

## Telepractice and the D-KEFS

The telepractice information in this document is intended to support professionals in making informed, well-reasoned decisions around remote assessment. This information is not intended to be comprehensive regarding all considerations for assessment via telepractice. It should not be interpreted as a requirement or recommendation to conduct assessment via telepractice.

Professionals should remain mindful to:

- Follow professional best practice recommendations and respective ethical codes
- Follow telepractice regulations and legal requirements from federal, state and local authorities, licensing boards, professional liability insurance providers, and payors
- Develop competence with assessment via telepractice through activities such as practicing, studying, consulting with other professionals, and engaging in professional development.

Professionals should use their clinical judgment to determine if assessment via telepractice is appropriate for a particular examinee, referral question, and situation. There are circumstances where assessment via telepractice is not feasible and/or is contraindicated. Documentation of all considerations, procedures, and conclusions remains a professional responsibility.

Several professional organizations and experts have provided guidance on telepractice assessment (American Psychological Association Services [APA Services], 2020; Association of State and Provincial Psychology Boards [ASPPB], 2013; Grosch, et al., 2011; Inter Organizational Practice Committee [IOPC], 2020; Stolwyk, et al., 2020) to assist professionals in decision making and ethical and legal practice issues.

The Delis-Kaplan Executive Function System (D-KEFS™; Delis, Kaplan, & Kramer, 2001) is a set of nine, higher level cognitive tests that require examiner instructions and feedback throughout administration. The D-KEFS can be administered in a telepractice context by using digital tools from Q-global®, Pearson's secure online testing and scoring platform. Specifically, Q-global digital assets (e.g., the D-KEFS stimulus book) can be shown to the examinee in another location via the screen-sharing features of teleconferencing software. Details regarding Q-global and how it is used are provided on the [Q-global product page](#).

Several of the D-KEFS tests lend themselves well to telepractice evaluations because the only visual stimuli shown are written sentences and only require the examinee to make verbal responses. These measures include the D-KEFS Verbal Fluency Test, Word Context Test, and Proverb Test. In

addition, the Color-Word Interference Test and Twenty Questions Test may be administered remotely if the stimuli can be displayed accurately; however, this requires verification of orientation, color, and font size. Other D-KEFS tests are not easily adapted to telepractice evaluations because they require the examinee to draw on record forms or use manipulatives. These measures include the D-KEFS Trail Making Test, Design Fluency Test, Sorting Test, and Tower Test. For these tests, a professional or nonprofessional facilitator may be needed to optimize assessment accuracy, especially for examinees with lower cognitive abilities.

It is important to note that, in traditional in-person assessments, the stimuli for the Color-Word Interference and Twenty Questions tests are presented flat on the table. There is no research investigating differences between presentation formats on performance at the time of this report. While there is no evidence suggesting that the angle of presentation of these stimuli should significantly affect the validity of the findings, this change in standardized administration should be noted in the practitioner's report along with any observations on whether or not this change may have affected the validity of the findings.

A spectrum of options is available for administering this assessment via telepractice; however, it is important to consider the fact that the normative data were collected via an in-person assessment. Telepractice is a deviation from the standardized administration, and the methods and approaches to administering it via telepractice should be supported by research and practice guidelines when appropriate.

Professionals engaging in telepractice assessment may train facilitators to work with them on a regular basis in order to provide greater coverage to underserved populations (e.g., only two professionals within a 500-mile radius, shortage of school psychologists within a school district). If such a facilitator is well trained and in a professional role (i.e., a professional facilitator), they can present the response booklet as well as adjust audiovisual equipment. While this approach yields the same D-KEFS scores that are available in face-to-face assessment mode, clinical judgment is required to determine the validity of this administration method given the lack of direct evidence for the equivalence of D-KEFS scores across modalities. If a professional facilitator is not used, it may increase measurement error, particularly for some tests, and therefore may impact the validity of the derived scores.

A key variable in determining whether or not a trained facilitator is needed for telepractice assessment is the level of cognitive functioning of the examinee. For younger children, older adults, and individuals with significant neurological or psychiatric disorders, a trained facilitator will likely be needed, especially for tests that require drawing on record forms or use of manipulatives. In contrast, for individuals with higher levels of overall cognitive functioning, a trained facilitator may not be needed. Again, clinical judgment is required to determine the need for using a trained facilitator; the decision of whether or not to use a facilitator and its impact on the validity of the assessment should be explicitly addressed in the practitioner's report.

In times when physical distancing is necessary (such as the COVID-19 pandemic), using a professional facilitator may not be safe or feasible. If testing must occur under these conditions, it is possible that the examinee may participate without the help of an on-site facilitator. If the examiner determines that no facilitator is required, the examinee can assist with technological and

administrative tasks during testing and should be oriented to these responsibilities prior to, and again at the beginning of, the session. An initial virtual meeting should occur in advance of the testing session to address numerous issues specific to testing via telepractice. This initial virtual meeting is described in the administrative and technological tasks portion of the Examiner Considerations section and referred to in various sections of this document. The examiner should consider best practice guidelines, the referral question, and the examinee's condition, as well as telepractice equivalence study conditions, to determine if this is possible and appropriate. Again, independent examinee participation may not be possible or appropriate, for example, for examinees with lower cognitive ability or with lower levels of technological literacy and experience.

