


E-PrimeとSuperLabを用いた高齢者層及び若年者層からの遠隔データ収集

Remote Data Collection from Younger and Elder Population Using E-Prime and SuperLab

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ABSTRACT

2020年、世界各地で新型コロナウイルス感染症の感染が拡大し、日本においては外出自粛が広く呼びかけられた。ICU言語学ラボでは感染拡大以前から対面で実験を実施していたが、外出自粛要請を受けて、これをオンラインで行う必要に迫られた。実験様式の変更にあたって最も困難であった点は、この実験の対象者の一部が65歳以上の高齢者であったことだ。高齢者は感染症の重症化リスクが高く、物理的接触は厳に避けなくてはならない。一方で、高齢者はコンピューターの操作に不慣れであることが多く、オンラインでの実験に単独で参加することは難しい。そこで、この実験では、高齢者と同居ないし近隣に居住している若者をサポーターとして募集した。サポーターが機器の操作を代行または補助することで、高齢者の実験データを遠隔で収集することが可能になった。本稿では、実験実施を通して明らかになったこの手法の利点と欠点を議論する。

In 2020, COVID-19 spread the infection around the world. In Japan, people were requested to stay at home to repress this pandemic. Due to this restriction to go out, ICU LINGLAB was forced to continue an experiment, which was fully conducted face-to-face at that time, in an online manner. The biggest difficulty in redesigning the experiment lay behind the condition that one group of the participants must be 65 years old or older. The elderly population is at high risk if contracting COVID-19 thus the physical contact with them had to be avoided strictly. Simultaneously, they tend not to be as familiar with manipulating a computer as they can participate in a remote experiment by themselves. To conduct a behavioral experiment targeting elderly participants without physical contact, they were recruited as a pair with younger supporters who live together or live nearby. The supporters supplemented their seniors with the use of applications and software. This paper discusses pros and cons of the methodology that emerged during the conduct of the online experiment.

1. Introduction

Online experiments have been conducted even before the pandemic, especially in an experiment that does not require meeting offline (face-to-face). Experiments using software such as E-Prime or SuperLab had to be conducted offline because no mechanism in the software programs allowed them to collect data online. It was only after this COVID-19 pandemic began that an online experiment using a software package became possible. One group of participants in the current experiment is seniors whose limited experience with computers may be an obstacle when participating in an online experiment. Due to the pandemic, the current experiment had to shift to an online method, and the research team developed protocols regarding remote data collection methods.

Prior to the pandemic, the most difficult part of our experiment was collecting data from senior participants. The concern was the limited ways in which the research assistants (university students) could recruit senior participants. The lack of connections and access to senior participants was a constant challenge. The COVID-19 pandemic changed the situation, however. Most universities started holding lectures online, which meant that younger people were not traveling anymore, and

some of them stayed with or near their grandparents. This changed situation opened up possibilities of running our experiment in a remote manner. One major concern in holding the experiment online was that seniors tend to have less experience with computers; talking to the computer using Zoom while wearing a set of headphones was not common.

To overcome these difficulties, a younger participant was recruited as an experimenter of their senior family member or acquaintance. In this research note, the methodology to collect psycholinguistic data from the elder population using two types of software (E-Prime and SuperLab) is reported. First, the experimental settings and procedure are described. Next, the advantages and disadvantages of each remote experiment program are compared. After that, the pros and cons specific to the current methodology and the general pros and cons of a remote experiment are discussed.

