**Supplementary Material**

Appendix 1

**Neurocognitive Driving Rehabilitation in Virtual Environments (NeuroDRIVE)**

**Intervention Manual**

**Manual Overview**

The virtual reality driving rehabilitation system includes both baseline and post-intervention assessments, as well as six 90-minute intervention sessions. Modeled after driving rehabilitation protocols developed by Dr. Daniel Cox at the University of Virginia, the intervention sessions follow a cognitive-behavioral self-regulation model. Each session provides an opportunity for the participant to practice a range of driving-relevant skills. The current rehabilitation system builds on Dr. Cox’s previous work through the hierarchical training of cognitive abilities and driving performance, as well as realistic scenarios that integrate both. Overall, the goals of this protocol are (1) to improve cognitive abilities that are highly associated with driving performance (i.e., attention and working memory) and (2) to restore real-world, functional driving skills in a safe, low-risk virtual reality environment.

The driving simulator and software used for the rehabilitation program is the T3 designed by MBFARR LLC. Therefore, the driving directions and building names are specific to the software. Additionally, the software is equipped with various features to assist in evaluating driving performance, such as alerting the participant if he or she violates particular parameters that can be adjusted by the Driving Rehabilitation Specialist (DRS), such as traveling 10 MPH over the posted speed limit, during the Tactical Scenarios. Over the course of the rehabilitation sessions, the DRS can adjust the parameters to be more or less stringent based on the participant’s previous performance. The goal is to increase participant autonomy (i.e., decrease alerts from the DRS and the software) in the simulated environment due to improved adherence to appropriate driving procedures.

***Session 1 only***

1. Vocalization Training: At the beginning of the pre-intervention Driving Assessment session (taking place prior to Session 1), the participant will undergo basic training on how to use the driving simulator. At the beginning of Session 1, the participant will get another chance to practice in the simulator. The practice in Session 1 is based on the vocalization training developed at UVA by Dr. Cox. The DRS will first model driving while vocalizing his or her thought processes. The participant will then demonstrate vocalization while driving, with the DRS providing real-time feedback.
2. Training Introduction: The DRS explains the purpose of the cognitive tasks, then gives directions and answers questions as needed.

***Sessions 1-6***

1. Self-Assessment: The participant provides a self-assessment of driving problems to the DRS.
2. Review of Previous Session Performance: In sessions 1-6, the DRS will provide a brief (~5 minute) review of the participant’s performance on each of the tasks as part of Component Training (item *e*, below). This review will include areas of strength and areas where improvements can be made.
3. Component Training: This includes Driving with Vocalization (**for sessions 1 and 2 only**); Cognitive Tasks (attention and working memory); and Integration Scenarios (applying cognitive tasks to real-world driving situations).
4. Review: The DRS will summarize the session with the participant.
5. Race Track: The participant is permitted to drive in a race track scenario as a reward. No component tasks are administered during this period.

**How to Abbreviate/Cut Time**

1. Adhere to specific time limits for subtests/tasks within a given session. Assuming that participants attend each session, this will ensure that all participants get equal exposure to all tasks.
2. If a participant cannot attend a given session and cannot reschedule within the preferred time frame (about 7-10 days), that session may need to be skipped. Consult with team members to determine how to proceed for each specific case.
3. Cut individual section reviews, but give an overall review at the end of the session.
4. Cut time from Race Track reward at the end of the session.

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| Schedule of Rehabilitation |
|  | **Driving Component** | **Cognitive Component** | **IntegrationScenarios** |
| S1 | Free Play Driving Route | **Attention Tasks** * Digit Forward
* Target Spotting

**Working Memory Task** * Executive Dual Processing
 | * Giving friend a ride
* Radio story

 |
| S2 | Free Play Driving Route | **Attention Tasks** * Digit Forward
* Alphabetized City Names A

**Working Memory Task** * Digit Sequencing
 | * Weather report with vowel city names
* Short shopping lists
 |
| S3 | Tactical 2 Driving Route | **Attention Task*** Target Spotting

**Working Memory Tasks*** Digit Backward
* Executive Response Inhibition
 | * Y/N fluency kid questions
* Water park-related math story problems
 |
| S4 | Tactical 2 Driving Route | **Attention Tasks*** Alphabetized City Names B
* Divided Attention

**Working Memory Task*** Size Judgment A
 | * Traffic update with conflicting information
* Sports radio scores
 |
| S5 | Tactical 3 Driving Route | **Attention Task*** Selective Attention

**Working Memory Tasks*** Size Judgment B
* Executive Working Memory
 | * List of items + 2
* Weather report with short-delay recall
 |
| S6 | Tactical 3 Driving Route | * Remediation A(assigned)
* Remediation B (1 of 3 options)
 | * Prioritizing/planning errands
 |

**Session 1**

Self-Assessment & Review

Self-Assessment

Next, the DRS will query the participant on driving issues that they may currently be experiencing during real world driving. Use **Self-Report Driving Assessment** form (Appendix 2) for this portion. If issues are reported, prompt the participant to rate the frequency of the issue on a Likert scale of 1-10 (1 = very rarely, 5 = sometimes, 10 = almost always).

*“With last week’s driving fresh in your mind, let’s talk about specific issues that you or your passengers have noticed.*

*For example, some people have a hard time staying in their lane, while others find that they end up sitting at traffic lights even after they have turned green. What sort of driving issues have you had over the past week?”*

Review

Then the DRS will review issues seen during the VR assessment:

*“Do you remember the driving tasks that you completed the last time you were here? You did really well on X, Y, and Z* (e.g., maintaining your speed, staying within your lane, giving yourself enough room to stop safely, etc.)*. You had some difficulty on A, B, and C…*(report issues.) *These are some things you may want to keep in mind while driving the simulator today.”*

\*\*Throughout intervention session, DRS should be careful to pay special attention to any driving issues participant reports and any issues observed in the earlier VR driving assessment session.

Time: (5-10 minutes total)

**Component Training**

Training Intro

*“Today is the first training session, and is meant to be an easy, low-stress introduction to our training process. As the sessions go on, we will introduce different tasks and the training will become more challenging. Furthermore, we try to make this training as realistic as possible, but there are some situations that you probably wouldn’t encounter in a real driving situation. Don’t worry about the realism of the tasks, just try your best and please do not try these tasks while driving a real car. We will try to push your limits, but we want you to be comfortable during training and we will tailor the tasks to your skills. That said, try to stay focused as best you can during each session and try to learn from this experience, but also have fun!”*

**[Begin new Free Play session]**

**Simulation Sickness Scale**

*“Before we begin, how are you currently feeling on the following scale?”* (Show participant printed scale while reading options)

**0 = Feel fine**

**1 = Feel a little light headed or woozy**

**2 = Uncomfortable**

**3 = Very uncomfortable**

**4 = I feel so poorly that I could not drive.**

**[Record baseline score on this scale]**

Intro Continued

*“For today’s session, we are going to do a variety of tasks. You may find some of these tasks to be easy, while others may be more difficult. Even if they are easy, try to do them carefully. If you find something difficult, just give your best effort.* ***You are not being graded on your performance.****”*

*To start off, I want you to sit in the VR chair and I’ll reintroduce you to the VR. As you may remember, the brake and gas pedals take some getting used to, and the steering takes a little practice, so we’ll do a short drive to get you more comfortable. If you experience any motion sickness or other problems while driving, please let us know right away. Ok, now adjust your seat if you need to, buckle your seat belt, and check your mirrors. Then make sure the car is in drive and start driving.*

*Go forward on Roundabout.*

*Follow the road as it becomes E HWY 20.*

*Turn Left on 5th Street.*

*Turn Left on Jefferson.*

*Turn Left on Broadway.*

**[Administer Simulator Sickness Scale]**

[At five minutes, have the participant pull over to the side of the road and ask them about any motion sickness or other issues with getting used to the simulator.]

**[Exit and Restart Free Play]**

Time: (5-10 minutes total)

Driving

▪ Vocalization Training

*“Ok, now I want you to step out of the simulator for a couple minutes while I show you what to do for the next task. I want you to speak out loud and narrate your drive so that I can understand some of your observations and decision making behind the wheel. I’ll show you an example while I drive and then you’ll try. Just stand in a comfortable spot behind me so that you can see. If you feel any motion sickness, please look away from the screen as needed.”* [DRS models appropriate driving behaviors in simulator while participant observes.]

Driving Route

*Go forward on Roundabout.*

*Follow the road as it curves to the left and then merge onto E Hwy 20.*

*Take a right on 6th Street.*

*Make a right on Mariner Avenue.*

*Next, make a right on 8th Street.*

*Lastly, make a right on Roundabout and then pull over next to Comicover.*

[**Do not exit current Free Play session.]**

Example Modeling Script for Vocalization:

*“I’m making sure my seat is positioned appropriately and putting on my seatbelt.*

*I’m checking my mirrors and making sure I can see around me.
I am now putting the car in drive and I see that the speed limit is 35 MPH.
I begin to lightly press the gas pedal to gradually reach the speed limit of 35MPH.
I’m making sure that I am staying in my lane.
I’m paying attention to the road signs.
I can see that the road is forking ahead and so I am taking my foot off the gas pedal and gradually pressing the brake to slow down.*

*I am looking ahead to the left and right, and quickly checking my mirrors for possible hazards as I approach the fork.*

*I begin to turn, watching my speed and making sure to stay in my lane.*

*I begin to slightly press the gas pedal to reach the speed limit of 35MPH.*

*I notice parked cars on both sides of the street and so I am looking to see if any are moving into my lane.*

*I am making sure that I maintain the appropriate speed and that I am staying in my lane.*

*I can see that a stop sign is ahead and so I am taking my foot off the gas pedal and gradually pressing the brake to slow down and come to a complete stop.”*

**[Keep Free Play session open and proceed to the next section]**

Time: 5 min (DRS example drive)

▪ Driving Route: Free Play Driving Route

Here, the participant will drive a guided route while using vocalization techniques. The DRS will provide immediate feedback on inappropriate driving behaviors. At the end of the driving session, the DRS will review the inappropriate behaviors.

