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The use of the Silent Answer Test along with the Concealed Information Test in the Suspect Detection System

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The need to detect deception and accurately assess the innocents is a pressing priority in a world where crime changes its face and form every day. Forensic psychological tools strive to detect deception using different methods and technologies. The present study uses the Suspect Detection System; a tool used to detect malicious intent in individuals. The system adopts a questioning technique called the Concealed Information Test (CIT). This study introduces the Silent Answer Test (SAT) after the CIT to observe changes between the results of the two questioning techniques administered in the sequence mentioned. Results of the study depicted that while CIT identified deceptive individuals, the SAT did not identify the same individuals as deceptive. Yet, one participant who was identified as deceptive in the SAT was not shown as such in the preceding CIT. There were no participants who were commonly identified as deceptive by both techniques.

Keywords: Suspect Detection System, Concealed information test, Silent answer test, deception, forensic

Detection of deception and accurate assessment of the innocents is a pressing priority in a world where crime changes its face and form every other day. Decades of extensive research and study have been done to accomplish this challenging task (Vrij & Mann, 2004). The terms 'detecting lies' and 'detecting deception' are distinguished in the commonly found observation that a liar finds it easier to deceive than to utter a lie (Amsel, 2017). This justifies using the latter term. It also provides a broader spectrum to study deception in terms of non-verbal cues, as deception may not always incorporate oral responses. Tsuchiya et al. (2023), addressing the possibility of deception by interviewees in virtual job interviews, proposed a machine learning approach to help detect a person's attempts to deceive the interviewer. This was accomplished by relating the different aspects of their facial expressions with their pulse rates. Vrij and Mann (2004) explored the advantages of non-verbal, auditory, and speech content-associated cues from behavior to better comprehend the classification of liars and truth-tellers. Forensic psychological tools and techniques that supplement behavioural cues are accessible today. These instruments facilitate deception detection. The Polygraph, the Layered Voice Analysis (LVA), the Brain Electrical Oscillation Signature (BEOS), and the Eye detection system (EDS) all strive to detect deception using different methods and technology. The Cogito Suspect Detection System (SDS thereon) is one such forensic psychological tool that is used to detect hostile intent in individuals.

The Cogito SDS uses the Concealed Information Test (CIT) (Verschuere et al., 2011), originally called the Guilty Knowledge Test or GKT (Lykken, 1959), one of the early questioning techniques used in the Polygraph. The test is self-explanatory – its aim to unearth any hidden information that an individual might possess of a crime.

Therefore, any reference to that information will cause a psychological reaction in the person presumed to be guilty of possessing that information. The Cogito SDS operates on the psychophysiological response of electrodermal activity. The Silent Answer Test (SAT) was initially examined by Horvath and Reid (1972) on the Polygraph. The SAT is named for the very procedure of testing it follows. It is a test that does not involve verbal responses. The subject has to answer the questions asked silently to him/herself. Their study's findings showed that psychophysiological responses are detected even when there are no verbal responses by the subject. The Polygraph, besides considering the electrodermal activity, also takes into consideration respiration, blood pressure, blood volume pulse, and movement. The polygraph assists in confirming the information gathered to establish the veracity, deceit or participation of persons accused of being involved in a crime (Gabela, 2013). The present study on the Cogito SDS adopts the SAT to understand its implications on the psychophysiological responses. It is used in conjunction with the CIT to compare the effects and results generated since the CIT is a standard questioning technique used in the Cogito SDS. This study is the first of its kind because little has been done to research the Cogito SDS as a forensic psychological tool.

Silent Answer Test (SAT)