2. Experiment Settings

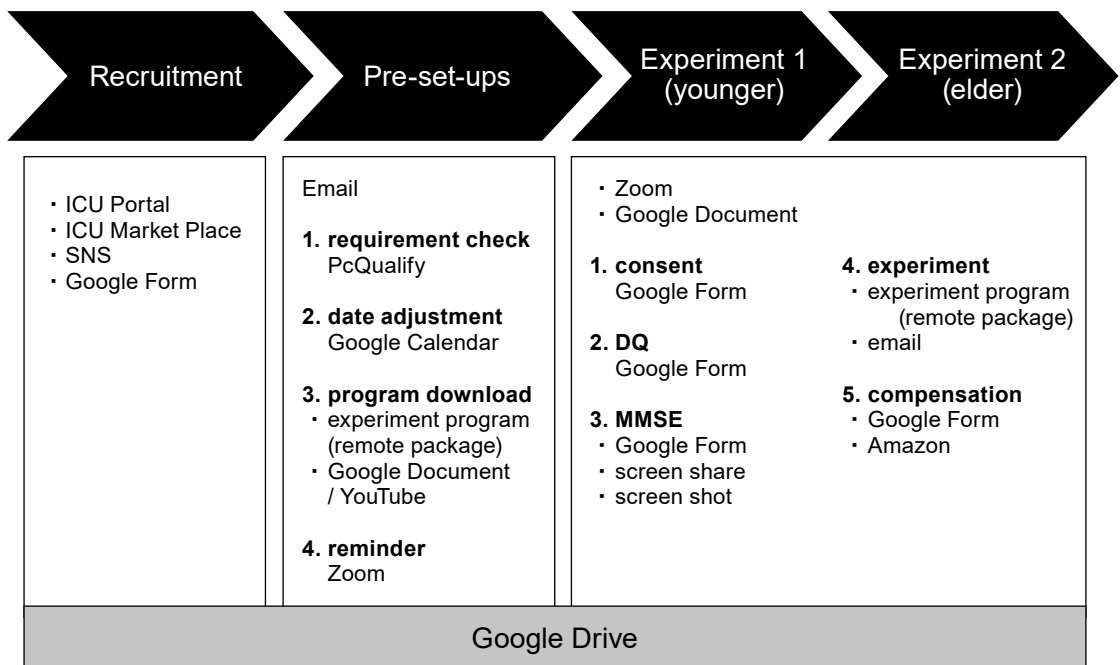
Experiments are designed to test hypotheses regarding language processing in younger participants and elderly participants. The project that funded these experiments is interested in understanding whether the aging population

normally shows linguistic response patterns different from the younger population using linguistic data. This paper reports two independent experiments that were both carried out online but with different software: one with E-prime and the other with SuperLab. The procedure used in both experiments is illustrated in Figure 1. The four main experiment phases are shown in the top black boxes, under which a list of the applications used in each procedure is described. The research team shared all materials and results with a shared folder on Google Drive as represented in the bottom grey box. The item “SNS” in Recruitment and the item “requirement check” in Pre-set-ups were only included in the E-Prime experiment. Note that the diagram shows only a typical sequence of procedures in an experiment. When more than one elder participant joined, the phase “Experiment 2” was repeated. When an elderly

participant could run an experiment alone, all steps were conducted without an assistance of a younger experimenter. In these exceptional cases, the preceding three steps were consistently carried out.

The experimental process comprised three phases: participants recruitment, pre-experiment set-ups, and experiment. The advertisement contained the requirement for participants, the requirement for the computer, the reward, and the expected time of the experiment. We targeted participants who lived together or near to the people who were aged over 65. The computer had to equip a camera. This recruitment advertisement was mainly announced through ICU Portal, ICU Marketplace, and additionally SNS for the E-Prime experiment. In the SuperLab experiment, SNS recruitment was not used. Participants filled out Google Forms for expressing intents to participate

Figure 1
Procedures in the experiment and used applications



in the experiment. This form collected personal information such as the name, the email address of the younger participant, the age of the elder participant, desired day of the week (if any, specific date), all of which were deleted upon the completion of the data collection. For the SuperLab experiment, the operating system (Windows or Mac) of the participant's computer was also asked because the remote data collection experiments were specific to an operating system.

Upon receiving a response in the Google Forms, email exchanges followed. The E-Prime software has specific requirements to run a remote experiment. With PcQualify available from E-Prime, we first asked participants to check whether their own device satisfies minimum requirements for running E-Prime. The experiment with SuperLab skipped this step. To determine the date and time of an experiment, the research team used Google Calendar to facilitate the scheduling between participants and the assistants in the team.

The experiment program and instruction materials were then shared with the younger participants. In the E-Prime experiment, it was a Google Docs that included how to download the program, what they prepare on the experiment day, and how they become the experimenter during the experiment for the elderly. For the SuperLab experiment, how to download the program was instructed by YouTube videos, and other instructions were delivered only via email. The SuperLab Remote package and the YouTube link were different depending on the OS, as explained in the next section.

Younger participants were asked to download the remote package program as a pre-experiment set-up. On the day before the experiment, a reminder about the experiment was sent to a younger participant. The reminder contained the Zoom information for the experiment and asked

the participant to prepare pieces of paper and a pen for Mini-Mental State Examination (MMSE), and headphones or earphones. The contents of the emails were prepared as templates as Google Docs to ensure consistency during the pre-experiment communication.