If the examiner determines that the examinee cannot participate independently, and testing must occur under physical distancing constraints, the only facilitator available may be someone in the examinee's home (e.g., a parent, guardian, or caretaker). If the on-site facilitator is not in a professional role (i.e., nonprofessional facilitator), they can assist with technological and administrative tasks during testing and should be oriented to these responsibilities in the initial virtual meeting and again at the beginning of the session.

Professional and nonprofessional facilitators should be in the testing room only for those tests that require their ongoing assistance (e.g., the Tower Test). The examiner should plan to minimize (as much as possible) the need for the facilitator to remain in the room. In rare cases when the facilitator must remain in the room, they should do so passively and unobtrusively; they should merely monitor and address the examinee's practical needs, as well as any technological or administrative issues as necessary. The facilitator's role should be defined clearly by the examiner. The facilitator should only perform those functions the examiner approves and deems necessary. The extent to which the facilitator assisted with the administration of the tests should also be included in the practitioner's report. In any case, if a facilitator is necessary it is preferred that the facilitator remain accessible.

The response booklets contain the response forms for the Trail Making and Design Fluency tests. Response booklets are required for the administration of these tests. Because of the timing and immediate corrective feedback requirements of these tests, these subtests should be administered with a trained facilitator for most examinees, except for those individuals with higher levels of cognitive skills. Again, the practitioner's clinical judgment is needed to make this determination, and the assessment procedures used should be discussed in the report.

## Conducting Telepractice Assessment

Conducting a valid assessment in a telepractice service delivery model requires an understanding of the interplay of a number of complex issues. In addition to the general information on Pearson's telepractice page, examiners should address five factors (Eichstadt et al., 2013) when planning to administer and score assessments via telepractice:

1. [Telepractice Environment & Equipment](#)
2. [Assessment Materials & Procedures](#)
3. [Examinee Considerations](#)

4. [Examiner Considerations](#)

5. [Other Considerations](#)

## 1. Telepractice Environment & Equipment

### Computers and Connectivity

Two computers with audio and video capability and stable internet connectivity—one for the examiner and one for the examinee—are required. A web camera, microphone, and speakers or headphones are required for both the examiner and the examinee. A second computer screen or split-screen format on a large computer monitor for the examiner is helpful to allow a view of a Pearson-delivered digital manual or administration directions, but the examiner can also use the paper format manual or administration directions. The second computer screen or large screen also tends to make sharing test content more straightforward for the examiner.

### Image/Screen Size

When items with visual stimuli are presented, the digital image of the visual stimuli on the examinee's screen should be similar in size to the paper stimulus book (8.5 x 11 inches). Twenty Questions requires the larger screen size because of the size and placement of the images. Because some teleconferencing software shrinks the size of images, the image size should be verified in the initial virtual meeting. It is recommended that computer screens used for teleconference assessment be at least 15" measured diagonally. Smaller screens, such as those of the iPad®, iPad mini, small tablet PCs, and smartphones, are not allowed for examinee-facing content because these have not been examined empirically and may affect stimulus presentation, examinee response, and validity of the test results. Similarly, presenting stimuli on extremely large screens has not been examined, so the same precaution applies. At the beginning of the testing session, the examiner may ask for a peripheral camera or device (as described later in this section) to be aimed at the examinee's screen to ensure that the examinee's screen is displaying images in the correct aspect ratio and not stretching or obscuring the stimuli image.

### Audio Considerations

High-quality audio capabilities are required during the administration. An over the head, two-ear, stereo headset with attached boom microphone is recommended for both the examiner and examinee. Headphones with a microphone may be used if a headset is not available.

The examiner should test the audio for both the examiner and examinee in the initial virtual meeting and at the beginning of the testing session to ensure a high-quality audio environment is present. Testing the audio should include an informal conversation prior to the administration where the examiner is listening for any clicks, pops, or breaks in the audio signal that distorts or interrupts the voice of the examinee. The examiner should also ask if there are any interruptions or distortions in the audio signal on the examinee's end. Any connectivity lapses, distractions, or intrusions that occurred during testing should be reported.

## **Audiovisual Distractions**

As with any testing session, the examiner should do everything possible to make sure the examinee's environment is free from audio and visual distractions. If the examiner is unfamiliar with the examinee's planned physical location, a visual tour of the intended testing room should be given during the initial virtual meeting. The examiner can then provide a list of issues to address to transform the environment into one suitable for testing. For example, remove distracting items, silence all electronics, and close doors. The examiner should confirm that these issues have been addressed at the time of testing. If possible, the examinee should be positioned facing away from the door to ensure the examiner can verify through the examinee's camera that the door remains shut and can monitor any interruptions. The examiner should confirm that all other applications on the computer, laptop, or peripheral device are closed, the keyboard is moved aside or covered after the session is connected, and alerts and notifications are silenced on the peripheral device. Radios, televisions, other cellular phones, fax machines, smart speakers, printers, and equipment that emit noise must be silenced and/or removed from the room.

## **Lighting**

Good overhead and facial lighting should be established for the examiner and examinee. Blinds or shades should be closed to reduce sun glare on faces and the computer screens.

## **Teleconferencing Software**

Teleconferencing software is required. Screen-sharing capability is required if anything other than items with verbal stimuli and responses are administered.