The SAT is one where the examiner instructs the subject to not respond in audible replies to the questions that will be asked of him/her during the examination (Horvath and Reid, 1972). The questions for the test were formulated on the basis of the Reid Control Questioning Technique. This included four irrelevant questions, four relevant questions and two control questions. The creation of the Silent Answer Test by Reid and Horvath (1972) was to reduce the chances of an individual coughing or clearing the throat while answering a question or even before or after that. They surmised that since the SAT does not require any verbal answer the anticipated stress of verbally responding to questions may be reduced. This may in turn produce more significant recordings. A meaningful reading could also be expected considering that an individual is free to focus on the questions that have some relevance to him/her rather than focus on giving answers to all the questions. This is helpful particularly with individuals who are exceedingly anxious. Yet another observation that they made pertains to the "carryover" type of response. This response is typical of highly apprehensive individuals who ponder over their verbal responses long after the question is over and carry that over to the next question. Two things were assumed here: a) When an individual, guilty of having committed a crime, is alone with his/her thoughts it is more stressful compared to when he/she gives an audible/verbal response to the crime related question because saying it out loud releases some of the stress. This prompts the individual to conceal the deception even more, consequently resulting in heightened responses on the Polygraph; and b) It is an exceedingly difficult task for a deceptive person to conceal his/her deception for long. The fear of being caught creates a mental and psychological strain resulting in physiological changes in the readings. Amsel (2017) reiterates by stating that a person does not exhibit or display any psychophysiological reactions or symptoms as a result of lying in and of itself. The signals are brought on by the emotions associated with the deception. The underlying assumption behind emotions that are at play during the SAT is also seen in Ekman's (2009) work on telling lies. He notes that when emotions are involved in deceit, it is simpler to hide an emotion that is no longer there, rather than hide an emotion that is

present at the time, especially if the emotion is strong. In fact, the more intense the emotion, the more likely it is that some indication of it will emerge despite the liar's best attempts to conceal it. Because the individual is not required to speak, they are left to deal with their emotions while answering the questions in silence, which strengthens the SAT from this point of view. The leakage of the emotional indicator is to be captured by the electrodermal activity. He continues by saying that the best way to conceal strong emotions is with a mask of false emotion since it works to both mislead and serve as an ideal camouflage.

The Concealed Information Test (CIT)

The Guilty Knowledge Test (GKT) was originally developed by Lykken (1959) after studying the galvanic skin response in the identification of guilt using a simulated crime scene. More recently called the Concealed Information Test (CIT) by Verschuere, Ben-Shakhar, and Meijer (2011) it is a part of the technique that is used in the psychophysiological detection of deception (PDD) (Krapohl et al, 2009) for polygraph examinations. The GKT consists of a series of questions, the response of which elicits a measure of "some involuntary physiological response (e.g., GSR) to stimuli" that is connected to the memory of the details of an individual's crime (Lykken, 1959, p. 385; 1960). Vrij, (2008) as cited by Denault and Jupe, (2017) used the term 'give-aways' to describe the physiological responses that a deceptive person will most likely demonstrate. The term 'give-away' is self-explanatory as these responses reveal the hidden antagonistic motives in suspects. The CIT works on the assumption that it can identify the difference between suspects who have knowledge and those who do not, based on the lack of details about a crucial incident or experience (Geven, Ben-Shakhar, Kindt, and Verschuere, 2019). The crime details are those that are known only to the perpetrator, police and to any innocent suspect (Meijer, Verschuere, & Merckelbach, 2010). The key item must have the quality of exclusivity to the perpetrator, be something that he/she might have paid attention to, and be easily recalled by the perpetrator. MacLaren (2001) replicated a study of the GKT using 22 laboratory simulated studies wherein he found that 76% of the participants who possessed concealed knowledge as well as 83% of those who did not, were correctly identified by the electrodermal measures.

Working Principle and Procedure of the Cogito SDS

Psychophysiological Detection of Deception

The Cogito SDS technology combines the functions of both screening and interrogation. It can detect and determine a possible suspect by identifying hostile intentions in the individual even before committing the criminal act. This makes the technology work as a screening system. As a system of interrogation, the technology can help apprehend a perpetrator after a criminal act by distinguishing him/her from a pool of suspects (PR Newswire, 2013. The technology uses the concept of stimulated psychophysical reaction (SPRR) which is based on stimulating examinees with specific terrorism-related triggers. When a threat of danger is perceived by an individual the human body instinctively responds intrinsically. The human body sends this response as a way to prepare itself for this threat. It is this fundamental instinctive response that forms the basis of the Cogito SDS technology (Spierer, Griffiths, and Sterland, 2010). The Cogito SDS assumes that the person who undergoes the examination has perfidious intentions. Therefore, the individual is expected to experience specific emotions when exposed to the crime-provoking statements; those which will differ significantly from that of an

innocent individual's (Suspect Detection System, 2021).

