to the participant, and they are shown the agent room and monitor upon which the interaction instructions will be displayed. When the participant is ready to start the session, the experimenter attaches the electrodes to the distal phalanges of the receiver's non-dominant hand. After assuring that the EDA recording is functioning properly, the experimenter proceeds to the main control room (located adjacent to the agent's room) and initiates the start of the experimental session. If it is a 'unknown' condition, the computer instructs the experimenter whether they are to serve as the agent (condition three) or not (condition four). In 'no agent' conditions (conditions two and four), the experimenter stays in the control room, turning their attention to other tasks during the data collection period, and thus remains blind as to what instructions are being shown on the agent's monitor.

When the computer signals the end of the session to the agent/experimenter, they immediately go to the receiver's room and remove the EDA electrodes. In condition three and four, the experimenter will inform the receiver as to whether or not they had been acting as an agent during the session. The experimenter then retrieves a computer generated printout of the session outcomes, and the receiver is given feedback as to the session outcome. The session is then discussed in as much detail as the receiver desires.

At the end of the study, information regarding the study outcome and a brief summary of their NEO-FFI personality profile was sent to all the participants who asked to be sent this information.

Results

Only the initial condition outcomes have been analysed to date. It had been planned to report both the Percentage Index Score (PIS) measure (Braud and Schlitz, 1991) that is commonly used to represent study outcomes in meta-analytic surveys of the literature (e.g., Schlitz and Braud, 1997) as well as analyses based on a Wilcoxon Matched Pairs Sign Test. Both measures are commonly used in DMILS studies, and both were performed on this data to assist in better understanding which may be a more sensitive measure. However, it has become common practice for the PIS measure to represent study outcomes in surveys of the DMILS database.

Table One below presents the findings, by condition and overall, across all condition for both the PIS and Wilcoxon analyses.

Table One

Statistic	Informed		Uninformed		Total
	Agent (Cond. 1)	No Agent (Cond. 2)	Agent (Cond. 3)	No Agent (Cond. 4)	
n	30	29	30	30	119
t(PIS)	-1.38	1.73	0.47	0.99	0.75
p(2-tailed)	0.18	0.09	0.64	0.33	0.45
Effect Size	-0.25	0.31	0.09	0.18	0.07
t(Wilcoxon)	-1.96	0.79	-0.24	-0.18	-0.93
p(2-tailed)	0.06	0.43	0.81	0.86	0.36
Effect Size	-0.34	0.15	-0.04	-0.03	-0.09

The above outcomes are disappointing in that two-tailed significance was not achieved in any condition. Also, in the condition that most closely resembles the standard DMILS procedure (i.e., condition one), the scoring was in the negative direction. Indeed, the scoring in condition one is approaching significant psi-missing when analysed by the Wilcoxon test. Thus the following observations must be treated with extreme caution. However, as evidenced by the effect sizes, both positive and negative, the largest DMILS effects were obtained in conditions one and two, where the receiver was fully informed as to whether there was or was not an agent trying to convey calm and activating intentions to the receiver during the session. This could suggest that the receivers' knowledge of the session procedure, and their orientation to the agent and/or agent's interaction instructions, had a greater impact upon their psi responses than did the actual presence or absence of an agent in the session. Indeed, the finding from the PIS analysis in condition two, where there was no agent, again approaches significance, this time in the desired direction (i.e., the receiver's EDA conformed to the agent's intentions).

A thorough discussion of these outcomes will be presented in the final report, after all the analyses have been performed.

Unfortunately the DAT analysis was not successful because some of the underlying statistical assumptions that were thought to be true did not in fact apply to psychophysiological data. There was an extensive search to discover a valid means of applying the DAT to the EDA data; however, the strong autocorrelation inherent in

psychophysical data could not be overcome by the current DAT formalism. A detailed report of this work, as performed by Dr. May, is reproduced in Appendix One.

Project Financial Status

The University of Edinburgh was aware of the various difficulties confronting DD during the course of this project, and kindly paid for all the salaries of CB and AR, to enable the completion of the project, in the knowledge that the second portion of the funding from the Bial Foundation would eventually be received when this report was submitted. I would like to stress that while the University of Edinburgh is keen to receive the remainder of the project balance, they fully realize that the delay is entirely due to DD's illnesses, etc., and the subsequent delay in submitting the project reports.

My original proposal had requested £49,937 to conduct a 160 session DMILS study. The proposed study involved four conditions, each comprised of 40 experimental DMILS sessions. However, the award received was for a reduced amount of £26,500. To accommodate the reduction between the amount of funding initially requested and the amount that was granted, I reduced the overall size of the study such that it comprised 120 sessions, with 30 sessions per condition. Reducing the number of sessions conducted in each condition enabled the proposed study design to be retained in full, and thus all questions posed in the initial proposal could still be addressed. The study reduction did result in a loss of statistical power, but the senior researcher (DD) felt this was more than compensated for by the various financial gains such a reduction provided, without threatening the basic study goals.