On the experiment day, two experimenters and the participants met on Zoom. The main experimenter gave instructions to the participant based on the manual created on Google Docs. The sub-experimenter assisted the main experimenter by sharing Google Forms links through Zoom chat and scoring MMSE. The first experiment was always with the younger participant so that they became familiar with the experimental procedure. This procedure was necessary so that the younger participant could become an experimenter when collecting data from the elder participants. When the younger participant did not agree to record their experiment data, they were nonetheless required to experience all the procedures without sharing their own data. In the latter part of the experiment, an elder participant joined the experiment. The younger participant now serving as the experimenter filled out the forms, launched the program, and sent the results to the research team.

Each experiment consisted of five parts. At the beginning of the experiment, the participant was asked to consent to participate in the experiment. After participants signed and dated the consent form, they also answered a demographic questionnaire, both using online forms. The demographic questions were identical to the questions created for a face-to-face experiment. A MMSE was also conducted using another online form to establish a comparable baseline about the cognitive abilities of all participants. Due to the remote data collection, two questions from MMSE were modified: (a) a current location question from "where are we: (hospital) (*Koko-wa nani byouin /*

daigaku desu-ka?)” to “Which room in your house are you at? (*Dono oheya-ni irasshaimasu-ka?*)”, and (b) a question about an action: from “Put it (the half-folded paper) on the floor. (*Sore (otta kami)-wo watashi-ni watashite kudasai.*)” to “Please show the folded paper using the web camera. (*Sore (otta kami)-wo watashi-ni misete kudasai.*)” (Folstein et al., 1975; National Epilepsy Center). The final three questions were conducted with screen sharing in Zoom because they examined the participant’s ability to comprehend a written sentence and to replicate a figure. For the last two tasks, the participant’s answer was recorded by taking a screenshot and scoring the points immediately.

The main experiment was conducted without the Zoom meeting to prevent the computer from becoming overburdened with the processing of two programs (Zoom and a remote data collection program). When the experiment finished, the participants rejoined the Zoom meeting and were asked what strategies they used to deal with the experimental task during the experiment. The participants were instructed to send the results that were saved on the desktop via email. The final step of the experiment was collecting information required for compensating for their participation time.

All forms used in the experiment were created on Google Forms, and the responses were stored on Google Sheets. The names of participants were removed from their responses, and each response was given a subject number, except for the consent form and the reward information form. All personally identifiable information was deleted from Google Drive upon the completion of the experiments. As a reward, participants chose either Amazon gift code or catalogue gift. The former was sent to the participant’s email address, and the latter was sent to the participant’s home.

3. Remote Data Collection Programs

In this section, advantages and disadvantages of the experimental procedures described in the previous paragraph are considered. The pros and cons which are common in both programs appear first. Next, program-specific good points and weak points of E-Prime and SuperLab will be presented in order. At the end of the section, the content will be overviewed.

3.1 Pros and Cons Common in E-Prime and SuperLab

A remote package means a set of files designed for online experiments. It “packages” all the experimental materials, such as pictures and audio stimuli, and the experiment program in a folder. By downloading the file, a participant can start an experiment remotely without a license for the experimental software. To compile a remote package, experimenters firstly build an experiment in a licensed program. The original program is converted into a remote package by the conversion software. The conversion program is additional and requires an additional fee. As for E-Prime and SuperLab, the conversion procedure is easy and simple. Therefore, experimenters can conduct an experiment remotely in two cases: when the original experiment is already available in either software or when they are used to constructing an experiment in either software.

A participant-friendly point is that both software automatically finish all the experimental steps after starting the program to generate the result file on the participant’s desktop. Because of this function, participants do not need to look for the result from the tremendous files stored in their computers. It is also easier for experimenters to indicate the file they wanted participants to send back.

One of the two difficulties which are common to E-Prime and SuperLab is that the programs

occasionally increase the processing load on machines. It can cause limitations in using the experiment software with other applications. For this reason, Zoom must be turned off during the experiment. As a result, experimenters could not monitor the experiment and had no way of knowing if the experiment was going properly. In addition, in case of problems during the experiment, alternative means of communication other than Zoom (such as LINE and email) had to be prepared, which made the experiment procedure complicated.