Electrodermal Activity (EDA)

One of the most significant psychophysiological measures is the Electrodermal Activity (EDA). As individuals respond to the test questions the EDA effectively helps distinguish between those who are telling the truth and those who are not (Widacki, 2015). Slowik and Buckley (1975) and Widacki (1977) confirmed that the galvanic skin reaction does indeed play a pivotal role in identifying deceit (cited by Widacki, 2015). It is seen in the numerous studies and mock crime scene experiments done by students in laboratories. A characteristic feature of the EDA is its distinct receptiveness to any information related to an individual. The EDA can thus be viewed as the "physiological windows of brain activity" (Sequeira, Deren, and Maitte, 2021, p. 407). The use of EDA in lie detection is based on the premise that individuals typically experience increased sympathetic nervous system activation when they are deceptive or concealing information. This heightened arousal is thought to manifest as changes in skin conductance, resulting in detectable variations in EDA measurements. When confronted with a deceptive situation or relevant questioning, individuals may exhibit a characteristic pattern of increased sweat gland activity, leading to elevated EDA levels (Ben-Shakhar and Elaad, 2003).

In their research Reid and Horvath (1972) found that the SAT not only helped to rectify the respiratory patterns like "suppression in respiration" (p. 288) produced by the verbal answers on the Control Question Test (CQT) (relevant questions) but it also demonstrated that the Galvanic Skin Response (GSR) recordings can be considered as an effective indicator of deception. This was because there was a marked change in the GSR response when the suspect was questioned on the specific details of a crime. The Cogito Suspect Detection uses the GSR as a parameter to detect any psychophysiological response to a question(s). Although Horvath and Reid (1972) used the CQT and the SAT in their study, the present study will use the CIT (the standard questioning technique used in the Cogito SDS) and the SAT.

Intent versus Means

The notion of intent versus means implies that the focus of Cogito SDS technology is on bringing out criminal intentions that are concealed by an individual. It is concerned with whether an individual has any pernicious design so that it can avert the actualization of such a plan. The means to achieve this is incidental as it is possible to establish that later through probing and additional questioning. The 'Intent versus means' principle of the Cogito SDS became prominent after the numerous terror attacks. Not every criminal or terrorism will move about with weapons on their person, but they can certainly harbour criminal thoughts and intent (Suspect Detection System, 2021). When an individual intends to carry out a task, the intention to accomplish that goal will be the guiding force (Malle & Knobe, 1997; Gollwitzer, 1999 cited in Djeriouat, et al., 2021). Intent is what guides and determines the different behaviour detection programs at airports because the objective of such programs is to prevent all kinds of terror attacks or felonious acts. Such goals are achieved by distinguishing the various indicators that signify an expected "pre-attack or pre-assault" (Djeriouat, et al., 2021 citing the National Commission on Terrorist Attacks Upon the United States, 2004). These markers highlight the importance of the idea of intention.

Objectives

- The SAT was conducted on the Polygraph, and it was observed that

countermeasures like respiration suppression were significantly reduced. It also revealed that the GSR is a reliable indicator to detect truth or deception in an individual. No study has been conducted on the Suspect Detection System using the SAT in conjunction with the CIT questioning technique to understand its effects, if any, on the psychophysiological responses and the resultant outcome as suspect or not. The SDS examination of suspects who are not cooperative or for some reason do not verbally answer the questions, can be administered the SAT if it reveals itself effective technique to detect deception in the same way as the CIT might do.

- The current study aims to use the Silent Answer Test in the Suspect Detection System examination after using the CIT to observe changes between the results obtained by the two different questioning techniques.

Method

Sampling design:

Convenience sampling.

Sample :

There were a total of 29 participants divided into two groups.

Procedure:

There were two phases in which the study was conducted.

Phase I

The layout of the experimental scene: There were two groups of participants and an Experimental Manager (EM). The experiment involved a short (30 minutes) paper-and-pencil test supervised by the EM that the two groups appeared for separately.

Briefing of Experimental Manager (invigilator) and participants by the researchers: The researchers briefed the Experimental Manager about his role. The briefing of the participants was done group-wise in the test room where they were told about the study, the Informed Consent form and the Socio-demographic form. A total of 19 participants in the first group and 14 participants in the second group filled in the Informed Consent form and Socio-demographic form.