*“Okay, now it is your turn to practice speaking out loud while driving. We hope this exercise will help make you more aware of your driving behaviors and help you drive more carefully. Moreover, it will give me a better understanding of your driving so I can better tailor the training to your needs. Does that make sense?* [pause so they can acknowledge or comment] *Great, as you go I’ll provide directions on where to turn and* *I’ll give you feedback on ways you can improve. Do you have any questions?”*

[Answer any questions, start stopwatch, then proceed with driving directions]

Driving Directions

*“Make sure the car is in Drive, then Drive Forward*

*Turn Right onto S 7th St.*

*Turn Right onto Mariner Ave.*

*Turn Left onto Mariner Ave.*

*Turn Right onto W 9th St.*

*Turn Right onto Jefferson Ave.*

*Turn Left onto 8th St.*

*Turn Right onto Jefferson Ave.*

*Turn Right onto 5th St.*

*Turn Right onto E HWY 20*

*Turn Left onto 6th St.*

*Turn Right onto Mariner Ave.*

*Turn Right onto Broadway St.*

*Stop at the Stop Sign at the intersection with Roundabout.”*

**[Administer Simulator Sickness Scale]**

\*Prompt participant to vocalize driving behaviors as necessary/appropriate

\*\*If 10 minutes elapses before the participant finishes the course, have them pull over to the side of the road where appropriate.

Time: 10 minutes

Cognitive

*“Great job vocalizing. While you are driving in the simulator for the next few tasks you will not have to narrate your driving, but I am going to ask you to answer questions and solve problems. These are designed to focus on your attention and memory. Nobody gets every answer right or even finishes every problem set, but I want you to try your best on each one. Furthermore, safe driving is the top priority while you are driving in the simulator. If it seems like you are having a tough time with driving and doing these other tasks, I may change the types of problems that I want you to solve or slow down how often I read them, to help keep a balance between too easy and too challenging. Do you have any questions?”* [DRS answers any questions]

* Attention Task: **Target Spotting** (12 minutes total: 3 min for instructions + 9 min for task)

**[Begin new Free Play session and introduce the task]** *“For this task, I’m going to show you a couple pictures of buildings from around the virtual town. I want you to pay close attention to each picture, because you’ll need to spot each of these buildings while you drive. I will give you directions on what route to take, but it is important that you do your best to maintain the proper speed, lane position, etc. and be aware of your surroundings while looking for the buildings. Make sure to let me know as soon as you spot each building.”*

[Show the participant each of the three pictures, one at a time. Agate Pharmacy and Bake-a-Dozen are primary targets, and Grene Willows is an alternate target. Make sure they have enough time to remember what each building looks like. If the driver misses a building during the task, quickly have them pull over and show them the building in the environment, if still visible, then have them continue.]

*“Ok, let’s get started. Drive forward*

*Turn right on 7th St.*

*Turn right on Mariner Ave.”*

[**Agate Pharmacy** is at the intersection of S. Broadway and Mariner Ave.]

*“Keep driving on Mariner Ave*

*Follow road as it curves to the right then make an immediate Left turn on Mariner Ave.*

*Turn Right on W 9th St.*

*Right on Jefferson Ave.*

*Left on N 8th St. then immediately turn Right on Jefferson Ave.”*

**[Bake a Dozen** is at the intersection of Jefferson and N. Broadway]

[**Alternate destination**: If time allows, or if participant misses one of the main targets, have them Drive forward on Jefferson Ave. to get to **Grene Willows**]

* Attention Task: **Digits Forward** (11 minutes total: 2 min for instructions + 9 min for task)

**[Begin new Free Play session]** *“For this task, you will drive around the city for about 9 minutes, doing your best to follow the rules of the road and practice safe driving. As you drive, I will provide you with directions on where to go and feedback on your driving. I’m also going to say some sets of numbers that I want you to repeat. Listen carefully, I can only say each set one time. When I am through, I want you to say them back to me in the same order. Just say what I say. Any questions?”* [Answer any questions.]

*“Start driving forward and let’s try some.”*Start stopwatch. Administer Set 1 from main scoresheet then proceed to Set 2a if the Alternate Set criterion has not been met:

* If participant misses three consecutive items within the same set, begin administering items from the fixed length Digit Span Forward scoresheet corresponding to span length of the previous set.
	+ If this occurs on the Set 1, administer 2 Digit subtest for duration of the task. Slow pace of administration if necessary.
	+ **Please note, some leniency can be given at the DRS’s discretion if the participant misses a trial because he/she was interrupted by the DRS.**
* End task at 9 minutes.

Driving Directions

*“Follow the road as it curves to the left*

*Merge onto E HWY 20*

*Turn left at 6th St*

*Turn left at Jefferson*

*Follow Jefferson as it curves around*

*Turn right on N Broadway*

*Turn right on Beltway (no street sign)*

*Follow Beltway around”*

End task at 9 minutes

* **Break (5 minutes)**
* Working Memory Task: **Executive Dual Processing** (5 minutes)

**[Download Executive Dual Processing scenario from DGS site, being careful to select appropriate Driver username and Study for that participant and intervention session]**

*“For this task, you’ll be doing an automated task similar to one you did in the assessment. The computer will give you instructions on what to do, but I wanted to point out a couple things first:*

*You will not be able to control your speed, but you will need to maintain consistent pressure on the gas pedal. You’ll hear a high-pitched tone if you’re pushing too hard on the gas, or a low-pitched tone if you aren’t pushing hard enough. Your job is to keep a consistent pressure so that there are no tones. You will also need to brake whenever you see the brake lights of the car in front of you and safely swerve to avoid all potholes.*

*Ok, now I’ll load the task. Listen to the computer’s instructions, and please let me know if you have any questions or want to hear the instructions again. You will have a chance to practice before the task itself.”* **[Click “Begin” on DGS control panel and allow instructions to play. Next, click “Practice” and allow participant to complete practice, then click “Test” and allow participant to complete test.]**

▪ Review Component Task (3-5 minutes)

Examples of things to review:

* Ability to maintain lane position, and to recover lane position quickly and safely
* Exaggerated swerving/overcompensating?
* Highlight that we understand this may not be how you accurately drive. In real life, you may not have to brake every time you see someone’s brake lights come on.

Integration

▪ Real World Scenario: **Scenario 1** (15 minutes total, including instructions)

**[Begin new Free Play session]***“The next task I will have you do in the simulator is meant to be more like a situation someone might experience in real life.*

*Your friend just called and asked for a ride. He gave me the address, but I need your help to remember it. The address is 77 Mariner Avenue, at the intersection of Mariner Avenue and South 8th Street. Can you say it back to me?”* (Pause while participant provides address.) “*Great, I will tell you where to turn as you drive so you can focus on the road. Any questions?”* Answer any questions, then say, “*as always, remember to follow all the normal rules of the road and pay attention to the driving directions and feedback that I provide as you go through the task. Ok, let’s proceed.”*

**[Start stopwatch to help keep track of time, then proceed with remaining directions]**

Driving Directions

*“Drive Forward*

*Turn Right on S. Broadway*

*Turn Right on Mariner Ave.*

*Turn Left on Mariner Ave. and prepare to pull over across from Barns Books*

*Pull over and stop across from Barns Books. You are picking up a friend and helping him go to three different places: Beauty Plus Power, Java=MC2 coffee shop, and Pizza Pitstop. I will provide directions to each place.*

*Put on your turn signal, check to make sure the road is clear, then drive forward*

*Turn Right on 9th St.*

*Turn Right on Jefferson Ave.*

*Turn Left on N. 8th St.*

*Turn Right on Jefferson Ave.*

*Pull over and stop at Beauty Plus Power.”* **[If participant misses, go around the block and circle back to Beauty Plus Power]**

*“While you’re waiting for your friend, listen to this story on the radio and try to remember as much as you can.”*

Radio Story

*“Jefferson City is holding its annual blueberry festival at the Jefferson Convention Center in two weeks. This year’s activities will include a pie-eating contest, carnival games, and live music. For tickets and more information, call Mary Jones at 531-6460.* (18 seconds)

*Ok, your friend has gotten back in the car; let’s continue to the next place.*

*First, put on your turn signal, check to make sure the road is clear, and then drive forward*

*Turn Right on N. 7th St.*

*Turn Right on N. Roundabout.*

*Pull over and stop at Java=MC2*

*Ok, your friend has gotten back in the car; let’s continue to the next place.*

*Put on your turn signal, check to make sure the road is clear, then drive forward*

*Follow Roundabout and merge onto W Hwy 20*

*Turn Right onto Jefferson Ave*

*Follow Jefferson Ave as it curves*

*Pull over and stop at Pizza Pitstop.*

*Now you want to tell your friend about the commercial you heard on the radio. Tell him as much as you can remember.”* [Record response.] “*Great job, that’s the last place your friend needed to go so we are all done with that task.”*

▪ Review (2 minutes)

Closing

▪ Race Track (8 minutes total: 2 min for instruction + 6 min for task)

[**Download Warrior Speedway scenario from DGS site, using Driver username and Study name corresponding to participant and intervention session. Next, click “Begin” on DGS control panel to initiate scenario]***“As a reward for your hard work, before you leave today, you will get to drive around a race track in the simulator. Here, you should still attempt to stay on the track and avoid any collisions. Go ahead and start.”* **[Click “Bypass Practice” on DGS control panel, then click “Test”]**

(4 minutes of racing)

*“Okay, please come to a stop. To get you back into the mindset of following regular driving laws, we will have you drive around the track while maintaining a typical speed of 50 MPH. Go ahead.”* (DRS will comment on participant’s driving: reminding him or her to maintain appropriate speed, signal when changing lanes, etc.) (2 minutes)

▪ Overall Review & Self-Assessment: Summarize the session by individual section. (5 minutes)

Potential aspects to discuss: lane position; maintaining speed; ability to pay attention to signs, traffic signals, other cars (if applicable), etc.; ability to respond to feedback from the DRS (can provide examples); using turn signal appropriately (or vocalizing turn signal if hardware is nonfunctional); how participant performed on cognitive task (how it compared to past performance); etc.