## **Video**

High-quality video (HD preferred) is required during the administration. Make sure the full faces of the examiner and the examinee are seen using each respective web camera. The teleconferencing software should allow all relevant visual stimuli to be fully visible to the examinee when providing instruction or completing items; the view of the examiner should not impede the examinee's view of visual test stimuli.

## **Peripheral Camera or Device**

A standalone peripheral camera can be used to provide a view of the session from another angle or a live view of the examinee's progress. Alternately, a separate device (e.g., a smartphone with a camera or another peripheral device) can be connected to the teleconference and set in a stable position to show the examinee's pointing or written responses. The device's audio should be silenced and microphone should be muted to prevent feedback. The examiner should guide positioning of the peripheral camera/device before administering written response tasks (i.e., Trail Making, Design Fluency) so that the examiner can see the examinee's real-time responses. Because corrective feedback is provided during performance, this view is critical for administration. A professional facilitator, trained to detect and intervene when errors are made, may be needed to ensure appropriate administration.

In a typical telepractice session, it is more feasible to make a document or moveable camera available in the examinee's location. However, while physical distancing is necessary, the only camera available may be a stationary camera integrated into the examinee's laptop or computer screen. It is unrealistic to expect examinees to have document cameras within their homes that will show their responses while they take the tests (e.g., their drawings on the Trail Making Test record forms). It may be necessary for examiners to think creatively about how to use a smartphone or other device in the examinee's location to gain a view of the examinee's progress in a response booklet or when pointing at a screen. Before attempting this with an examinee, the examiner should work to become fluid and competent at directing examinees in these methods, which can require extensive practice with varied individuals and types of devices. In addition, this requires planning and practice in the initial virtual meeting to prevent technical difficulties and to help the examinee feel confident doing this when it is time.

Online instructional videos (e.g., [here](#)) demonstrate how a smartphone may be used with common household objects (e.g., a tower or stack of books, paper weight, ruler, and rubber band or tape) to create an improvised document camera for use during tasks involving response booklets. Similarly, on some tests (e.g., Color-Word Interference Test), some examinees may point to test stimuli as they respond to the items. In this situation, other everyday household objects (e.g., books) could be used to form an improvised stand upon which to position the device to provide a second-angle view of the examinee pointing at the screen. A simple mirror behind the examinee has been used successfully to observe pointing responses. Typically, devices provide the best view of the examinee's screen and pointing responses when positioned in landscape orientation. While using additional cameras or devices/objects may not be an optimal solution for telepractice, it can be functional if executed well.

## Screen Sharing Digital Components

Digital components are shared within the teleconferencing software as specified in [Table 1](#). There are two ways to view digital components in the Q-global Resource Library: through the pdf viewer in the browser window or full screen in presentation mode. Always use full screen (i.e., presentation) mode for digital components viewed by the examinee. This provides the cleanest presentation of test content without on-screen distractions (e.g., extra toolbars). Refer to *Using Your Digital Assets on Q-global* in the Q-global Resource Library for complete directions on how to enter presentation mode.

## 2. Assessment Materials & Procedures

### Test Item Security

The examiner is responsible for ensuring test item security is maintained, as outlined in the Terms and Conditions for test use. The examiner should address test security requirements with the examinee (and facilitator, if applicable) during the informed consent process. The examiner should make it clear to the examinee/caregivers that the video should not be captured, photos should not be taken, and stimuli should not be copied or recorded, as this is a copyright violation. The examinee must agree that they will not record (audio or visual) or take photos or screenshots of any portion of the test materials or testing session, and not permit anyone to observe the testing

session or be in the testing room (except for a facilitator, when necessary). Any test-related materials used in the testing session must be returned to the examiner.

## **Disruptions**

The examiner should record any and all atypical events that occur during the testing session. This may include delayed audio or video, disruptions to connectivity, the examinee being distracted by external stimuli, and any other anomalies. These can be noted on the record form or in the notes section on Q-interactive, if applicable, and should be considered during interpretation and described in the written report. Refer to [Other Considerations](#) for guidance on report writing.

## **Response Booklets**

The Trail Making Test and Design Fluency Test use response booklets and will therefore usually require administration with a trained facilitator because of the complex interplay of multiple response booklets, teaching and practice, timing, and immediate corrective feedback during test conditions. (The exception to this may be individuals with higher levels of cognitive skills.) The response booklets should be provided in advance of the testing session, and the plan for securing and forwarding/returning materials, real-time and after testing, should be communicated. The examiner must confirm that the correct response booklet is presented for each condition of the Trail Making and Design Fluency tests because the response booklets for the different conditions look similar. After completing the administration of the different conditions of each of these tests, the examiner may ask for the completed response booklets to be shown on camera so that they can take a screenshot of it for later scoring (which ensures that the responses are not lost or modified). One successful approach to protecting test security uses sealed envelopes (i.e., the sealed envelope method) and is described as follows. The examiner gathers response booklets and a self-addressed stamped envelope. The examiner places these materials in an envelope and signs it on the seal, then mails or delivers it to the testing location. The examiner emphasizes that the sealed envelope containing the response booklets must not be opened until the examiner asks. The response booklets are then placed in the provided self-addressed stamped envelope after completion of each subtest, sealed at the conclusion and signed on the seal on camera, and then mailed or delivered to the examiner immediately following the testing session.