Conduction of experiment: Group 1: Two participants out of the group reached test room about minutes late. The invigilator gave each participant a paper envelope with the question paper enclosed inside. It comprised of 35 multiple choice questions. One envelope had the answer key along with the question paper inside the envelope. The test environment created for the first group was informal. Participants could interact with each other as the invigilator stepped out of the room on the pretext of attending to phone calls thereby giving them the opportunity. After the test was complete they put the question papers back into the envelopes and returned them to the invigilator. Before leaving the test room, the invigilator instructed the participants to tell the researchers a lie (on being asked) during their subsequent interviews that they completed the test honestly without discussing the answers amongst themselves.

Group 2: The test for the second group (G-2) was conducted one day later. G-2 got same question paper in the same way, but there was no answer key with the question paper in any of the envelopes. The test environment with this group was formal leaving no room for discussion amongst the participants. Once they were done, they submitted the envelopes with the question papers inside. Just before exiting the test room, the invigilator instructed the second

group to tell (lie) the researchers (if asked) that they completed the test by discussing the answers amongst themselves. The reason for this was to a) get one group to prove their innocence by stating that they did not cheat and b) get the other group to falsely confess to cheating and, c) to see whether suggestion would affect the results.

Phase II

Interviews and examination of participants: Individual interviews were conducted with the EM and the participants of G-1 and G-2. The researchers conducted an interview with the EM. This was followed by examining the 29 participants on the Cogito SDS. The system follows a four-set questioning technique with one relevant question per set. The system calculates the strongest reaction in each set of questions and then decides whether to provide additional questions.

Results

The results generated by the SDS are based on statistically generated data and graphs. The analysis was done on the comparative examination of the results ("Suspect/Non-Suspect") generated by the SDS using the CIT and followed by the SAT questioning technique. There was also a comparative examination of the graphs generated by the instrument for the two questioning types. The socio-demographic details of the participants included age, gender, marital status, community, religion, educational and occupational data. The average age was 24.5 years. There were 13 males and 16 females. The highest level of education was post-graduation for 23 participants, and while 16 were employed, the rest were students pursuing a course. The final number of participants who completed the entire procedure was 29 (N=29). The EM was a post-graduate male employee with over five years of work experience.

The SDS analysis with reference to the graphs is given in the following tables.

Table 1.1. summarizes the results of the Cogito SDS for the two questioning techniques, viz., CIT and SAT in terms of the final "Suspect" and "Non-suspect" for all the participants.

Questioning Technique	CIT	SAT
Suspect	06	01
Non-Suspect	23	28
Total (N)	29	29

Table 1.2 summarizes the results of the Cogito SDS for the two groups in terms of the final "Suspect" and "Non-suspect" on the CIT and SAT.

Questioning	Group 1 (N=16)		Group 2 (N=13)	
Technique	CIT	SAT	CIT	SAT
Suspect	03	01	03	00
Non-Suspect	13	15	10	13

Peak of Tension (POT): Peak of tension algorithm compares the signal altitude. The peak-of-tension algorithm identifies pattern of responsiveness that increases as the relevant question occurs, and decreases when the question passes. Consequently, the subject shows the strongest reaction on that particular question. The Peak of Tension thus depicts the strongest reaction to a question that has some significance to the individual. In their paper, Vaya, Wagh and Kumar (2010) noted that the Cogito SDS does not solely depend on verbal responses. The system registers a response through the GSR even when a suspect does not give an answer.

POT and strongest reaction on the CIT:

Psychophysiological reactions were seen in every participant in Group 1. Both relevant and non-relevant questions elicited reactions. Ten (10) participants reacted to

at least one relevant question each. Out of this, six (06) had reactions to select non-relevant questions too, while four (04) only reacted to select relevant questions. Six (06) had reactions to select non-relevant questions only. All the participants in G-2 also had psychophysiological reactions. Five (05) participants had reactions to at least one relevant question, and four out of these five had reactions to select non-relevant questions too. One (01) participant reacted to two relevant questions only. Eight (08) had reactions to select non-relevant questions only.

POT and strongest reaction on the SAT:

Five (05) participants had the strongest reaction to at least one relevant question each, and four out of which had reactions to select non-relevant questions too. One (01) participant's reaction was only on a single relevant question. Eleven (11) (including the five above-mentioned) participants showed the strongest reaction to select non-relevant questions. Four (04) participants did not react strongly to any of the questions. There were three (03) participants who had the strongest reaction on one relevant question each. Ten (10) participants (including two from the above-mentioned three) depicted the strongest reactions on select non-relevant questions. Two participants had no reactions on any of the questions.