The other complication of this method is that the programs require the participants to do many steps of the experiment. They need to install the program in advance and to send the file containing the results to experimenters in a specified way after the experiment is over. Note that the latest version of E-Prime Go (1.0.2.41) automates many of those procedures described here (PST Admin, 2020b).

3.2 E-Prime and E-Prime Go

E-Prime is software by Psychology Software Tools Inc., which has been used for behavioral research in psychology and linguistics (Psychology Software Tools, 2021a). E-Prime Go is newly released software in 2020 for converting the experimental program into a remote package (PST Admin, 2020a). This section considers the pros and cons of E-Prime Go. Note that the following pros and cons are about the version used in this project (1.0.1.44). The latest version of E-Prime Go is 1.0.2.41. (PST Admin, 2020b).

The strength of E-Prime Go is its stability. Although participants needed to install PcQualify before the experiment to check the system requirements, few problems occurred during the experiments thanks to this application. This research project performed online experiments on 56 participants (including both younger and elderly participants) using E-Prime Go, but it crashed only

a couple of times.

E-Prime Go has some limitations, which bring some drawbacks to E-Prime Go. First, E-Prime Go only runs on Windows (Psychology Software Tools, 2021b). If someone who wants to participate only owns a Mac, they will not be able to participate in the experiment. In addition, E-Prime Go will not work properly even on Windows 7, 8, 10 if the machine specifications are not met (PST Admin, 2021). Participants are required to download and run additional software to confirm whether E-Prime Go runs appropriately. Secondly, E-Prime Go requires participants to do more steps than SuperLab. Participants have to download PcQualify and run it to make sure that their machine meets the specifications. Additionally, they have to enter the assigned subject number by themselves (This process is no longer needed in E-Prime Go 1.0.2.41. (PST Admin, 2020b)).

3.3 SuperLab 6 and SuperLab Remote

SuperLab is a behavioral experiment software developed by Cedrus Corporation (Cedrus Corporation, 2021). The latest version is SuperLab 6. SuperLab Remote is the remote package compiling software, which became available in July 2020 (Cedrus Corporation, 2020a). SuperLab 6 runs both on Windows (7, 8, and 10) and macOS (10.12 or later) (Cedrus Corporation, 2020b). Though the system requirements for SuperLab Remote and the remote package were not found in the official announcement, no problem happened under the same criteria with SuperLab 6 in this project.

There are three strengths in a SuperLab experiment. The most significant superiority of SuperLab to E-Prime is that the SuperLab expands the potential participants' population due to its compatibility with more than one OS. Moreover, SuperLab is easy to design an experiment. By making a demo experiment explained in the

manual, the essential operation was learned in less than one hour. A relatively small pro of SuperLab is that it does not require participants to type their subject numbers by themselves. From the perspective of the reduction of participant’s burden, it is an advantage. Instead of the participant, the experimenter labeled the result file with the subject number after receiving it from the participant.

However, even on a SuperLab experiment, Mac users still have one disadvantage that does not concern Windows users. For security reason, macOS does not launch an alien file unless the file is once manually placed out of the original folder. This process was sometimes hard for a participant to understand. In order to moderate this drawback, two supplemental items were devised: a ghost folder and an instructional video on YouTube. Within a zip folder that younger participants were instructed to download in advance, an empty folder named “Move-The-Zip-File-to-this-folder”. The existence and the name of the folder guided participants to an appropriate operation. Also, a YouTube video demonstrating this operation was uploaded.

In the previous paragraph, the OS-specific weakness was addressed. There is another negative side of OS-wide availability in the remote package compilation. SuperLab Remote can create a remote package only for the identical OS where the packaging was held. Thus, experimenters have to prepare the computers for each OS to conduct an experiment under both environments.

3.4 Summary

Table 1 summarizes some significant features of E-Prime Go and SuperLab Remote. Since SuperLab Remote is compatible with both Windows and Mac, the potential participant population is larger than that of E-Prime Go, which is only compatible with Windows. The similarities between the two software packages are (a) the result file would be

located on the participant’s desktop, and (b) Zoom and other applications must be turned off due to the risk of computer freezing. In terms of the participant’s work, participants have to do more steps in E-Prime Go than in SuperLab Remote. While PcQualify and filling in the subject number are necessary in E-Prime Go, they are unnecessary in SuperLab Remote. Only for Mac users, the step of moving the file to a ghost folder is added in SuperLab Remote. Both software packages require the participants to download the file and send it back to the experimenter. However, as indicated in section 3.2, the latest version of E-Prime Go overcomes most of the drawbacks. To sum up, there are both advantages and disadvantages in using each software package.