## **Manipulatives**

The Tower Test and Sorting Test may only be administered when a professional facilitator is present. The base, disks, and cards should be provided to the professional facilitator before the testing session. The examiner should not allow nonprofessional facilitators or examinees to administer these tests.

## **Digital Assets**

The examiner should practice using the digital assets until the use of the materials is as smooth as an in-person administration. It is not recommended that the examiner display items from paper stimulus books on a camera. Refer to *Using Your Digital Assets on Q-global* in the Q-global Resource Library for complete directions.

## Gesturing

Several D-KEFS tests require that the examiner point or gesture to the stimulus image or response booklet throughout administration. For Color-Word Interference and Tower, the examiner may display the digital assets on-screen and use the mouse cursor for pointing. Other tests may require a professional facilitator to provide gestures as needed. Refer to [Table 1](#) for specific instructions by subtest.

## Content Considerations

Review [Table 1](#) for the specific telepractice considerations for each subtest to be administered.

**Table 1. Specific Telepractice Considerations**

Subtest(s)	Considerations
Trail Making Design Fluency	<ul style="list-style-type: none"> <li>• An on-site trained facilitator is recommended for administration for most examinees due to the complexities of timing and real-time corrective feedback (visual feedback is required on Trail Making).</li> <li>• Peripheral camera/device must be placed in a stable position that shows examinee’s response booklets and provides examiner a view of examinee’s written responses to allow feedback to be given in real time</li> <li>• Printed copies of response booklets in examiner’s location are needed in order to show on camera drawing demonstrations as outlined in test directions</li> <li>• Design Fluency requires video display of the rules for each condition.</li> <li>• Examiner uses stopwatch and must ensure examinee stops at task time limit</li> <li>• Examiner ensures the appropriate response booklet and page is opened for each condition.</li> <li>• Examiner ensures the response booklet is displayed correctly.</li> <li>• Trail Making: Examiner uses a stopwatch or timer to record completion times and stop examinee at discontinuation times.</li> </ul>
Verbal Fluency	<ul style="list-style-type: none"> <li>• Requires high-quality audio for examinee and examiner</li> <li>• Requires video display of rules for each condition</li> <li>• Examiner uses stopwatch or timer to stop examinee at time limit</li> </ul>
Color-Word Interference	<ul style="list-style-type: none"> <li>• The font size and colors were selected for readability of the words and changes to the image will influence performance. Therefore, the stimulus book is required for this subtest.</li> <li>• On-site professional should assist with administration due to stimulus book requirement</li> <li>• Requires high-quality audio for examinee and examiner</li> <li>• Stimulus should be displayed flat/horizontal on the table for the examinee</li> <li>• Examiner uses stopwatch or timer and stops examinee at time limit</li> </ul>



<b>Subtest(s)</b>	<b>Considerations</b>
Sorting	<ul style="list-style-type: none"> <li>• Professional on-site trained facilitator should assist with administration</li> <li>• Train new on-site facilitator until presentation of cards during instructions and items is performed according to directions in manual</li> <li>• Do not allow nonprofessionals to present cards or record results nor attempt to have examinee present their own cards or record results</li> <li>• On-site professional presents stimuli while examiner provides all verbal instructions</li> <li>• Requires high-quality audio for examinee and examiner</li> <li>• Requires video display of rules during first two conditions</li> <li>• Peripheral camera/device should be placed in a stable position to show examinee’s responses</li> </ul>
Twenty Questions	<ul style="list-style-type: none"> <li>• Can be administered using video display of stimuli, but only if the examiner determines beforehand that the examinee’s digital device accurately displays the objects and colors. Otherwise, an on-site trained facilitator should assist with the administration because of the stimulus book requirement.</li> <li>• Requires high-quality audio for examinee and examiner</li> <li>• Examiner uses mouse/cursor to point to stimuli on-screen</li> <li>• Stimulus should be displayed flat/horizontal on the table for the examinee; ensure glare from overhead lighting does not interfere with task performance</li> <li>• Examinee can say name of object or use mouse/cursor to point at choices</li> <li>• Optional: Peripheral camera/device can be placed in stable position that shows examinee’s screen and provides a view of choices made nonverbally (e.g., pointing)</li> </ul>
Word Context	<ul style="list-style-type: none"> <li>• Requires high-quality audio for examinee and examiner</li> <li>• Examiner displays and reads stimuli on-screen</li> </ul>
Tower	<ul style="list-style-type: none"> <li>• Professional on-site trained facilitator should assist with administration</li> <li>• Train new on-site facilitator until presentation of manipulatives (i.e., base, disks) during instructions and items is performed according to directions</li> <li>• Do not allow nonprofessionals to present manipulatives nor attempt to have examinee present their own manipulatives</li> <li>• On-site professional presents the tower manipulatives while examiner presents the visual stimuli and provides all verbal instructions</li> <li>• Examiner uses mouse/cursor to point to stimuli on-screen</li> <li>• Examiner uses stopwatch to stop examinee at item time limit</li> <li>• Peripheral camera/device should be placed in a stable position to show examinee’s responses</li> </ul>

Subtest(s)	Considerations
Proverbs	<ul style="list-style-type: none"> <li>• Requires high-quality audio for examinee and examiner</li> <li>• Examiner displays and reads stimuli on-screen</li> </ul>