Discussion

The Cogito SDS' basic algorithm analyzes the human psycho-physical signals through the sensors, examines the signals, and then evaluates the reaction of each relevant stimulus (question) in comparison to another non-relevant stimulus (question).

Group 1

There were three (03) participants who were identified by the Cogito SDS as 'Suspects'. One participant showed a POT on the relevant questions in two sets of the CIT and another had a POT on one relevant question and on four non-relevant questions. The relevant question about the instructions given by the examiner to tell a lie showed a strong response by four participants (including two 'Non-Suspects'). It was repeated in the additional sets of two 'Suspects'. This could be because some are more attentive to an examiner's words during an exam. Additionally, the content of the instruction included a thrill of concealment. It is possible that the idea of purposefully withholding information might have been exciting for some of the participants since quite a few of them did not divulge this information. Although two participants displayed strong reactions on the CIT, they had no reaction to any questions in the SAT. Horvath and Reid (1972) surmised that when an answer is orally given, even if it is just a 'No', the participant relieves him/herself of some of the stress that comes with it. Therefore, during the SAT the participant may not have felt the same level of stress or anxiety as he/she had to silently answer to him/herself. This is not exceptionally stressful. However, the opposite can also hold true that, left alone with one's thoughts will make an individual anxious. This is because the individual is free to hide the actual truth since there is no need to speak. When this happens, a mental conflict is created that is reflected in the Polygraph chart as an emotional response. Ekman (2009) found that when emotions are aroused, changes happen naturally without choice or deliberation. This is true for the CIT and SAT both. The participant who was in possession of the answer key displayed the strongest reactions on the relevant questions in two out of the first four sets and also in the subsequent two sets that followed in the CIT. He had a POT on the relevant question regarding the answer key. When he found the answer key along with the question paper he had the choice to inform the invigilator about it or use it to his advantage without

informing. He chose the latter which is an affectively evoking act as it is done covertly. This may bring about a degree of guilt in the person and a consequent psycho-physiological reaction to a topic or question on that act. Once he relieved himself of the tension by verbally responding to the question, he may have felt comparatively relaxed in the SAT as he had to answer silently. The thought might have lingered because in the SAT there was a POT on a non-relevant question related to cheat sheets. A cheat sheet is similar to an answer key since it is supposed to contain answers. This question was in the same set as the answer key. When questioned, the reactions to a specific event (crime) will differ between the suspects and the innocents (DePaulo, 2003).

One participant was identified as a non-suspect in the CIT, where she had a POT for a non-relevant question. She was, however, identified as a 'Suspect' in the SAT, although she had no POT on any relevant question. She had POTs in three non-relevant questions of three sets out of 6. It is assumed that 'suspects' will exhibit the strongest reactions to the relevant questions even if they show response on the non-relevant ones. The readings were new to the researchers. The researchers' personal communication with the representatives of the manufacturer regarding such results did not yield much success. The original equipment manufacturer stated that since most of the queries pertained to their proprietary algorithm they would not be able to disclose the information (S. Shoval, personal communication, July 17, 2023). Then again, POTs were seen amongst 'Non-Suspects' on relevant questions in both the CIT and SAT. It is interesting to note that a participant who was identified as a 'Non-suspect' had a POT on a relevant question in the SAT. The concerned question was about the answer key. This participant was seated next to the participant with the answer key. It is therefore possible that she had knowledge of the presence and use of the answer key. This may have triggered a psychophysiological response during the SAT as it does not involve any oral communication. In fact, these two participants were the only ones who had a POT on the question about the answer key. While the guilty participant had it in the CIT, the participant who was seated next to him had it in the SAT. DePaulo et al. (2003) asserted that the irony with liars is that as they try to control their actions to continue their deception, they instead expose those very lies. Because liars were not efficient in regulating their behavior it could lead to verbal and non-verbal inconsistencies. Such attempts were seen in the interviews of both these participants. Although these participants were identified as Non-suspects it is evident by their reactions to the relevant questions in the SAT that this questioning technique has a potential to elicit guilty knowledge in subjects.