The financial savings (from the originally requested amount) were achieved by: a) reducing the number of sessions in the study, b) eliminating the need for new equipment and c) eliminating the salary allotted to DD. The reduction in the number of sessions run meant that fewer new participants needed to be recruited as a greater proportion of the study participants could be obtained from the existing participant pool at the Koestler Parapsychology Unit (KPU). As most existing KPU participants had already completed the requisite questionnaire measures, there was a subsequent reduction in material costs as well as in staff time devoted to recruitment. Additional financial saving were made by timing the study such that it did not conflict with other projects, thereby not requiring the purchase of new equipment (i.e., a computer). One consequence of this change is that the study was started somewhat prior to the stated date of April 1999. The remaining savings were achieved by not diverting funds to DD's salary. As she took up a new post as Professor of Psychology at University College Northampton in October 1999 which paid her salary in full for the remaining

duration of the project, and due to her illness during several months preceding this change of position, it was felt this was the most equitable means of achieving the required financial savings.

A breakdown of the funding schedule is provided below. Please contact DD if more information is required.

Paid:	£12,800
Due at approval of interim report:	£10,240
Due upon approval of final report:	£ 2,560
Total	£25,600

Please send the amount of £10,240, payable upon satisfactory approval of this report, to:

Mrs. T. McKinlay
Senior Grants Officer
FG1,2 &5
Research Grants Administration Section
Finance Office
University of Edinburgh
Edinburgh
Scotland, UK

Please note that the cheque is for payment to:
Grant Number: R81251
Principle Investigator: Delanoy, D.

References

Braud, W.G. and Schlitz, M.J. (1989). A methodology for the objective study of transpersonal imagery. *Journal of Scientific Exploration*. 3: 43-63.

Braud, W.G. and Schlitz, M. J. (1991). Consciousness interactions with remote biological systems: Anomalous intentionality effects. *Subtle Energies*, 2: 1-46.

Delanoy, D.L., Morris, R.L., Brady, A. and Roe, A. (1999). An EDA DMILS study exploring agent-receiver pairing. In K.D. Dalton (Ed.) *Proceedings of Presented Papers of the Parapsychological Association 42nd Annual Convention*, Durham, NC: Parapsychological Association, Inc., 68-82.

May, E.C., Utts, J.M., and Spottiswoode, S.J.P. (1995a). Decision augmentation theory: Toward a model of anomalous mental phenomena. *Journal of Parapsychology*, 59:3, 195-220.

May, E.C., Spottiswoode, S.J.P., Utts, J.M. and James, C.L. (1995b). Applications of decision augmentation theory. *Journal of Parapsychology*, 59:3, 221-250.

Palmer, J. (1986). ESP research findings: The process approach. In: Edge, H.L., Morris, R.L., Palmer, J., and Rush, J.H. (1986) *Foundations of Parapsychology*, Routledge & Kegan Paul, London, pp. 111-137.

Palmer, J. (1997). The challenge of experimenter psi. *European Journal of Parapsychology*, 13, 110-125.

Schlitz, M.J. and Braud, W.G. (1997). Distant intentionality and healing: Assessing the evidence. *Alternative Therapies*, 3: 62-73.

Schmeidler, G.R. (1997). Psi-conducive experimenter and psi-permissive ones. *European Journal of Parapsychology*, 13, 83-94.

White, R.A. (1977). The influence of the experimenter motivation, attitudes and methods ofhandling subjects in psi test results. In B.B. Wolman (Ed.) *Handbook of Parapsychology*. pp. 273-301, New Yoerk: Van Nostrand Reinhold.

Appendix One

Decision Augmentation Theory

May et al.(1995) developed a model called Decision Augmentation Theory (DAT) that holds that PK experiments that possess statistical outcomes might be successful not on the basis of PK but rather on the basis of ESP. That is subjects/experimenters use their own ESP ability to make protocol and/or run decisions that tend to favor significant outcomes. DAT has mostly been applied to the large database of random number generator (RNG) experiments and has only rarely been applied to PK experiments with biological targets. In those cases, however, the analysis shows that a PK mechanism is favored over an ESP-mediated selection mechanism–a result opposite to that obtained from the analysis of the RNG database. Thus, we are analyzing DMILS data with DAT.