## Evaluating Equivalence Evidence

Examiners should review the current research available on equivalence between different modes of administration before proceeding to use remote administration of a standardized assessment with normative data collected via in-person assessment. When reviewing the literature, the examiner should consider the input and output requirements for each task, and the evidence available for telepractice equivalence for the specific task type. Direct evidence of equivalence for a specific task may be available because the task was researched in a study with results indicating no significant difference between telepractice and in-person assessment. Indirect evidence may also be reported in the literature for a task that is similar in construct and input/output demands to the standardized assessment being considered for remote administration and may help determine the examiner's level of confidence in applying the norms. For instance, a study demonstrating direct evidence for the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) Picture Naming subtest also demonstrates valuable indirect evidence for the WISC-V Vocabulary and CLQT+ Confrontation Naming subtests because Picture Naming, Vocabulary, and Confrontation Naming all require brief spoken directions with pictorial stimuli inputs with open-ended spoken response outputs. Examiners can have more confidence that the normative scores are valid when tasks have direct evidence showing equivalency between modes.

In reviewing the literature of telepractice–in-person and digital–traditional investigations, professionals should also be mindful of the age range and population (e.g., clinical group) of the research study to consider relevancy for the examinee. Greater caution is recommended when only indirect evidence of equivalency is available for a task, or when equivalence has not been established for a particular examinee's age range and clinical condition. However, it can be informative to consider any such available evidence when considering impact of remote administration on results and interpretation. Pearson Clinical Assessment is tracking and aggregating the relevant equivalence evidence for our assessments, including the age range, population, direct evidence, and indirect evidence (see [Evidence for Remote Assessment](#)).

Preliminary research has compared results obtained in telepractice and face-to-face administration modes. One study (Harder et al., 2020) used the D-KEFS Verbal Fluency and Color-Word Interference tasks remotely with children ages 10–17 years. The visual stimuli were sent to the examinee's home in a sealed envelope and were opened in front of the examiner during administration. Examinees completed all testing in their home. Upon completion of the testing session, the materials were sealed in an envelope and returned to the examiner. In this study, no difference was found between scores obtained through the remote testing and those who were tested in face-to-face sessions. Several tasks with similar administration and response requirements to those found in the D-KEFS have produced evidence of equivalence in telepractice and face-to-face modes for examinees with a variety of clinical conditions (Cullum et al., 2006; Cullum et al., 2014; Dekhytar et al., 2020; Galusha-Glasscock et al., 2016; Hildebrand et al., 2004; Hodge et al., 2019; Jacobsen, 2003; Ragbeer et al., 2016; Stain et al., 2011; Vahia et al., 2015; Vestal et al., 2006; Wadsworth et al., 2018). Other studies support equivalence of tasks that are similar to some of the

D-KEFS tests with nonclinical examinees using telepractice compared with face-to-face administration and scoring (Galusha-Glasscock et al., 2016; Wright, 2020). In addition, a meta-analysis of telepractice studies provides support for telepractice and face-to-face mode equivalence across a variety of neuropsychological tests (Brearly et al., 2017).

While equivalence data on similar measures are relevant, practitioners should be mindful that more research is needed to establish equivalence in all ages and for all tasks on the D-KEFS. Additional caveats and cautions are described in Grosch et al. (2011). Also, most telepractice-based studies were conducted with volunteer subjects in controlled environments. When social distancing is critical (such as during the COVID-19 pandemic), some examinations may need to occur in patients' homes, and it should be noted that very little research has been done about remote assessment in private homes.

It is important to consider the conditions under which equivalence studies of telepractice and face-to-face assessment modes were conducted and to attempt to reproduce these as closely as possible if testing via telepractice. Typical telepractice studies that support telepractice and face-to-face equivalence involve the examiner becoming very familiar with the teleconference platform by using it for its intended purpose for several hours and administering tests (even those that are familiar in face-to-face mode) multiple times to "practice examinees." Some studies that have established telepractice and face-to-face mode equivalence involve a professional facilitator. However, preliminary research conducted and described by Lana Harder (Stolwyk et al., 2020) with parents serving as in-home facilitators who managed audiovisual needs and response booklets found no significant differences across modes. Finally, the examinee is typically in an office- or school-based setting. Therefore, if in-home assessment is taking place, it is advisable to prepare a similar environment as much as possible to that described in the Telepractice Environment & Equipment section.

Studies that investigate assessment in digital versus traditional formats are also relevant. During the development of the D-KEFS on Q-interactive, an equivalency study was conducted on Design Fluency, Verbal Fluency, Trail Making, and Color-Word Interference. It is important to note that for these subtests all the materials used for paper administration were retained, with the exception of the display of written rules for the Verbal Fluency subtest. The paper response booklets for Trail Making and Design Fluency were retained and the stimulus book was used for Color-Word Interference. The other tests were not provided in Q-interactive. The Q-interactive platform provided all the instructions, response capture, and scoring for the examiner. Daniel (2012) found no difference in raw scores on the measures between the paper and digital administrations. It is important to note that these studies were not conducted remotely or via video conference.

[Table 2](#) lists the input and output requirements of each D-KEFS test. The abbreviations in the Input and Output column correspond to the various input and output requirements of each task, and a key appears at the bottom of the table. For example, spoken directions as an input requirement is abbreviated as SD.