4. Discussion

By conducting experiments on seniors online with the support of younger participants, several advantages and disadvantages emerged. The general pros and cons of remote experiment

Table 1
Comparison of E-Prime Go and SuperLab Remote

	E-Prime Go		SuperLab 6	
Compatible OS	Windows 7, 8, and 10		Windows 7, 8, and 10, Mac 10.12 or later	
Potential participant population	Windows users only		Both Windows and Mac users	
Location of the result file	Desktop		Desktop	
Potential risks	Computer freezing		Computer freezing	
	v1.0.1.44	v1.0.2.41	Windows	Mac
PcQualify	○	○	-	-
Move the file to a ghost folder	-	-	-	○
Participant’s work				
File download	○	-	○	○
Fill in subject number	○	-	-	-
Send the file	○	-	○	○

Note. Unnecessary steps are marked with a hyphen.

methods are also discussed in this section.

4.1 Collaborative Data Collection

The most successful point of the current experimental method was that a younger supporter supplemented experimental settings in a computer on the elder participant's behalf. The senior population, who were the target of the current experiments, usually do not have enough knowledge of information technology to participate in a remote experience solely. To request a younger supporter to manipulate a computer, the elderly were able to participate in a remote data collection. As far as we know, this method was not utilized in previous studies.

Limiting the younger participants to those who live together or near a senior citizen, our method secured the health and safety of the participants while collecting data for the research program. Under the coronavirus situation, elderly people had to avoid physical contact more than younger people due to the higher possibility of becoming seriously ill when contracting the virus. By limiting participants to those who share their living environments, we were able to minimize the risk of spreading the virus.

For the comparative data collection from two generations, the methodology yielded other benefits for experimenters. Because participants are basically recruited as a pair of a younger person and an elderly person, experimenters can recruit both generations in one session. In addition, the required time for an experiment tends to be shorter than doing two experiments individually. Experimenters also easily administrate the progress of the experiment and expect the end of the experiment since the results for each generation are accumulated at almost the same pace.

Meanwhile, this method has a drawback, too; the small size of potential participants in Japan. A typical pair of participants of the current

experiments consisted of a university student and her / his grandparent. However, according to the Cabinet Office (2021), "three generations family" occupies only 9.4% of all households containing at least one elderly (p.9). Though "others", including four-generation families, occupies another 9.5% in the same report, it is clear that the elderly population who live together with potential experimenters is not common. However, this can be solved if recruiting occurs just before the beginning of the school recess. During the recess, students usually return to their original hometown where their grandparents may live as well. Thus, the potential pool of participants becomes bigger after the recess begins. We note that the recruitment announcement is most effective before the recess starts because students are not always attentive to the information from the university during the recess. In addition, the actual potential pool could be larger than "three generations family". In fact, in some cases the younger participants lived next to their grandparents or in the same apartment, but in other cases the elder participants were the parents of the younger supporters.

4.2 Pros and Cons of an Online Experiment

As for the general pros of being able to participate in a data collection at home, there are three beneficial points. First, it allows a wide range of people to be part of the experiment, no matter where the participants reside. Moreover, participating in the experiment at home, and not at the university, makes it easier to hold the experiment during non-working hours. Also, online experiments are beneficial in terms of time saving, which means that more people can easily participate.

There are potential disadvantages of remote experiments in general, however. One of them is the risk of comparing the results with the ones held face-to-face. The results of the experiment, especially that of MMSE, may differ between those

conducted offline and online. For example, face-to-face experiments may make participants more nervous than online experiments. In the offline experiments, elder participants join the experiment in an unfamiliar place under the instruction of an experimenter who is a stranger. In contrast, senior people can join the experiment in a familiar place with a younger family member in the online experiment setting. Of course, some participants may feel anxious or odd to sit in front of and talk to the computer though they do not feel more at ease in offline experiments. We do not know what the exact impact will be on experimental results, but future studies that compare these differences would be beneficial to balance these two modes of data collection.