**Session 2**

Self-Assessment & Review

At the beginning of the session, the NeuroDRIVE Driving Rehabilitation Specialist (DRS) will welcome the participant. Next, the DRS will query the participant on driving issues that they may currently be experiencing during real world driving. Use Self-Report Driving Assessment form for this portion. If issues are reported, prompt the participant to rate the frequency of the issue on a Likert scale of 1-10 (1 = very rarely, 5 = sometimes, 10 = almost always).

*“With last week’s driving fresh in your mind, let’s talk about specific issues that you or your passengers have noticed.*

*For example: some people have a hard time staying in their lane, while others find that they end up sitting at traffic lights even after they have turned green. What sort of driving issues have you had over the past week?”*

Then the DRS will review issues seen during the VR assessment:

*“Do you remember the driving tasks that you completed the last time you were here? You did really well on X, Y, and Z* (e.g., maintaining your speed, staying within your lane, giving yourself enough room to stop safely, etc.)*. You had some difficulty on A, B, and C…*(report issues.) *These are some things you may want to keep in mind while driving the simulator today.”*

\*\*Throughout the intervention session, DRS should be careful to pay special attention to any driving issues participant reports and any issues observed in earlier VR sessions.

Time: 5-10 minutes

**Component Training**

Training Intro

*“We are going to do a variety of tasks during the session today. You may find some of these tasks to be easy, while others may be more difficult. Even if they are easy, try to do them carefully. If you find something difficult, just give your best effort.* ***You are not being graded on your performance.”* [Begin new Free Play session]**

Driving

▪ Driving Route: Free Play Driving Route

Here, the participant will drive a guided route and the participant will use vocalization techniques. The DRS will provide immediate feedback of inappropriate driving behaviors. At the end of the driving session, the DRS will review the inappropriate behaviors with the participant.

Script for Free Play Driving Route:

*“While driving the simulator in this task, I want you to speak out loud and explain what you are doing so we can understand some of your thinking, just like you did last time you were here. I will tell you the driving directions as you go and give you feedback on your driving. Any questions?*

*Make sure the car is in drive, then drive Forward*

*Slight left then merge onto E HWY 20*

*Follow E HWY 20 all the way to Big St*

*Turn Left onto Big St.*

*Turn Right onto 5th St*

*Turn Left onto Jefferson Ave.*

*Turn Left onto 6th St.*

*Turn Right onto E. HWY 20*

*Sight Right to Merge onto Roundabout*

*Right on N. Broadway*

*Stop at Stop Sign at intersection of N Broadway and Expressway”* (takes about 10 - 11 minutes)

Time: 12 minutes total (including instructions)

Cognitive

* Attention: **Digits Forward** (11 minutes total: 2 min for instructions + 9 min for task)

**[Begin new Free Play session]** *“For this task, you will drive around the city for about 9 minutes, doing your best to follow the rules of the road and practice safe driving. As you drive, I will provide you with directions on where to go and feedback on your driving. I’m also going to say some sets of numbers that I want you to repeat. Listen carefully, I can only say each set one time. When I am through with each set, I want you to say them back to me in the same order. Just say what I say. Any questions?”* Answer any questions.

*“Start driving and let’s try some.”*Start stopwatch. Administer Set 1 from subtest sheet then proceed to Set 2a if the Alternate Set criterion has not been met:

* If participant misses three consecutive items within the same set, begin administering items from the fixed length Digit Span Forward sheet corresponding to span length of the previous set.
	+ If this occurs on the Set 1, administer 2 Digit subtest sheet for duration of the task
	+ Slow pace of administration if necessary.
	+ **Please note, some leniency can be given at the DRS’s discretion if the participant misses a trial because he/she was interrupted by the DRS.**
* End task at 9 minutes.

Driving Directions

*“Drive forward*

*Follow the road as it curves to the left then merge onto E HWY 20*

*Turn left at Expressway (Keep speed at or below 40 mph)*

*Turn left on Jefferson*

*Turn left on 6th*

*Turn left on E HWY 20*

*Follow E HWY 20”*

End task at 9 minutes

* Attention: **Alphabetized City Names A** (10 minutes total: 2 min for instructions + 8 min for task)

**[Begin new Free Play session and introduce the task as follows]** *“For this task, you will drive around the city for about 8 minutes, doing your best to follow the rules of the road and practice safe driving. As you drive, I will provide you with directions on where to go and feedback on your driving. I’m also going to say some sets of words, including city names. Listen carefully, I can only say each set one time. When I am through, I want you to tell me if the city names were listed in alphabetical order. All you have to say is ‘yes’ or ‘no.’*

*For example, if I say ‘Cleveland, telephone, Richmond,’ what would you say?”* **[Correct answer is “yes.”]**

1. If response is incorrect, say *“That’s not quite right. I said ‘Cleveland, telephone, Richmond,’ so you would say ‘yes’ because the two city names, Cleveland and Richmond, are in alphabetical order. Let’s try another. If I said ‘Lexington, egg, Gainesville,’ what would you say?”*
	1. If response is correct, say: *“That’s right. Any questions?”* Answer any questions, then say, *“Now let’s try some while you drive in the simulator.”*
	2. If response is incorrect, say, *“That’s not quite right. I said ‘Lexington, egg, Gainesville,’ so you would say ‘no’ because the two city names, Lexington and Gainesville, are not in alphabetical order. Remember, you should only be concerned whether the city names are in alphabetical order, not the other words. Any questions?”* Answer any questions, then say, *“Let’s try some while you drive in the simulator.”*
2. If response is correct, say *“That’s right, and remember you are only concerned with whether the city names are in alphabetical order, not the other words. Any questions?”* Answer any questions, then say, *“Let’s try some while you drive in the simulator.”*

*“Start driving forward.”*Start stopwatch. Administer Set 1 from Primary subtest sheet.

* If participant misses three consecutive items within the same set, begin administering items from the fixed length Alphabetized City Names sheet corresponding to span length of the previous set.
	+ If this occurs on the Set 1, administer 3-item subtest sheet for duration of the task
	+ Slow pace of administration if necessary.
	+ **Please note, some leniency can be given at the DRS’s discretion if the participant misses a trial because he/she was interrupted by the DRS.**
* End task at 8 minutes.

Driving Directions

*“Follow the road as it curves to the left then merge onto E HWY 20*

*Turn left at 6th St*

*Turn left at Jefferson*

*Follow Jefferson as it curves around*

*Turn right on N Broadway*

*Turn right on Beltway (no street sign)*

*Follow Beltway around”*

End task at 8 minutes

* **Break (5 minutes)**
* Working Memory: **Digit Sequencing** (10 minutes total: 2 min for instructions + 8 min for task)

**[Begin new Free Play session]** *“For this task, you will drive around the city for about 8 minutes, doing your best to follow the rules of the road and practice safe driving. As you drive, I will provide you with directions on where to go and feedback on your driving. I’m also going to say some sets of numbers that I want you to repeat, but in order, from lowest to highest. Listen carefully, I can only say each set one time. When I am through with a set, I want you to tell me the numbers in order, starting with the lowest number.*

*For example, if I say 2-3-1, what would you say?”* **[Correct answer is 1-2-3]**

1. If response is incorrect, say *“That’s not quite right. I said 2-3-1, so to say them in order from lowest to highest, you should say, 1-2-3. Let’s try another: If I say 3-9-4, what would you say?”*
	1. If response is correct, say *“That’s right. Any questions?”*Answer any questions then say, *“Ok, now let’s try some while you drive in the simulator. Remember to say the numbers in order from lowest to highest. Go ahead and drive forward.”*
	2. If response is incorrect, say *“That’s not quite right. I said 3-9-4, so to say them in order from lowest to highest, you should say, 3-4-9. Let’s try some while you drive in the simulator. Remember to say the numbers in order from lowest to highest.”*
2. If response is correct, say *“That’s right. Any questions?”* Answer any questions then say, *“Ok, now let’s try some while you drive in the simulator. Remember to say the numbers in order from lowest to highest.”*

*“Start driving forward.”*Start stopwatch. Administer Set 1 from Primary subtest sheet.

* If participant misses three consecutive items within the same set, begin administering items from the fixed length Digit Span Sequencing sheet corresponding to span length of the previous set.
	+ If this occurs on the Set 1, administer 2 Digit subtest sheet for duration of the task
	+ Slow pace of administration if necessary.
	+ **Please note, some leniency can be given at the DRS’s discretion if the participant misses a trial because he/she was interrupted by the DRS.**
* End task at 8 minutes.

Driving Directions

*“Follow the road as it curves to the left then merge onto E HWY 20*

*Turn Left at 6th St*

*Turn Left at Jefferson*

*Follow Jefferson as it curves around*

*Turn Right on N 8th St*

*Turn Right on West Washington*

*Take the first right onto N Broadway*

*Turn Right onto Roundabout*

*Turn Right on N 8th St*

*Turn Right on West Washington*

*Turn Right on N Broadway”*

End task at 8 minutes

▪ Review Component Task (5 minutes)

Integration

▪ Real World Scenario: **Scenario 2** (15 minutes total)

***Short Shopping Lists***

**[Begin new Free Play session]**

Encourage participant to get comfortable in the seat and buckle seat belt, then read instructions:

*“The next task I will have you do in the simulator is meant to be more like a situation someone might experience in real life. As always, remember to follow all the normal rules of the road and pay attention to the driving directions and feedback I provide as you go through the task.*

*Now, you are going shopping at stores around town. I will tell you a short list of items that you need to buy. I will tell you the directions to drive to each place as we go. When we arrive at each store, you have to remember the list of items that you need and then tell them back to me. Any questions?”*

**Answer any questions, start stopwatch to help keep track of time, then proceed with remaining directions:**

Directions to each stop

*“First, you will drive to the movie theater. While you are there, you are to pick up a ticket to an action movie.”*

**To Theater: (~2 min)**

*“Go straight*

*Turn Right on S. Broadway*

*Turn Right on Mariner Ave.*

*Follow the curving road*

*Turn Left to continue on Mariner Ave.*

*{Theater is on the left} Pull over and stop at the theater*

*Please tell me what item you are picking up here.”* [Correct answer: ticket to an action movie]