**Table 2. Input and Output Requirements**

<b>Test</b>	<b>Input<sup>a</sup></b>	<b>Output<sup>b</sup></b>
Trail Making	GD, IT, RB, SP, SD	TT, RF, WFR
Design Fluency	Trail Making: VF Design Fluency: WP, AF	
Verbal Fluency	SD, SS, WP	OE, SPR, TT
Color-Word Interference	SD, CC, GD, IT, PS, WP	ITL, OE, SPR
Sorting	SD, IT, MD, PM, PS, WP	FMR, ITL
Twenty Questions	SD, PS	MC, PR, BSR
Word Context Proverb	SD, SS, WP	OE, SPR
Tower	GD, MD, PM, PS, SD, WP	ITL, FMR

Note. <sup>a</sup>Input abbreviations are: AF = Auditory corrective feedback, CC = Color-critical items, GD = Gestured directions, IT = Interactive teaching, MD = Motor demonstration, PM = Physical manipulatives, PS = Pictorial stimuli, RB = Paper response booklet, SD = Spoken directions, SP = Letters, digits, or symbols in print, SS = Spoken stimuli, VF = Visual corrective feedback, WP = Words in print

<sup>b</sup>Output abbreviations are: BSR = Brief spoken response, FMR = Fine motor response, ITL = Item-level time limit, MC = Multiple choice, OE = Open ended, PR = Pointing response, RF = Response to corrective feedback, SPR = Spoken response, TT = Task-level time limit, WFR = Written or fine motor response.

### 3. Examinee Considerations

#### Appropriateness

The examiner should first ensure that a telepractice administration is appropriate for the examinee and for the purpose of the assessment. Clinical judgment, best practice guidance for telepractice (e.g., APA Services, 2020; ASPPB, 2013; IOPC, 2020), information from professional organizations and other professional entities (e.g., licensing boards, legal resources, professional liability insurance providers, payors), consultation with other knowledgeable professionals, existing research, and any available federal or state regulations should be considered in the decision-making process. Consideration should be given to whether the necessary administrative and technological tasks involved in a telepractice session can be accomplished without influencing results.

#### Preparedness

Before initiating test administration, the examiner should ensure that the examinee is well-rested, able, prepared, and ready to appropriately and fully participate in the testing session.

#### Facilitator Role

If using a facilitator, the role of the facilitator must be explained to the examinee so participation and actions are understood.

## **Headset**

It may not be appropriate or feasible for some examinees to use a headset due to behavior, positioning, physical needs, or tactile sensitivities, or if a headset is not available. Clinical judgment on the appropriate use of a headset in these situations should be used. If a headset is not utilized, the examiner's and examinee's microphones and speakers should be turned up to a comfortable volume.

## **Mouse**

On some teleconferencing software, the examiner can pass control of the mouse to allow the examinee to point to indicate responses; this is an option if it is within the capabilities of the examinee. However, best practice guidelines provide cautions about this. For example, the IOPC guidelines suggest examiners be alert throughout administration, resume control of the screen once the task is finished, and never leave the computer unattended while the examinee has control over the examiner's computer (IOPC, 2020).

# **4. Examiner Considerations**

## **Practice**

During the telepractice setup, and before administering to any actual examinee, the examiner should rehearse the mechanics and workflow of every item in the entire test using the selected teleconferencing software so that the examiner is familiar with the administration procedures. For example, a colleague could be used as a practice examinee.

## **Standardized Procedures**

The examiner must follow the administration procedures of in-person administration as much as possible. For example, if a spoken stimulus cannot be said more than once in in-person administration, the examiner must not say it more than once in a telepractice administration unless a technical difficulty precluded the examinee from hearing the stimulus.

## **Real-Time Troubleshooting**

In order to conduct a smooth telepractice session, audiovisual needs and materials must be managed appropriately. The initial virtual meeting involves the examiner, examinee, and/or the facilitator (if used), and is the opportunity for the examiner to provide information about the audiovisual needs and materials. During the initial virtual meeting, the examiner should provide training in troubleshooting audiovisual needs that arise during the testing session, including camera angle, lighting, and audio checks. The examiner should provide verbal feedback to guide camera adjustment, checking the on-screen video shown by the peripheral camera/device to provide information about how to reposition it until the proper view is shown. The examiner should emphasize that no materials should be opened until the examiner provides instructions to do so, if applicable. The examiner should also expect to provide verbal guidance about these issues during

the testing session. Refer to the [Telepractice Environment & Equipment](#) section and to [Table 1](#) for specific subtest telepractice considerations.

## Collaborating With Facilitators

If used, the facilitator is to assist with administrative and technological tasks and not to manage rapport, engagement, or attention during the testing session. The examiner should direct them not to interfere with the examinee's performance or responses. Any other roles and responsibilities for which an examiner needs support, such as behavior management, should be outlined and trained prior to the beginning of the testing session. The examiner is responsible for documenting all behaviors of the facilitator during test administration and taking these into consideration when reporting scores and performance.