Group 2

It will be recalled that the participants of G-2 were told to tell a lie by the invigilator. It is assumed, therefore, that 'Suspects' identified by the Cogito SDS would be because of this. Three (03) participants were identified as 'Suspects' by the Cogito SDS. However, none of them showed a POT in the CIT or SAT on the question about being told to lie. Two participants who were 'Non-suspects' reacted strongly on two relevant questions in the CIT, but even these were not related to the lie. During the interviews some of the participants mentioned to the researchers that they the invigilator had told them to lie in their interviews. The constant presence of an examiner during the Cogito SDS examination is not required. This might cause an individual to be more relaxed and pay less attention, especially during the SAT. This can be particularly true with non-deceptive individuals.

Conclusion

The present study was conducted to see the effects on the results generated by the Cogito SDS on the SAT following the CIT in an experimental setup. The results of the study showed that while the CIT identified three participants as "Suspects" the SAT did not identify the same participants as 'Suspects'. However, there was one participant who was identified as a 'Suspect' in the SAT but not in the CIT. There were no participants who were identified as 'Suspects' in both the CIT and the SAT. Moreover, the use of suggestion had little impact in the group where it was expected.

There are many factors that have an effect on the influence on the final results of the test as far as the SAT is concerned. The Cogito SDS uses the skin conductance to understand emotional stimulation in an individual. Since the autonomic activation of sweat glands is responsible for this, physiological differences amongst individuals cannot be ruled out. There are some people who sweat more and faster than others and this cannot be consciously controlled. While this quality makes it an effective indicator for emotional arousal it can also affect results due to individual differences. Recent findings indicate that skin conductance is also sensitive towards other aspects of a stimulus that might reflect motivational and attentional processing (iMotions, 2020). This was seen during the interviews when certain participants mentioned a reduced sincerity in the task as they did not see that it "benefit" them nor did they see any punishment as a consequence. The invigilator and the participants of G-1 were employees of the same organization. They were familiar with him. For G-2, he was an official with whom they had no prior acquaintance. The observation of 'Non-Suspects' displaying strong reactions (psycho-physiologically) on relevant questions indicates that a further attempt with a bigger sample size while using the SAT can be made to see its effects on the final results. It may be likely that if this study is expanded similarly with the SAT there would be more data to assess its efficacy and draw conclusions.

The study also posed challenges. The first challenge that the researchers faced was participant attrition. In spite of giving their informed consent, three participants dropped out from the study. Ultimately, the sample was unevenly distributed and the sample size was reduced. The ideal conditions (soundproofed room) required in a testing (examination) environment were absent; therefore, distractions could not be eliminated. It has been found that such interferences influence the examination process and, consequently, the results. The possibility of impact of weather conditions (heat, humidity, and sweating) in a non-air-conditioned room cannot be undermined as the instrument works only on the skin conductance. Leakage of information is yet another challenge that the researchers had to face. The time duration between the conduction of the experiment and the examination on the SDS got extended due to unforeseen circumstances giving ample opportunities for discussion amongst the participants. Additionally, the participants were scheduled for examination during the working hours of the office. An individual may, during an examination, not be able to focus completely if he/she is preoccupied with thoughts pertaining to existing tasks at the workplace. This affects the ability of an individual to pay attention to the task at hand. Certain queries remain unresolved as answers to those cannot be disclosed as mentioned by the original equipment manufacturer.

Over the years, advancements in technology have improved the precision and reliability of EDA measurement devices, making them invaluable tools in forensic

investigations, security screenings, and criminal justice proceedings. Nevertheless, the application of EDA in lie detection is not without its controversies and challenges, including issues related to individual differences in sweat gland activity and the need for standardized protocols (Dawson et al., 2007). Regardless, the use of the Cogito SDS technology is seen extensively in "homeland security, military intelligence and law enforcement" (Suspect Detection Systems, Inc. SDSS, 2021, para.1). Its application in "counter terrorism and crime prevention behavior pattern recognition technologies" is seen extensively since it works as a preemptive tool (AI driven insider threat detection, n.d., para. 1). However, empirical research on the Cogito SDS is negligible. This paves the way for research and development on the instrument as times are changing and updating technologies is a necessity rather than a luxury of choice.

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