*“Next, you are going to Pizza Pitstop. While you are there, you are to pick up a large pepperoni pizza and an order of wings.”*

**To Pizza Pitstop: (~3 min)**

*“First, put your turn signal on, check to make sure the road is clear, then stop at the stop sign and proceed through the intersection on Mariner Ave.*

*Follow the road*

*Turn Right on W. Hwy 20*

*Turn Left on Jefferson*

*{Pizza Pitstop on left} Pull over and stop at Pizza Pitstop”*

*“Tell me what items you are picking up here.”* [Correct answer: a large pepperoni pizza and an order of wings]

*“Great. Next, you are going to the hospital gift shop. While you are there to pick up a get-well card, a balloon, and a flower arrangement.”*

**To Hospital: (~3 min)**

*“Put your turn signal on, check to make sure the road is clear, then continue on Jefferson*

*Turn Left on N. 8th St.*

*Turn Right on Expressway.*

*Turn Right on N. Broadway.*

*{Hospital on right} Pull over and park next to the hospital.*

*Tell me what items you are picking up here.”* [Correct answer: a get-well card, a balloon, and a flower arrangement]

*“Next, you are going to KARS Auto Shop. While you are there, you are to pick up 1 bottle of motor oil, 2 windshield wipers, and an air filter.”*

**To KARS: (~3 min)**

*“Put your turn signal on, check to make sure the road is clear, then proceed forward*

*Turn Left on Jefferson*

*Turn Right on N. 7th*

*Turn Right on Roundabout, KARS will be just ahead on the right*

*Pull over on right at intersection of Roundabout and N. Broadway and stop at KARS*

*Tell me what items you are picking up here.”* [Correct answer: 1 bottle of motor oil, 2 windshield wipers, and an air filter] “*Great job! That was the last of the errands. Stay seated and I’ll explain the next task.”*

[**Do not exit current Free Play session]**

Directions to alternate location and item to remember

**To Grene Willows from E Hwy 20:**

*“Put your turn signal on, check to make sure the road is clear, then turn right on Roundabout*

*Turn Right on N. 8th St.*

*Turn Right on Jefferson*

*Grene Willows will be on the right. Pull over and stop at Grene Willows.”*

**Items:** 2 loaves of bread

Driving route: From KARS to the third house on the left in Lynx Loop neighborhood.

**[Note: Team member 1 should monitor audio and give directions; Team member 2 should score items and provide feedback on task instructions]**

***Weather Report 1: city names embedded; participant indicates whether city starts with a vowel.***

[**Keep previous Free Play session open,** but have participant remain parked while preparing audio stimuli and reading task instructions**]**

*“For this task, you are driving over to a friend’s house for a party. I will give you directions so that you can drive us there. While you drive us to his house, we will listen to a weather report on the radio. It will talk about the temperatures and weather conditions in different cities across the country. Your job is to listen carefully to the report, and when you hear a city name that begins with a vowel -- A, E, I, O, or U -- say the word “****vowel****” as quickly as you can.*

*For example, if the report said “Atlanta, 79 and clear,” what would you say?* **[“Vowel”]**

*That’s correct; you would say “****vowel****,” because Atlanta starts with a vowel.*

*If the report said “Richmond, 81 and partly cloudy,” what would you say?* **[\*silence\*]**

*Right; you would not say anything, because Richmond does not start with a vowel.*

*While you are listening and responding to the report, be sure to follow the rules of the road, pay attention to any feedback that I give you on your driving, and listen to the directions that I provide so that we travel safely and not get lost. Any questions?* [Answer any questions.] *Great, as a reminder: say “****vowel****” whenever you hear a city name that begins with a vowel. Otherwise, say nothing.”*

Directions to the third house on the left in the residential neighborhood (~3-4 min)

*“Turn on your turn signal, check to make sure road is clear, then drive Forward*

*Quick right onto Broadway*

*Ok, I’ll turn the radio on now* **[Start playing radio report audio]**

**[Start directions here if at Grene Willows]**

*Turn right on Jefferson Ave*

*Turn right on 6th St*

*Turn left onto Mariner Ave*

*Turn left on Lynx Loop*

*It is the third house on the left. Just pull over and park on the street in front of the house.”*[Interject directions as appropriate]

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **City** | **Region** | **Temperature/Weather** | **Response** |  **Score** | **Warning** |
| **Arlington** | **Mid-Atlantic** | **69, light rain** |  | 0 1 |  |
| Baltimore | Mid-Atlantic | 75, heavy rain |  |  |  |
| Washington, DC | Mid-Atlantic | 71, overcast |  |  |  |
| Chicago | Midwest | 64, rain |  |  |  |
| Cleveland | Midwest | 75, mostly cloudy |  |  |  |
| Detroit  | Midwest | 65, clear |  |  |  |
| **Indianapolis** | **Midwest** | **66, thunderstorms** |  | 0 1 |  |
| **Iowa City** | **Midwest** | **67, clear** |  | 0 1 |  |
| Kansas City | Midwest | 66, clear |  |  |  |
| Milwaukee | Midwest | 59, overcast |  |  |  |
| Minneapolis | Midwest | 68, clear |  |  |  |
| **Oklahoma City** | **Midwest** | **73, partly cloudy** |  | 0 1 |  |
| **Omaha** | **Midwest** | **67, mostly sunny** |  | 0 1 |  |
| St. Louis | Midwest | 71, partly cloudy |  |  |  |
| Tulsa | Midwest | 68, sunny |  |  |  |
| Wichita | Midwest | 68, mostly cloudy |  |  |  |
| Boston | New England | 78, light rain |  |  |  |
| Providence | New England | 76, mostly cloudy |  |  |  |
| **Utica** | **New England** | **63, light rain** |  | 0 1 |  |
| New York City | Northeast | 78, heavy rain |  |  |  |
| Philadelphia | Northeast | 78, overcast |  |  |  |
| Portland | Northeast | 64, overcast |  |  |  |
| **Atlanta** | **South** | **79, clear** |  | 0 1 |  |
| **Austin** | **South** | **82, partly cloudy** |  | 0 1 |  |
| Charlotte | South | 79, thunderstorms |  |  |  |
| Dallas | South | 84, clear |  |  |  |
| **El Paso** | **South** | **75, mostly cloudy** |  | 0 1 |  |
| Fort Worth | South | 90, partly cloudy |  |  |  |
| Houston | South | 93, scattered clouds |  |  |  |
| Jacksonville | South | 88, mostly cloudy |  |  |  |
| Memphis | South | 88, mostly cloudy |  |  |  |
| Miami | South | 88, clear |  |  |  |
| Nashville | South | 83, cloudy |  |  |  |
| New Orleans | South | 84, thunderstorms |  |  |  |
| **Albuquerque** | **Southwest** | **80, mostly sunny** |  | 0 1 |  |
| Phoenix | Southwest | 99, light rain |  |  |  |
| San Antonio | Southwest | 88, overcast |  |  |  |
| Tucson | Southwest | 89, clear |  |  |  |
| **Anchorage** | **West** | **55, overcast** |  | 0 1 |  |
| Colorado Springs | West | 76, partly cloudy |  |  |  |
| Denver | West | 79, clear |  |  |  |
| Fresno | West | 81, sunny |  |  |  |
| Honolulu | West | 75, mostly cloudy |  |  |  |
| Las Vegas | West | 85, partly cloudy |  |  |  |
| Los Angeles | West | 74, clear |  |  |  |
| **Oakland** | **West** | **68, overcast** |  | 0 1 |  |
| Sacramento | West | 66, partly cloudy |  |  |  |
| San Diego | West | 71, partly cloudy |  |  |  |
| San Francisco | West | 64, clear |  |  |  |
| Seattle | West | 67, light rain |  |  |  |
| **Total Errors** |  | **Total Score** |  /12 | **Total Warnings**  |  |
| **Notes:** |  |

\*Items in **bold** begin with vowels, audio runs approximately 2:30 minutes

▪ Review (5 minutes)

Closing

▪ Race Track (8 minutes total: 2 min for instruction + 6 min for task)

[**Download Warrior Speedway scenario from DGS site, using Driver username and Study name corresponding to participant and intervention session. Next, click “Begin” on DGS control panel to initiate scenario]***“As a reward for your hard work, before you leave today, you will get to drive around the simulated race track again. Here, you should still attempt to stay on the track and avoid any collisions. Go ahead and start.”*

**[Click “Bypass Practice” on DGS control panel, then click “Test”]**

(4 minutes of racing)

*“Okay, come to a stop. To get you back into the mindset of following regular driving laws, we will have you drive around the track while maintaining a typical speed of 50 MPH. Go ahead.”* [DRS will comment on participant’s driving: reminding him or her to maintain appropriate speed, signal when changing lanes, etc.] (2 minutes of normal driving)

▪ Overall Review & Self-Assessment: Summarize the session by individual section. (5 minutes)

[Potential aspects to discuss: lane position; maintaining speed; ability to pay attention to signs, traffic signals, other cars (if applicable), etc.; ability to respond to feedback from the DRS (can provide examples); using turn signal appropriately (or vocalizing turn signal if hardware is nonfunctional); how participant performed on cognitive task (how it compared to past performance); etc.]

**Session 3**

Self-Assessment & Review

At the beginning of the session, the NeuroDRIVE Driving Rehabilitation Specialist (DRS) will welcome the participant. Next, the DRS will query the participant on driving issues that they may currently be experiencing during real world driving. Use Self-Report Driving Assessment form for this portion. If issues are reported, prompt the participant to rate the frequency of the issue on a Likert scale of 1-10 (1 = very rarely, 5 = sometimes, 10 = almost always).