## 5. Other Considerations

There are special considerations for written reports describing testing that takes place via telepractice. The professional completing the written report should state in the report that the test was administered via telepractice, and briefly describe the method of telepractice used. The professional should also make a clinical judgment, similar to an in-person session, about whether or not the examiner was able to obtain the examinee's best performance. Clinical decisions should be explained in the report, including comments on the factors that led to the decision to conduct testing via telepractice and to report all (or not to report suspect) scores. In addition, it is recommended that the report include a record of any and all atypical events during the testing session (e.g., delayed video or audio, disruptions to connectivity, extraneous noises such as phone ringing or loud dog barking, person or animal unexpectedly walking into room, the examinee responding to other external stimuli). List and describe these anomalies as is typical for reporting behavioral observations in the written report, as well as any observed or perceived impact on the testing sessions and/or results, and consider these in the interpretation of results.

An example of a written report might include:

*"The D-KEFS Twenty Questions Test was administered via remote telepractice using digital stimulus materials on Pearson's Q-global system, and a facilitator monitored the administration on-site during the live video connection using the [name of telepractice system, e.g., Zoom] platform. The remote testing environment appeared free of distractions, adequate rapport was established with the examinee via video/audio, and the examinee appeared appropriately engaged in the task throughout the session. No significant technological problems or distractions were noted during administration. Modifications to the standardization procedure included: [list]. Tasks with similar administration and response demands to those on the D-KEFS have received initial validation in several samples for remote telepractice and digital format administration, and the results are considered a valid description of the examinee's skills and abilities."*

Notes may be recorded about any testing issues on the record form or in the notes section on Q-interactive.

## Conclusion

This test was not standardized in a telepractice mode, and this should be taken into consideration when utilizing this test via telepractice and interpreting results. For example, the examiner should consider relying on convergence of multiple data sources and/or being tentative about conclusions. Provided that the examiner has thoroughly considered and addressed the factors and the specific considerations as listed above, the examiner should be prepared to observe and comment about the reliable and valid delivery of the test via telepractice. Materials may be used via telepractice without additional permission from Pearson in the following published contexts:

- D-KEFS manual, digital stimulus book, and response booklets via Q-global
- D-KEFS via Q-interactive (requires advanced technology skills and mirroring software)
- D-KEFS via a Pearson-licensed telepractice provider/platform

Any other use of this test via telepractice is not currently recommended. This includes, but is not limited to, scanning the paper stimulus books, digitizing the paper record forms, holding the stimulus books physically up in the camera's viewing area, or uploading a manual onto a shared drive or site.

## References

- American Psychological Association Services (APA Services). (2020). Guidance on psychological tele-assessment during the COVID-19 crisis. (2020).  
[https://www.apaservices.org/practice/reimbursement/health-codes/testing/tele-assessment-covid-19?fbclid=IwAR1d\\_YNXYS2Yc5mdlz\\_ZIYSkrrj\\_6A9BQeKulHxEEjjRh1XDR6fOYncM3b4](https://www.apaservices.org/practice/reimbursement/health-codes/testing/tele-assessment-covid-19?fbclid=IwAR1d_YNXYS2Yc5mdlz_ZIYSkrrj_6A9BQeKulHxEEjjRh1XDR6fOYncM3b4)
- Association of State and Provincial Psychology Boards (ASPPB). (2013). ASPPB telepsychology task force principles and standards.  
[https://cdn.ymaws.com/www.asppb.net/resource/resmgr/PSYPACT\\_Docs/ASPPB\\_TELEPSYCH\\_PRINCIPLES.pdf](https://cdn.ymaws.com/www.asppb.net/resource/resmgr/PSYPACT_Docs/ASPPB_TELEPSYCH_PRINCIPLES.pdf)
- Brearly, T. W., Shura, R. D., Martindale, S. L., Lazowski, R. A., Luxton, D. D., Shenal, B. V., & Rowland, J. A. (2017). Neuropsychological test administration by videoconference: A systematic review and meta-analysis. *Neuropsychology Review*, 27(2), 174–186. <https://doi.org/10.1007/s11065-017-9349-1>
- Cullum, C. M., Hynan, L. S., Grosch, M., Parikh, M., & Weiner, M. F. (2014). Teleneuropsychology: Evidence for video teleconference-based neuropsychological assessment. *Journal of the International Neuropsychological Society*, 20, 1028–1033.  
<https://doi.org/10.1017/S1355617714000873>
- Cullum, C. M., Weiner, M. F., Gehrman, H. R., & Hynan, L. S. (2006). Feasibility of telecognitive assessment in dementia. *Assessment*, 13(4), 385–390.  
<https://doi.org/10.1177/1073191106289065>