Some experiment procedures were not directly available remotely and thus needed modification. An experiment on the elderly requires by default MMSE in order to ensure whether the results of the experiment are not due to any cognitive defects, such as the onset of Alzheimer's disease. The current experiment modified MMSE, which was originally created to be conducted offline, to adapt to the online environment. For example, out of 30 questions, there are five questions on time and place. As for the time, it is not necessary to be in the same space as long as both the interviewer and the participant are in Japan. However, as for the orientation questions, the answer is not confirmed because there is no way to know their location remotely, and their address should not be collected without permission. Hence, it is required to stipulate the answers from the younger supporters as correct. Following this speculation, the interviewer and the participant should stay in the same room. In the current experiment, the whole procedure was done on younger participants first to gain a plausible answer.

Due to the processing power of personal computers, Zoom sessions were turned off during

the experiments, resulting in lost opportunities for observing the participant's behavior by an experimenter. It is hard to know whether a participant receives any further assistance or whether they are interrupted during the experiment. The use of a second computer or an SNS account would be possible to avoid such a lack of monitoring, but it may complicate the experimental procedure and serve as a hindrance in recruiting participants, especially those who do not own additional devices.

5. Conclusion

In this research note, the methodology to conduct an online experiment recruiting senior citizens was introduced, and its pros and cons were discussed. Though elderly people tend not to be as familiar with information technology as younger people, they can participate in a remote experiment with a younger participant who serves as an experimenter. Younger participants in our study played both the roles of a participant and an experimenter in an experiment. The coronavirus pandemic, despite the negative aspects, forced the development of this data collection method.

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References

- Cabinet Office. (2021). *Dai 1 shou Dai 1 setsu 3 Kazoku to Setai [Chapter 1, Section 1, 3 Family and Household]* [PDF file]. Reiwa san-nendo ban kourei shakai hakusho (zentai ban) [Annual Report on the Ageing Society FY2021 (whole)]. Retrieved July 30, 2021, from https://www8.cao.go.jp/kourei/whitepaper/w-2021/zenbun/pdf/1s1s_03.pdf
- Cedrus Corporation. (2020a, June 24). *New – SuperLab Remote*. Retrieved July 16, 2021, from https://cedrus.com/blog/superlab_remote.htm
- Cedrus Corporation. (2020b, July 27). *SuperLab 6 Manual* [PDF file]. Retrieved July 16, 2021, from <https://cedrus.com/superlab/manual/superlab6-manual-rev-a.pdf>
- Cedrus Corporation. (2021). *SuperLab*. Retrieved July 16, 2021, from <https://www.cedrus.com/superlab/>
- Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state": A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, 12(3), 189-198. DOI: 10.1016/0022-3956(75)90026-6
- National Epilepsy Center NHO Shizuoka Institute of Epilepsy and Neurological Disorders. (n.d.). *Mini-Mental State Examination (MMSE) Kensa shiito [evaluation sheet]* [PDF file]. Retrieved July 30, 2021, from <http://www.shizuokamind.org/wp-content/uploads/2013/10/MMSE.pdf>
- Psychology Software Tools. (2021a). *E-Prime*. Retrieved July 13, 2021, from <https://pstnet.com/products/e-prime/>
- Psychology Software Tools. (2021b). *E-Prime Go*. Retrieved July 13, 2021, from <https://pstnet.com/eprime-go/>
- PST Admin. (2020a). *RELEASE INFO: E-Prime Go 1.0 Released (Version 1.0.1.44) [34991]*. Retrieved July 13, 2021, from <https://support.pstnet.com/hc/en-us/articles/360047842893-RELEASE-INFO-E-Prime-Go-1-0-Released-Version-1-0-1-44-34991>
- PST Admin. (2020b). *RELEASE INFO: E-Prime Go 1.0 Released (Version 1.0.2.41) [36055]*. Retrieved July 13, 2021, from <https://support.pstnet.com/hc/en-us/articles/360053731194-RELEASE-INFO-E-Prime-Go-1-0-Released-Version-1-0-2-41-36055>
- PST Admin. (2021). *INFO: PcQualify for E-Prime Go / E-Prime 3.0 [35382]*. Retrieved July 13, 2021, from https://support.pstnet.com/hc/en-us/articles/360052137233-INFO-PcQualify-for-E-Prime-Go-E-Prime-3-0-35382-?_ga=2.49822118.147652341.2.16261566321137672948.1626156632