*“With last week’s driving fresh in your mind, let’s talk about specific issues that you or your passengers have noticed.*

*For example: some people have a hard time staying in their lane, while others find that they end up sitting at traffic lights even after they have turned green. What sort of driving issues have you had over the past week?”*

Then the DRS will review issues seen during the VR assessment:

*“Do you remember the driving tasks that you completed the last time you were here? You did really well on X, Y, and Z* (e.g., maintaining your speed, staying within your lane, giving yourself enough room to stop safely, etc.)*. You had some difficulty on A, B, and C…*(report issues.) *These are some things you may want to keep in mind while driving the simulator today.”*

\*\*Throughout intervention session, DRS should be careful to pay special attention to any driving issues participant reports and any issues observed in earlier VR sessions.

Time: 5-10 minutes

**Component Training**

Training Intro

*“We are going to do a variety of tasks during the session today. You may find some of these tasks to be easy, while others may be more difficult. Even if they are easy, try to do them carefully. If you find something difficult, just give your best effort.* ***You are not being graded on your performance.”***

Driving

▪ Driving Route: Tactical 2

Here, the participant will drive a guided route and receive spoken driving directions from the computer. The DRS will provide minimal feedback on inappropriate driving behaviors. At the end of the driving session, the DRS will review the inappropriate behaviors.

Script for Tactical Route 2

[**Download Tactical Scenario A2 from DGS site, using Driver username and Study name corresponding to that participant and intervention session]***“For this task, you will receive driving directions from the computer to tell you where to go and I will provide you with feedback on your driving. Unlike many of our tasks, in this one you will also have to deal with other moving vehicles. Just like in the real world, these other vehicles can sometimes behave unpredictably, so pay close attention to your own driving and to the other vehicles around you. Do you have any questions?*” **[**Answer any questions, then **click “Begin” on DGS control panel and allow instructions to play. Next, click “Bypass Practice” on DGS control panel, then click “Test”]**

Time: 10 minutes

Cognitive

* Attention: **Target Spotting** (11 minutes total: 3 min for instructions + 8 min for task)

**[Begin new Free Play session]** *“This task is very similar to one you did in the first intervention session. I will show you a couple pictures of particular buildings. I want you to pay close attention to each picture because you’ll need to spot each of these buildings while you drive. I will give you directions on what route to take, but it is important that you do your best to maintain the proper speed, lane position, etc. and be aware of your surroundings while looking for the buildings. Make sure to let me know as soon as you spot each building.”*

[Show the participant each of the pictures, one at a time. Convention Center and Hospital are primary targets, with KARS is an alternate destination. Make sure they have enough time to remember what they look like. If the driver misses a building during the task, quickly have them pull over and show them the building in the VR environment, if still visible, then have them continue.]

“*Ok let’s get started. Drive forward.*

*Follow the road as it curves and merges onto E. Highway 20*

*Turn left on 5th St.”*

[**Convention Center** is at the intersection of 5th St and Jefferson Ave.]

“*Turn right on Jefferson Ave.*

*Turn left on Lamar Ln.*

*Turn left on Expressway (be sure to keep your speed at or below 40 mph)*

[**Hospital** is at the intersection of N. Broadway and Expressway]

Alternate destination directions, if necessary: “*Turn left on N. Broadway”* (**KARS** is at intersection of N. Broadway and Roundabout)

* Working Memory: **Digit Backward** (10 minutes total: 3 min for instructions + 7 min for task)

**[Begin new Free Play session]** *“For this task, you will drive around the city for about 7 minutes, doing your best to follow the rules of the road and practice safe driving. As you drive, I will provide you with directions on where to go and feedback on your driving. I’m also going to say some sets of numbers that I want you to repeat, but in reverse order. Listen carefully, I can only say each set one time. When I am through, I want you to say the numbers backward. For example, if I say 8-2, what would you say?”*

* 1. If response is incorrect, say *“That’s not quite right. I said 8-2, so to say them backward, you should say 2-8. Any questions?”*
	2. If response is correct, say *“That’s right. Any questions?”*

[Proceed to Trial 2 of Set 1a.]*“Let’s try another one. Remember to say them backward. 4-5.”*

1. If response is incorrect, say *“That’s not quite right. I said 4-5, so to say them backward you should say 5-4. Start driving and let’s try some more.”*
2. If the response is correct, say *“That’s right. Start driving and let’s try some more.”*

[Start stopwatch. Finish administering Set 1 from subtest sheet then proceed to Set 2a if the Alternate Set criterion has not been met:

* If participant misses three consecutive items within the same set, begin administering items from the fixed length Digit Span Backward sheet corresponding to span length of the previous set.
	+ If this occurs on the Set 1, administer 2 Digit subtest sheet for duration of the task
	+ Slow pace of administration if necessary.
	+ **Please note, some leniency can be given at the DRS’s discretion if the participant misses a trial because he/she was interrupted by the DRS.**
* End task at 7 minutes.
* If participant continues to violate laws and/or regulations and is unresponsive to DRS feedback in all three trial sets of the same sequence, discontinue the task early.]

Driving Directions

*“Follow the road as it curves to the left, then merge onto E HWY 20*

*Turn Left at 6th St*

*Turn Left at Jefferson*

*Follow Jefferson as it curves around*

*Turn Right on N Broadway*

*Turn Right on Beltway (no street sign)*

*Follow Beltway around until task completion”* End task at 7 minutes

* **Break (5 minutes)**
* Working Memory: **Executive Response Inhibition** (7 minutes)

**[Download Executive Response Inhibition scenario from DGS site, using Driver username and Study name corresponding to participant and intervention session]**

*“For this task, you’ll be doing an automated task similar to one you did before. You will need to steer and brake according to the specific instructions for this task, but you will not be able to control your speed. You will, however, need to maintain consistent pressure on the gas pedal. You’ll hear a high-pitched tone if you’re pushing too hard on the gas, or a low-pitched tone if you aren’t pushing hard enough.”*

**“***Ok, now I’ll load the task. Listen carefully to the computer’s instructions, and please let me know if you have any questions or want to hear the instructions again. You will have a chance to practice before the task itself.”*

**[Click “Begin” on DGS control panel and allow instructions to play. Next, click “Practice” and allow participant to complete practice, then click “Test” and allow participant to complete test. Record answers for practice and test in DGS control panel]**

▪ Review Component Task (3 to 5 minutes)

Integration

▪ Real World Scenario: **Scenario 3** (15 minutes total)

**Kid Questions**

**[Begin new Free Play session,** encourage participant to get comfortable in the seat and buckle seat belt, then read instructions]

*“The next task I will have you do in the simulator is meant to be more like a situation someone might experience in real life. As always, remember to follow all the normal rules of the road and pay attention to the driving directions and feedback as you go through the task.*

*For this task, you are taking some friends and their kids to the movies. On the way, they are asking you a whole bunch of yes or no questions. Some of these questions are a bit silly, but they are all meant to be straightforward “yes” or “no” questions. They are not meant to trick you, so just answer “yes” or “no” as quickly as you can and drive safely. Again, be sure to pay attention to any feedback that I provide on how you are driving and the driving directions that I give you so you do not get lost along the way. Any questions?”*

**[Answer any questions, start stopwatch, then proceed with driving directions.]** (Directions in **bold** are embedded at approximate intervals)

Directions to the Northside Theater from standard start point (about 7-8 minutes)

*Drive Forward and we’ll start with the yes/no questions* **[Start reading questions]**

*Follow the curve in the street to the left.*

*Merge onto E. Hwy 20*

*Turn Left on 5th St.*

*Turn Left on Jefferson Ave. and follow the road as it curves*

*Turn Right on N. 8th St.*

*Theater is on the right, pull over in front and park at a meter.*

|  |
| --- |
| Kid Questions |
| Question | **Response** | **Correct Response** | **Score** | **Warning** |
| *Drive Forward* |
| *1) Can most birds fly?* |  | Y | 0 1 |  |
| *2) Do you wear shoes on your hands?* |  | N | 0 1 |  |
| *3) Do fish swim?* |  | Y | 0 1 |  |
| *4) Does wood come from trees?* |  | Y | 0 1 |  |
| *Follow the road as it curves to the Left and Merge onto E. Hwy 20* |
|
| *5) Can you write with a pencil?* |  | Y | 0 1 |  |
| *6) Do trains ride on highways?* |  | N | 0 1 |  |
| *7) Do chickens lay eggs?* |  | Y | 0 1 |  |
| *8) Do worms live underground?* |  | Y | 0 1 |  |
| *9) Do bees make honey?* |  | Y | 0 1 |  |
| *Turn Left on 5th St.* |
| *10) Do frogs hop?* |  | Y | 0 1 |  |
| *11) Is Wednesday the last day of the calendar week?* |  | N | 0 1 |  |
| *12) Can you eat pie with a fork?* |  | Y | 0 1 |  |
| *Turn Left on Jefferson Ave.* |
| *13) Can you stay at a hotel for more than one night?* |  | Y | 0 1 |  |
| *14) Is a baseball the same size as a basketball?* |  | N | 0 1 |  |
| *15) Do dogs bark?* |  | Y | 0 1 |  |
| *16) Is winter a season of the year?* |  | Y | 0 1 |  |
| *17) Do you need to put gasoline in a normal bicycle?* |  | N | 0 1 |  |
| *18) Is the Thanksgiving holiday in the Summer?* |  | N | 0 1 |  |
| *19) Is snow green?* |  | N | 0 1 |  |
| *20) Do you wear shoes on your feet?* |  | Y | 0 1 |  |
| *Turn Right on N. 8th St.* |
| *21) Do beaches have sand?* |  | Y | 0 1 |  |
| *22) Do dogs climb trees?* |  | N | 0 1 |  |
| *23) Does grass grow out of the ground?* |  | Y | 0 1 |  |
| *24) Does a normal calendar have both days and weeks?* |  | Y | 0 1 |  |
| *25) Do you eat soup with a knife?* |  | N | 0 1 |  |
| *26) Do cows moo?* |  | Y | 0 1 |  |
| *27) Do people usually use keys to comb their hair?* |  | N | 0 1 |  |
| *28) Can a photo album hold many pictures?* |  | Y | 0 1 |  |
| *29) Do birds build nests?* |  | Y | 0 1 |  |
| *30) Do squirrels have tails?* |  | Y | 0 1 |  |
| *31) Is grass purple?* |  | N | 0 1 |  |
| *32) Are you supposed to swallow gum?* |  | N | 0 1 |  |
| *33) Is May the first month of the year?* |  | N | 0 1 |  |
| *Theater is on the Right, pull over at a meter and park* |
| *34) Can a person drink milk through a straw?* |  | Y | 0 1 |  |
| *35) Are there 60 seconds in a minute?* |  | Y | 0 1 |  |
| *36) Do hospitals usually have doctors and nurses?* |  | Y | 0 1 |  |
| *37) Do you wear gloves on your feet?* |  | N | 0 1 |  |
| *38) Are there many fish in the ocean?* |  | Y | 0 1 |  |
| *39) Are pitchers used to pour water?* |  | Y | 0 1 |  |
| *40) Do cars need new engines every year?* |  | N | 0 1 |  |
| *41) Do some men have long hair?* |  | Y | 0 1 |  |
| *42) Does the month of June come before March?* |  | Y | 0 1 |  |
| *43) Do most houses have doors?* |  | Y | 0 1 |  |
| Additional Items (If necessary) |
| *44) Is the Sun smaller than the Earth?* |  | N | 0 1 |  |
| *45) Is New Year’s Eve in October?* |  | N | 0 1 |  |
| *46) Does rain fall from clouds?* |  | Y | 0 1 |  |
| *47) Do buildings have walls?* |  | Y | 0 1 |  |
| *48) Do fire engines have lights?* |  | Y | 0 1 |  |
| Total Attempted: |  | **Total Correct:** |  | **Total Warnings:** |
| Notes: |  |