Method of Approach

We begin with a brief overview of the theory. Considered a normalize effort period of n samples. Let this period be considered as K epochs of k samples each. For convenience, let $K \times k = n$. That is an equal number of epochs fit into the effort period. Under the null hypothesis and assuming stationarity, the expected distribution within each epoch is normal as $N(\mu,\sigma^2)$. For the j^{th} epoch we compute the mean as:

$$y_j = \frac{1}{k}\sum_{i=1}^{k} x_i,$$

where the x_i are the normalized data points in the epoch. Under the assumption the x's are statistically independent, the variance associated with these means is given by:

$$Var(y) = \frac{\sigma^2}{k}$$

Consider two averages of these averages.

$$Y(2) = \frac{1}{2}(y_1 + y_2),$$

and

$$Y(K) = \frac{1}{K}\sum_{j=1}^{K} y_j.$$

Since the distribution of means of data that are distributed as $N(\mu,\sigma^2/k)$ is $N(\mu,\sigma^2/kK)$, z-scores derived from the above are given by:

$$z_2 = \frac{Y(2)-\mu}{\sigma}\sqrt{2k},$$

and

$$z_K = \frac{Y(K)-\mu}{\sigma}\sqrt{kK},$$

respectively. After T trials each in the "2" and "K" conditions, we compute the mean (m) and the standard deviation (sd) for each condition of the z's in the usual way. We construct:

$$Z_2^2 = m_2^2 + \left(\frac{T-1}{T}\right) sd_2^2 \pm \sqrt{\frac{2}{T}},$$

and

$$Z_K^2 = m_K^2 + \left(\frac{T-1}{T}\right) sd_K^2 \pm \sqrt{\frac{2}{T}}.$$

For each set of $2T$ trials, these points represent the data and there associated one standard errors.

Predictions for PK and ESP

In general, the effect size (ε) is given by:

$$\varepsilon = \frac{z}{\sqrt{n}}.$$

Given the data under the "2" condition, we predict the expected values under the K condition for PK and for ESP. In PK we assume that the effect size is independent of the number of epochs so $\varepsilon_K = \varepsilon_2$, which lead so the PK prediction:

$$Z_K^2(PK) = 1 + \frac{K}{2}\mu_2^2.$$

In ESP we assume that the effect size scales as one over the square root of the number of epochs. Or:

$$\varepsilon_K = \varepsilon_2 \sqrt{\frac{2}{K}}.$$

This leads to the ESP prediction of:

$$Z_K^2(ESP) = 1 + \mu_2^2.$$

So given the data at the "2" condition, we have clear predictions for PK and for ESP under the K condition. A Student's t-test or z-score test can be used to determine which model best fits the data.

Analysis

The analysis above makes the underlying assumption that the data are normally distributed, and statistically independent. Figure 1 demonstrates that raw EDA data are not distributed normally. We notice an often-observed "tail" in the distribution that arises in skin conductance data because of the relatively sharp rise and much slower recovery of spontaneous skin conductance responses. As is often done in data analysis, the distribution can be transformed to a more normal distribution that will satisfy the DAT assumptions.

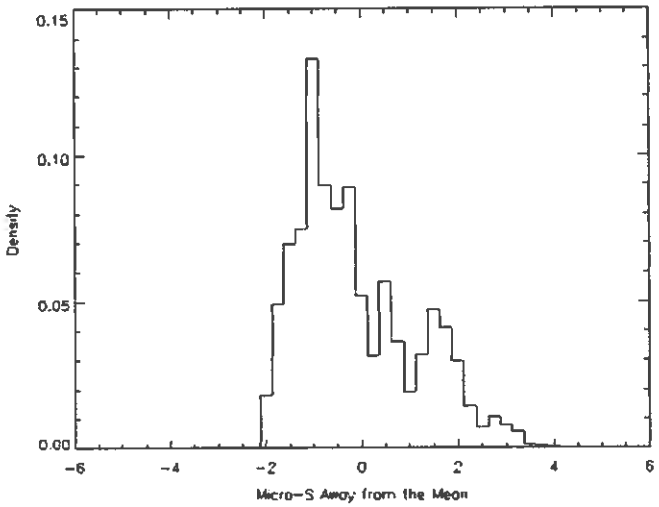

Figure 1. Distribution of Raw Skin Conductance Difference from the Mean

We applied a causal high-pass, 3-pole Butterworth filter, which improves the traditional analysis of DMILS, we see in Figure 2 that the distribution is symmetric and is a better approximation to a normal distribution.