- Daniel, M. H. (2012). Equivalence of Q-interactive-administered cognitive tasks: CVLT-II and selected D-KEFS subtests (Q-interactive Technical Report 3).  
[https://www.pearsonassessments.com/content/dam/school/global/clinical/us/assets/q-interactive/005-s-Technical%20Report%203\\_CVLT\\_DKEFS\\_final\\_rev.pdf](https://www.pearsonassessments.com/content/dam/school/global/clinical/us/assets/q-interactive/005-s-Technical%20Report%203_CVLT_DKEFS_final_rev.pdf)
- Dekhtyar, M., Braun, E. J., Billot, A., Foo, L., & Kiran, S. (2020). Videoconference administration of the Western Aphasia Battery–Revised: Feasibility and validity. *American Journal of Speech-Language Pathology, 29*(2), 673–687. [https://doi.org/10.1044/2019\\_AJSLP-19-00023](https://doi.org/10.1044/2019_AJSLP-19-00023)
- Delis, D. C., Kaplan, E., & Kramer, J. H. (2001). *Delis-Kaplan Executive Function System*. Pearson.
- Eichstadt, T. J., Castilleja, N., Jakubowitz, M., & Wallace, A. (2013, November). Standardized assessment via telepractice: Qualitative review and survey data [Paper presentation]. Annual meeting of the American Speech-Language-Hearing Association, Chicago, IL, United States.
- Galusha-Glasscock, J. M., Horton, D. K., Weiner, M. F., & Cullum, C. M. (2016). Video teleconference administration of the Repeatable Battery for the Assessment of Neuropsychological Status. *Archives of Clinical Neuropsychology, 31*(1), 8–11. <https://doi.org/10.1093/arclin/acv058>
- Grosch, M. C., Gottlieb, M. C., & Cullum, C. M. (2011). Initial practice recommendations for teleneuropsychology. *The Clinical Neuropsychologist, 25*(7), 1119–1133. <https://doi.org/10.1080/13854046.2011.609840>
- Harder, L., Hernandez, A., Hague, C., Neumann, J., McCreary, M., Cullum, C. M., & Greenberg, B. (2020). Home-based pediatric teleneuropsychology: A validation study. *Archives of Clinical Neuropsychology, 35*(8), 1266–1275. <https://doi.org/10.1093/arclin/aaa070>
- Hildebrand, R., Chow, H., Williams, C., Nelson, M., & Wass, P. (2004). Feasibility of neuropsychological testing of older adults via videoconference: Implications for assessing the capacity for independent living. *Journal of Telemedicine and Telecare, 10*(3), 130–134. <https://doi.org/10.1258/135763304323070751>
- Hodge, M. A., Sutherland, R., Jeng, K., Bale, G., Batta, P., Cambridge, A., Detheridge, J., Drevensek, S., Edwards, L., Everett, M., Ganesalingam, K., Geier, P., Kass, C., Mathieson, S., McCabe, M., Micallef, K., Molomby, K., Ong, N., Pfeiffer, S., ... Silove, N. (2019). Agreement between telehealth and face-to-face assessment of intellectual ability in children with specific learning disorder. *Journal of Telemedicine and Telecare, 25*(7), 431–437. <https://doi.org/10.1177/1357633X18776095>
- Inter Organizational Practice Committee (IOPC). (2020). *Recommendations/guidance for teleneuropsychology (TeleNP) in response to the COVID-19 pandemic*. <https://static1.squarespace.com/static/50a3e393e4b07025e1a4f0d0/t/5e8260be9a64587cfd3a9832/1585602750557/Recommendations-Guidance+for+Teleneuropsychology-COVID-19-4.pdf>
- Jacobsen, S. E., Sprenger, T., Andersson, S., & Krogstad, J.-M. (2003). Neuropsychological assessment and telemedicine: A preliminary study examining the reliability of neuropsychology services performed via telecommunication. *Journal of the International Neuropsychological Society, 9*(3), 472–478. <https://doi.org/10.1017/S1355617703930128>



- Ragbeer, S. N., Augustine, E. F., Mink, J. W., Thatcher, A. R., Vierhile, A. E., & Adams, H. R. (2016). Remote assessment of cognitive function in juvenile neuronal ceroid lipofuscinosis (Batten disease): A pilot study of feasibility and reliability. *Journal of Child Neurology*, *31*(4), 481–487. <https://doi.org/10.1177/0883073815600863>
- Stain, H. J., Payne, K., Thienel, R., Michie, P., Vaughan, C., & Kelly, B. (2011). The feasibility of videoconferencing for neuropsychological assessments of rural youth experiencing early psychosis. *Journal of Telemedicine and Telecare*, *17*(6), 328–331. <https://doi.org/10.1258/jtt.2011.101015>
- Stolwyk, R., Hammers, D. B., Harder, L., & Cullum, C. M. (2020). *Teleneuropsychology (TeleNP) in response to COVID-19*. <https://event.webinarjam.com/replay/13/pyl2nayhvspsp09>
- Vahia, I. V., Ng, B., Camacho, A., Cardenas, V., Cherner, M., Depp, C. A., Palmer, B. W., Jeste, D. V., & Agha, Z. (2015). Telepsychiatry for neurocognitive testing in older rural Latino adults. *American Journal of Geriatric Psychiatry*, *23*(7), 666–670. <https://doi.org/10.1016/j.jagp.2014.08.006>
- Vestal, L., Smith-Olinde, L., Hicks, G., Hutton, T., & Hart, J., Jr. (2006). Efficacy of language assessment in Alzheimer's disease: Comparing in-person examination and telemedicine. *Clinical Interventions in Aging*, *1*(4), 467–471. <https://doi.org/10.2147/ciia.2006.1.4.467>
- Wadsworth, H. E., Dhima, K., Womack, K. B., Hart, J., Jr., Weiner, M. F., Hynan, L. S., & Cullum, C. M. (2018). Validity of teleneuropsychological assessment in older patients with cognitive disorders. *Archives of Clinical Neuropsychology*, *33*(8), 1040–1045. <https://doi.org/10.1093/arclin/acx140>
- Wright, A. J. (2020). Equivalence of remote, digital administration and traditional, in-person administration of the Wechsler Intelligence Scale for Children, Fifth Edition (WISC-V). *Psychological Assessment*, *32*(9), 809–817. <https://doi.org/10.1037/pas0000939>