**Water Park**

[**Keep previous Free Play session open**, but have participant remain parked while reading instructions for Water Park task]*“Very good. Now you are taking the kids to the water park on the other side of town. I will provide directions to the water park as you drive. To demonstrate the importance of math skills to these kids, you will be answering water park related math problems* *as we go. Try to answer the questions as best you can,but be sure to follow the rules of the road and listen to the feedback and driving directions that I give you. Any questions?”* [Answer any questions, start stopwatch to help keep track of time, then proceed with driving directions.]

Directions to the Water Park from the Theater (about 7-8 minutes)

*Put on your turn signal, check to make sure the road is clear, then drive Forward* (*and we’ll get started with the math problems)*

*Turn Right onto the Beltway, (keep speed at or below 35 mph), and prepare to take the next right*

*Turn Right onto the next street, which is* ***unmarked***

*Turn Right on Roundabout*

*Follow the road as it curves to the left and merge onto W. Hwy 20*

*Follow the road as it curves, and keep your speed at or below 40 mph*

*Turn Right at Expressway*

*Turn Right at the water park and then park in any space on the right hand side.*

[Directions in **bold** are embedded at approximate intervals]

|  |
| --- |
| **Water Park Math Problems** |
| **Math Problem** | **Response** | **Correct Response** | **Score** | **Warning** | **Difficulty** |
| *Dave brought $10 to spend on snacks at the water park. If he spent $5 on hot dogs, how much does he have left?* |   | 5 | 0 1 |   | 1 |
| *There are 5 lifeguards at the large pool and 2 lifeguards at the small pool. How many total lifeguards are there at the two pools?* |   | 7 | 0 1 |   | 1 |
| *John brought 4 beach balls to the waterpark, but lost 2 of them. How many are left?* |   | 2 | 0 1 |   | 1 |
| *It takes 5 minutes to ride the log flume once. How long would it take to ride it 3 times?* |   | 15 | 0 1 |   | 2 |
| *The park had 6 water slides last year and added 3 more this year. How many slides do they have now?* |   | 9 | 0 1 |   | 1 |
| *James bought 3 cans of soda at the park and drank 1. How many sodas does he have left?* |   | 2 | 0 1 |   | 1 |
| *Tickets to the water park are $12 each. How much do 3 tickets cost?* |   | 36 | 0 1 |   | 2 |
| *Robin finds 4 seashells and gives 2 to her brother. How many does she have left?* |   | 2 | 0 1 |   | 1 |
| *There are 20 total chairs around the pool. If 15 of them are being used, how many unused pool chairs are left?* |   | 5 | 0 1 |   | 1 |
| *Ali swam for twice as long as Jim. If Jim swam for 15 minutes, how long did Ali swim for?* |   | 30 | 0 1 |   | 2 |
| *Bill rode the water slide once before lunch and three times after lunch. How many times did he ride it altogether?* |  | 4 | 0 1 |   | 1 |
| *Stephen fills up 10 water balloons, but 4 of them pop accidentally. How many are left?* |   | 6 | 0 1 |   | 1 |
| *Aaron’s 4 kids all need life jackets, but he could only bring 1. How many does he need to borrow from the water park?* |   | 3 | 0 1 |   | 1 |
| *George got to the park at 1pm, but had to leave at 2:30pm. How long was he there?* |   | 1.5 hours (90 min) | 0 1 |   | 1 |
| *Bobby has summer school and can’t go to the water park. Instead, he’s stuck doing math problems. If he can solve 7 math problems in 30 minutes, how many can he do in 60 minutes?* |   | 14 | 0 1 |   | 2 or 3 |
| *Keisha builds 3 sandcastles by herself and her father helps her build 2 more. How many sandcastles does she build altogether?* |   | 5 | 0 1 |   | 1 |
| *Micah put out 10 beach umbrellas. If he only opened 5 of them, how many closed umbrellas are left?* |   | 5 | 0 1 |   | 1 |
| *There are 20 people going to the water park and 5 seats in each car. How many cars are needed to make the trip?* |   | 4 | 0 1 |   | 2 |
| *Chase bought 8 popsicles and gave 6 away to his friends. How many popsicles does he have left for himself?* |   | 2 | 0 1 |   | 1 |
| *Julia swims 40 ft. across the pool and takes a break. She then swims the last 20 ft. across the pool. How far did she swim in all?* |   | 60 | 0 1 |   | 1 |
| *The small water slide is 20 ft. high. How tall is the large water slide if it is twice as high as the small one?* |   | 40 | 0 1 |   | 2 |
| *Ray brought 6 towels to the water park and 4 got wet. How many dry towels does he have left?* |   | 2 | 0 1 |   | 1 |
| *Jessica is carrying a tray with 4 hot dogs and 2 sodas. She spills one of the sodas. How many* ***hot dogs*** *does she have left?* |   | 4 | 0 1 |   | 2 |
| *The daily attendance at the waterpark has doubled compared to last year. If they had 600 visitors per day last year, how many do they have per day this year?* |  | 1200 | 0 1 |   | 2 |
| *Beth brings 6 arm floaties for her kids, but accidentally leaves 2 at the park. How many does she have left?* |   | 4 | 0 1 |   | 1 |
| *Michelle can carry 3 buckets of sand. Kelly can carry 2 buckets of sand. How many can they carry altogether?* |   | 5 | 0 1 |   | 1 |
| *Tina brings 3 water guns to the park. Joyce brings 2 more. How many water guns do they have combined?* |   | 5 | 0 1 |   | 1 |
| *Danny swam 2 laps in the pool. Tommy swam 4 times as many laps as Danny. How many laps did Tommy swim?* |   | 8 | 0 1 |   | 2 |
| *Pablo brought sandwiches to the park to share with his 2 younger siblings. If each sibling gets one sandwich and Pablo gets 2 sandwiches, how many did he bring?* |   | 4 | 0 1 |   | 1 or 2 |
| **Total Questions Attempted:** |  | **Total Correct:** |  |  **Total Warnings:** |  |
| **Notes:** |   |

\*Difficulty defined as follows: 1 = Addition and Subtraction, 2 = Multiplication, 3 = Algebraic

\*\*Responses should be scored “Correct” with or without corresponding units

▪ Review (2 to 5 minutes)

Closing

▪ Race Track (8 minutes total: 2 min for instruction + 6 min for task)

[**Download Warrior Speedway scenario from DGS site, using Driver username and Study name corresponding to participant and intervention session. Next, click “Begin” on DGS control panel to initiate scenario]***“As a reward for your hard work, before you leave today, you will get to drive around the race track in the simulator again. Here, you should still attempt to stay on the track and avoid any collisions. Go ahead and start.”* **[Click “Bypass Practice” on DGS control panel, then click “Test”]**

(4 minutes of racing)

*Okay, please come to a stop. To get you back into the mindset of following regular driving laws, we will have you drive around the track while maintaining a typical speed of 50 MPH. Go ahead.* (DRS will comment on participant’s driving: reminding him or her to maintain appropriate speed, signal when changing lanes, etc.) (2 minutes of normal driving)

▪ Overall Review & Self-Assessment: Summarize the session by individual section. (5 minutes)

[Potential aspects to discuss: lane position; speed; ability to pay attention to signs, traffic signals, other cars (if applicable), etc.; ability to respond to feedback from the DRS (provide examples); using turn signal appropriately (or vocalizing turn signal if hardware is nonfunctional); how participant performed on cognitive task (how it compared to past performance); etc.]

**Session 4**

Self-Assessment & Review

At the beginning of the session, the NeuroDRIVE Driving Rehabilitation Specialist (DRS) will welcome the participant. Next, the DRS will query the participant on driving issues that they may currently be experiencing during real world driving. Use Self-Report Driving Assessment form for this portion. If issues are reported, prompt the participant to rate the frequency of the issue on a Likert scale of 1-10 (1 = very rarely, 5 = sometimes, 10 = almost always).

*“With last week’s driving fresh in your mind, let’s talk about specific issues that you or your passengers have noticed.*

*For example: some people have a hard time staying in their lane, while others find that they end up sitting at traffic lights even after they have turned green. What sort of driving issues have you had over the past week?”*

Then the DRS will review issues seen during the VR assessment:

*“Do you remember the driving tasks that you completed the last time you were here? You did really well on X, Y, and Z* (e.g., maintaining your speed, staying within your lane, giving yourself enough room to stop safely, etc.)*. You had some difficulty on A, B, and C…*(report issues.) *These are some things you may want to keep in mind while driving the simulator today.”*

\*\*Throughout intervention session, DRS should be careful to pay special attention to any driving issues participant reports and any issues observed in earlier VR sessions.