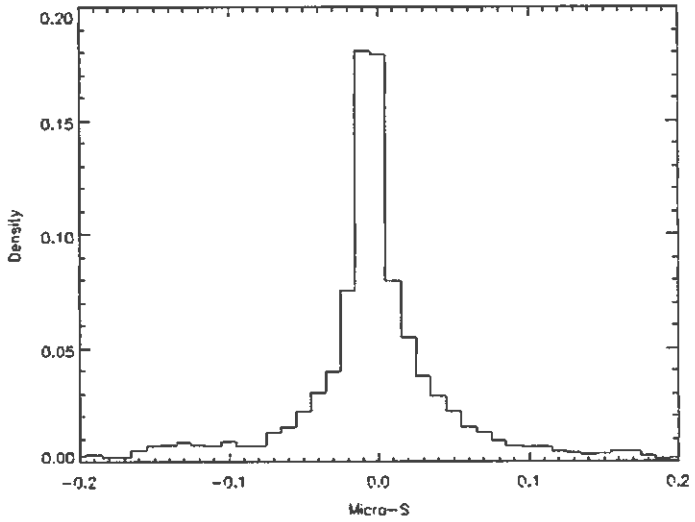

Figure 2. High-Pass Filtered Skin Conductance

The cutoff frequency for the filtered data shown in Figure 2 is 0.05 Hz. Thus the data exclude the skin conductance level but include very slow changes.

The second critical assumption of statistical independence is not met either by the raw data or any transformed or filtered version of the raw data. To demonstrate this problem, we used the 30 DMILS runs from all the data in the known-sender conditions. For each data set we computed the autocorrelation function for lags ±60 seconds. Figure 3 shows the results of averaging the autocorrelation across all 30 runs.

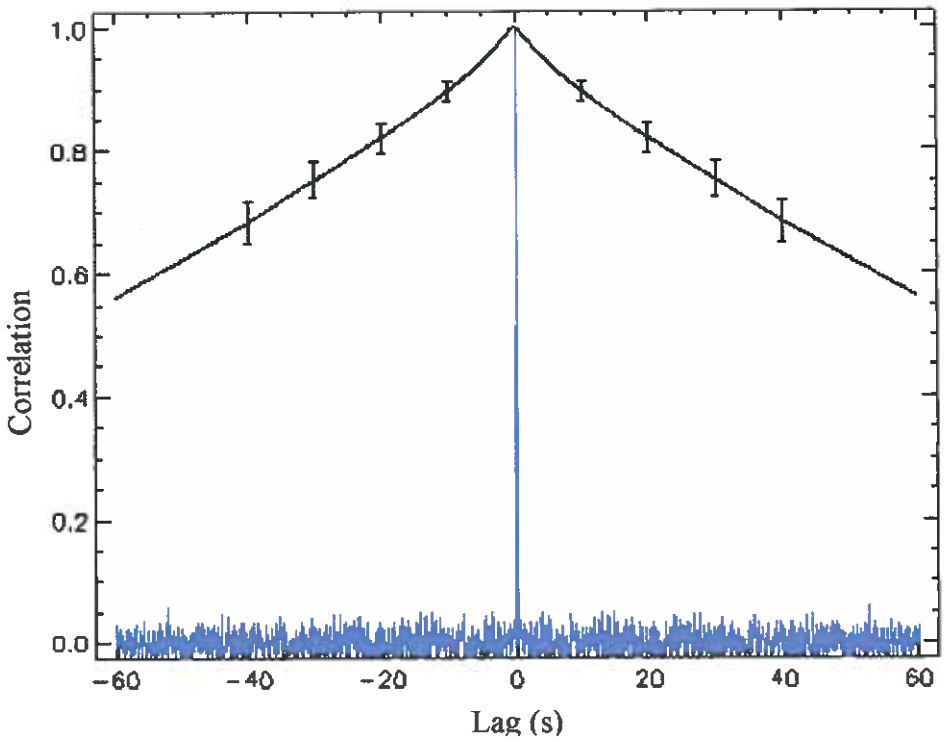

Figure 3. Autocorrelation of EDA and Random Data

The error bars show one standard error for the autocorrelation of the EDA data. The blue curve is the autocorrelation function for normally distributed random data of the same length as the EDA data. The large autocorrelation for the EDA data demonstrate that each new data point contains substantial information from many seconds prior to it—a circumstance that is well known for skin conductance. Whereas random data show essentially no dependence of prior data—a requirement for random data.

The effect of this autocorrelation is to invalidate the DAT formalism from May et al. The reason is that variance measures, which are a critical feature of the formalism, will be substantially under estimated, and thus lead to inflated z-scores. This arises because the true variance for correlated data contains and additional term, which includes the covariance resulting from the lack of statistical independence.

Conclusions

Given the success of the DAT model in random number generator data, we had inadvertently overlooked the requirement of statistical independence. This error of

assumption only became apparent in applying the formalism to EDA data, and then applying it to simulated data with increasing built-in autocorrelations.

It was beyond the scope of this first attempt to apply DAT to DMISL data to re-derive the DAT theory; however, that theoretical exercise is underway.

Reference

May, E. C., Utts, J. M, & Spottiswoode, S. J. P. (1995). Decision Augmentation Theory: Toward a Model of Anomalous Mental Phenomena. *Journal of Parapsychology*, **59**, 195-220.