Time: 5-10 minutes

**Component Training**

Training Intro

*“We are going to do a variety of tasks during the session today. As before, you may find some of these tasks to be easy, while others may be more difficult. Even if the tasks are easy, try to do them carefully. If you find something difficult, just give your best effort.* ***You are not being graded on your performance.”***

Driving

Driving Route: Tactical 2

**[Download Tactical Scenario A2 from DGS site, using Driver username and Study name corresponding to participant and intervention session]** Here, the participant will drive a guided route. The DRS will provide immediate feedback of inappropriate driving behaviors. At the end of the driving session, the DRS will review the number of inappropriate behaviors.

Script for Tactical 2:

*“For this task, the computer will tell you driving directions as you go, and I will provide you with feedback on your driving. In this task you will also have to deal with other moving vehicles. Just like in the real world, these other vehicles can sometimes behave unpredictably, so pay close attention to both your own driving and the other vehicles around you. Do you have any questions?”* **[**Answer any questions, then **click “Begin” on DGS control panel and allow instructions to play. Next, click “Bypass Practice” on DGS control panel, then click “Test”]**

Time: 15 minutes

Cognitive

* Attention: **Alphabetized City Names B** (11 minutes total: 3 min for instructions + 8 min for task)

**[Begin new Free Play session]** *“For this task, you will drive around the city for about 8 minutes, doing your best to follow the rules of the road and practice safe driving. As you drive, I will provide you with directions on where to go and feedback on your driving. I’m also going to say some sets of words that include city names. Listen carefully, I can only say each set one time. When I am through, I want you to tell me if the city names I said were listed in alphabetical order. All you have to say is ‘yes’ or ‘no.’ So for example, if I say ‘Detroit, house, Seattle,’ what would you say?”*

1. If response is *incorrect*, say *“That’s not quite right. I said ‘Detroit, house Seattle,’ so you would say ‘yes’ because the two city names, Detroit and Seattle, are in alphabetical order. Let’s try another. If I said ‘Charlottesville, pizza, Annapolis’ what would you say?”*
	1. If response is *correct*, say: *“That’s right. Any questions?”* Answer any questions, then say, *“Now let’s try some while you drive in the simulator.”*
	2. If response is *incorrect*, say, *“That’s not quite right. I said ‘Charlottesville, pizza, Annapolis,’ so you would say ‘no’ because the two city names, Charlottesville and Annapolis, are not in alphabetical order. Remember, you should only be concerned whether the city names are in alphabetical order, not the other words. Any questions?”* Answer any questions, then say, *“Ok, let’s try some while you drive in the simulator.”*

b. If response is correct, say *“That’s right, and remember you are only concerned with whether the city names are in alphabetical order, not the other words. Any questions?”* **[Answer any questions.]** *“Ok, let’s try some while you drive in the simulator.”*

*“Start driving forward.”*Start stopwatch. Administer Set 1 from Primary subtest sheet.

* If participant misses three consecutive items within the same set, begin administering items from the fixed length Alphabetized City Names sheet corresponding to span length of the previous set.
	+ If this occurs on the Set 1, administer 3-item subtest sheet for duration of the task
	+ Slow pace of administration if necessary.
	+ **Please note, some leniency can be given at the DRS’s discretion if the participant misses a trial because he/she was interrupted by the DRS.**
* End task at 8 minutes.
* If participant continues to violate laws and/or regulations and is unresponsive to DRS feedback in all three trial sets of the same sequence, discontinue the task early]

Driving Directions

*Drive forward*

*Follow the road as it curves to the left then merge onto E HWY 20*

*Turn Left at 6th St*

*Turn Left at Jefferson*

*Follow Jefferson as it curves around*

*Turn Right on N 8th St*

*Turn Right on West Washington*

*Take the first right onto N Broadway*

*Turn Right onto Roundabout*

*Turn Right on N 8th St*

*Turn Right on West Washington (2nd unmarked)*

*Turn Right on N Broadway (1st unmarked) -* [End task at 8 minutes]

* Working Memory: **Size Judgment A Smallest to Largest** (11 minutes total: 3 min for instructions + 8 min for task)

**[Begin new Free Play session and then introduce the task]** *“For this task, you will drive around the city for about 8 minutes, doing your best to follow the rules of the road and practice safe driving. As you drive, I will provide you with directions on where to go and feedback on your driving. I’m also going to say some sets of words, which may include animals, vehicles, household items, or other common objects. Listen carefully, I can only say each set one time. When I am through, I want you to tell me the words, in order by size, from smallest to largest. The objects are meant to have average, straightforward sizes, so just do the best you can to repeat them back in order from smallest to largest. For example, if I said “house, apple, pig,” what would you say?”*

* 1. If response is *incorrect*, say *“That’s not quite right. I said ‘house, apple, pig’ so to put them in size order from smallest to largest, you would say ‘apple, pig, house’ because an apple is smaller than a pig, which is smaller than a house. Let’s try another. If I said ‘car, egg, purse,’ what would you say?”*
		1. If response is *incorrect, say “That’s not quite right. I said ‘car, egg, purse,’ so to put them in order by size, from smallest to largest, you would say ‘egg, purse, car’ because an egg is smaller than a purse, which is smaller than a car. Any questions?”* Answer any questions then say, *“Let’s try some while you drive in the simulator. Remember to say them in order from smallest to largest.”*
		2. If response is correct, say *“That’s right. Any questions?”* Answer any questions then say, *“Let’s try some while you drive in the simulator. Remember to say them in order from smallest to largest.”*
	2. If response is correct, say *“That’s right. Any questions?”* Answer any questions then say, *“Ok, now let’s try some while you drive in the simulator. Remember to say them in order from smallest to largest.”*

*“Start driving forward and let’s try some.”* **[**Start stopwatch. Administer Set 1 from subtest sheet then proceed to Set 2a if the Alternate Set criterion has not been met:

* If participant misses three consecutive items within the same set, begin administering items from the fixed length Size Judgment Span A sheet corresponding to span length of the previous set.
	+ If this occurs on the Set 1, administer 3-item subtest sheet for duration of the task
	+ Slow pace of administration if necessary.
	+ **Please note, some leniency can be given at the DRS’s discretion if the participant misses a trial because he/she was interrupted by the DRS.**
* End task at 8 minutes.
* If participant continues to violate laws and/or regulations and is unresponsive to DRS feedback in all three trial sets of the same sequence, discontinue the task early]

Driving Directions

*Follow the road as it curves to the left then merge onto E HWY 20*

*Merge onto E HWY 20*

*Turn Left at Expressway (Keep 40 mph)*

*Turn Left on Jefferson*

*Turn Left on 6th*

*Turn Left on E HWY 20*

*Follow E HWY 20 -* [End task at 8 minutes]

* **Break (5 minutes) [Download Cognitive Divided Attention task, using Driver username and Study name corresponding to participant and intervention session]**
* Attention: **Cognitive Divided Attention** (9 minutes total: 2 min for instructions + 7 min for task)

“*Ok, for this task, the computer will control your speed and steering, but you will need to pay close attention to what is on the screen and tell me what you saw after each trial. Now, listen to the instructions and let me know afterwards if you have any questions or need to hear the instructions again. You will have a chance to practice before the task itself.”*

**[Click “Begin” on DGS control panel and allow instructions to play. Next, click “Practice” and allow participant to complete practice, then click “Test” and allow participant to complete test. Record answers for practice and test in DGS control panel]**

* Review Component Task (3 to 5 minutes)

Integration

**[These Integration scenarios are more easily administered with two examiners:**

**Person 1 should sit at the computer, playing the audio files and giving driving directions.**

**Person 2 should sit to the right/rear of the participant, scoring the participant’s responses and providing driving feedback.]**

▪ Real World Scenario: **Scenario 4** (20 minutes total)

[Prepare necessary subtest forms and audio stimuli for Traffic Update and Sports Radio broadcast. **Begin new Free Play session,** encourage participant to get comfortable in the seat and buckle seat belt, then read instructions.]

*“The next task I will have you do in the simulator is meant to be like a situation someone might experience in real life. There will not be any other cars in the scenario, but as always, remember to follow all the normal rules of the road and pay attention to the driving directions and feedback that I provide as you go through the task.”*

**Conflicting Radio Traffic Updates**

*“For this task, you are headed to the Annual Blueberry Festival at the Jefferson Convention Center, so you turn on the radio to listen for traffic updates. Because of construction in the area, certain streets are closed. The announcer will discuss the traffic, with periodic updates about different streets.*

*Each time they go to commercial break, I will ask you questions about specific road closures mentioned in that update. Your job is to tell me if each road was open or closed according to the latest update, while you drive us safely to the Blueberry Festival. (My colleague* or *I) will provide directions to get to the festival while you drive. While we want you to pay attention to the radio report, it is more important that you pay attention to your driving, including maintaining proper speed and paying attention to street signs and signals. Any questions?”*

**[Answer any questions, start stopwatch, then proceed with driving directions]**

Directions to the Convention Center from Comicover

*Make sure the car is in drive*

*Drive Forward*

*Turn Right on S. Broadway Street*

*Turn Left on Mariner* **[Start playing audio file after turn]**

*Turn Left on Expressway and follow it as it curves around (keep speed at or below 40 mph)*

*Turn Left on E. Highway 20 (continue to keep speed at/below 40 mph) and then move into the right lane*

*Turn Right on Big Street*

*Turn Right on 5th Street*

*Pull over and park at intersection with Jefferson Ave. before the stop sign.*

Audio text and corresponding questions:

1. *And now, here is the WSIM Radio Traffic Update: Andrews Avenue is closed due to construction. Eagle Street has been reopened after a repaving. East Highway 20 is open but West Highway 20 is closed due to an accident. This afternoon, there will be cloudy skies with a 50% chance of rain; high temperature of 82, low temperature of 73. We’ll be right back after this.* (26 seconds)
	* *What is the status of Eagle Street?* **Open**
	* *What is the status of West Highway 20?* **Closed**
	* *What is the status of East Highway 20?* **Open**
2. *This is WSIM, with another Radio Traffic Update. Construction on Andrews Avenue continues, so it remains closed. We recommend taking London Lane as an alternative route to get you where you need to be. Accident on West Highway 20 has been cleared and traffic is moving smoothly now on both East and West Highway 20. The new Valley Bridge is still closed but is set to open this afternoon. The rain has started, so be careful out there on the roads. Right now the temperature is 75 degrees. Back after this.* (31 seconds)
	* *What is the status of Andrews Avenue?* **Closed**
	* *What is the status of West Highway 20?* **Open**
	* *What is the status of Valley Bridge?* **Closed**
3. *WSIM, your traffic station. Our current Radio Traffic Update. After six months of building, the new Valley Bridge has opened, making traffic to nearby Moss Town much easier. East and West Highway 20 are clear. Andrews Avenue is pothole free and now is open to the public. Good thing, as London Lane has begun to flood due to the heavier rains; yes, London Lane is closed. Charles Avenue is an open and safe alternative to London Lane if you need to get to downtown. Pouring rain out there; it’s 72 degrees. We’ll be right back after this.* (36 seconds)
	* *What is the status of Valley Bridge?* **Open**
	* *What is the status of Andrews Avenue?* **Open**
	* *What is the status of London Lane?* **Closed**
4. *WSIM. Your Radio Traffic Update for Jefferson City. London Lane remains closed due to flooding, though city workers are out there attempting to unclog the drains and get that water moving. Andrews Avenue has seen little traffic lately but it is smooth and open. On the numbered streets: 5th and 8th are open, but 6th and 7th are closed due to preparations for the upcoming Blueberry Festival Parade. East and West Highway 20 are open with some light stop-and-go traffic. The rain seems to have let up; let’s hope this weather holds for the live music concert in the park tonight. Still 72 degrees; back after this.* (35 seconds)
	* *What is the status of East Highway 20?* **Open**
	* *What is the status of 5th Street?* **Open**
	* *What is the status of 6th Street?* **Closed**
5. *Welcome back to your Radio Traffic Update here on WSIM. The sun decided to peek out from behind the clouds; the temperature is heating up a bit. We’re at 80 degrees right now. The drains around London Lane have been unclogged, so it is now safe to drive. I just received an update; in the numbered streets downtown, 5th, 6th, and 8th, are open, only 7th is closed for parade preparation. Andrews Avenue is open. A truck has toppled over on West Highway 20, closing two of four lanes; East Highway 20 is still fully operational. You might want to take Charles Avenue to avoid the long lines on West Highway 20. Thanks for listening; this is WSIM.* (43 seconds)
	* *What is the status of 6th Street?* **Open**
	* *What is the status of 7th Street?* **Closed**
	* *What is the status of Andrews Avenue?* **Open**

[After audio task is complete,continue navigating the participant through the environment to the intersection at Jefferson Ave. **Keep this same Free Play session open** and proceed to Sports Radio instructions.]

**[Note: These Integration scenarios are more easily administered with two examiners:**

**Person 1 should sit at the computer, playing the audio files and giving driving directions.**

**Person 2 should sit to the right/rear of the participant, scoring the participant’s responses and providing driving feedback.]**

**Sports Radio: participants have to count the number of times they say a particular score.**

**[Stay in same Free Play session**, but have participant remain parked while introducing the task]

“*Now you are on your way to the Agate Country Club for your boss’s retirement party. On the way, you are listening to the radio to get updates on your favorite local sports team, the Jefferson City Jackalopes, who are playing against their cross-town rival, the Springfield Snails.*

*The problem is, there are several other games going on at the same time, so the announcer will be providing updates for different teams. Your job is to maintain your safe driving while listening for updates about the Jefferson City Jackalopes. When you hear a score update for the Jackalopes game vs the Snails, let me know by saying* ***“SCORE****.****”******Only say******“score”*** *when the score for* ***the Jackalopes game*** *is updated. I will provide directions to Agate Country Club as you drive.*

*Just to be clear, we just want you to* ***say the word “score,”*** *do not repeat the actual score. As before, it is more important to focus on your driving, such as following traffic signs and maintaining appropriate speed and lane position, but try your best to pay attention to the radio updates. Any questions?”*

**[Answer any questions, make sure stopwatch is still running (to help keep track of time), then proceed with driving directions]**

Directions from Convention Center to Country Club: (~7 min)

*“Put on your turn signal, look to make sure the way is clear, then turn Left onto Jefferson Ave*

*Ok, now I’ll turn the radio on.* **[Start playing audio]**

*Turn Right on N. 8th St.* (at the stop sign)

*Turn Left on Expressway*

*Left on the unmarked street immediately after Emerald Ave,* ***keep your speed at or below 40 mph****.*

*Turn Left on Emerald Ave*, ***keeping your speed at or below 40 mph***

*Turn Right onto Gravel Road at the sign for Agate Country Club*

*You will see Agate Country Club on your left; pull in and park next to the golf carts.”*

Sports Radio Broadcast Text

*Welcome back to WSIM for the Jefferson City Radio Sports Report! Here are the scores for the basketball games taking place now:*

*In Shelbyville, the Sharks currently trail the Iowa City Isotopes, 13-9, just over 4 minutes into the 1st quarter. In Austin, the game between the Colorado Wildcats and the Austin Sound is expected to tip-off in the next few minutes. This should be an interesting matchup because both teams are in first place in their respective divisions, and have not played each other in over 3 seasons, when Austin beat Colorado on a buzzer beating 3 pointer to win the league championship… In Carolina, the game between the San Diego Sails and Carolina Cougars has just returned from halftime with the score: San Diego 56, Carolina 46. The game had been tied until the San Diego Sails scored 10 unanswered points to close the half. Here in Jefferson City,* ***the Jefferson City Jackalopes have just finished the first quarter against the Springfield Snails, leading 22-14****. The score is below what we all expected as these are two of the top offensive teams in the league. We’ll be back after this on WSIM…* [5 second pause]

*In Shelbyville, the Sharks are having a hard time keeping pace with the Iowa City Isotopes, and now trail 30-17 at the end of the first quarter. The Shelbyville Sharks’ offense has really struggled to put up points after losing their top scorer, Jones, to injury in last week’s game against Carolina… Back in Austin, the game between the Colorado Wildcats and Austin Sound game has just tipped off, with the Colorado Wildcats holding an early 6-4 lead… Meanwhile, the Springfield Snails have come to life, going on a 12-4 scoring run to tie the game against* ***the Jefferson City Jackalopes at 26 points apiece****, 4 minutes into the second quarter. And remember, you’re listening to WSIM, Jefferson City’s sports leader!* [5 second pause]

*In Carolina, the Cougars have closed the gap with the San Diego Sails, now trailing 75-73 at the start of the fourth quarter. In Shelbyville, it’s Isotopes 35, Sharks 25. Here at home,* ***the Jefferson City Jackalopes have fought back against the Springfield Snails, taking a 36-30 lead*** *with 3 minutes to go in the second quarter. This game has continued to be a low scoring contest, but seems to be picking up. Back in Austin, the Sound are still ahead, leading the Colorado Wildcats 31-29 at the end of the first quarter. This has been a fun back and forth game so far, with both teams shooting the ball well. In Shelbyville, the Sharks are still struggling against a tough Isotopes defense, with Iowa City leading 41-29 at the end of the first half. Meanwhile,* ***the Jefferson City Jackalopes have added to their lead over the Springfield Snails, now up 42-33 at half-time****. Back in Carolina, the San Diego Sails lead the Carolina Cougars by 4 points, 87-83, with 2 minutes left in the game. San Diego has not lost a game when leading in the last 5 minutes all season… We’ll be back with more scores after this.* [5 second pause]

*Halfway through the 3rd quarter, the Springfield Snails have come back to take the lead against* ***the Jefferson City Jackalopes, now up 55-53****. In Austin, the Wildcats have a slight lead over the Sound, 51 to 49, with 5 minutes left in the first half. And in a surprise finish, the Carolina Cougars scored the final 6 points of the game to beat the San Diego Sails at the very end, 89 to 87. This is the first time all season that San Diego has lost a lead so late in a game. In Shelbyville, the Sharks are losing to the Isotopes, 55 to 41, midway through the 3rd quarter. Back home, the Jefferson City Jackalopes and Springfield Snails are still playing an exciting game,* ***with the Jefferson City Jackalopes leading the Springfield Snails 75-72*** *at the end of the third quarter. The end of the quarter finally brought the high-scoring performance we expected from these two teams… Back after this on WSIM.* [5 second pause]

*In Austin, the Sound now lead the Colorado Wildcats 60 to 55 at halftime, marking the largest lead of the game for either team after Austin’s star forward, Anderson, hit a long 3 point shot to close the half. And in Jefferson City, the game is now in the fourth quarter, with the* ***Jackalopes trailing the Springfield Snails, 95-90****, with less than two minutes left in the game. The Iowa City Isotopes have a comfortable lead over the Shelbyville Sharks, with a score of 67-50 at the start of the fourth quarter. The Colorado Wildcats have started off strong in the second half, now leading the Austin Sound by 4 points, 87-73, at the end of the third quarter. And this just in:* ***the Jefferson City Jackalopes have pulled out the victory, beating the Springfield Snails 96-95!*** *What a great defensive effort at the end of the game!* [5 second pause]

*Thanks for listening to the Jefferson City Radio Sports Report on WSIM, the leader in virtual radio broadcasting.*

▪ Review (5 minutes)

Closing

▪ Race Track (8 minutes total: 2 min for instruction + 6 min for task)

[**Download Warrior Speedway scenario from DGS site, using Driver username and Study name corresponding to participant and intervention session. Next, click “Begin” on DGS control panel to initiate scenario]***“As a reward for your hard work, before you leave today, you will get to drive around the race track in the simulator again. Here, you should still attempt to stay on the track and avoid any collisions. Go ahead and start.”* **[Click “Bypass Practice” on DGS control panel, then click “Test”]**(4 minutes of racing)

*“Okay, please come to a stop. To get you back into the mindset of following regular driving laws, we will have you drive around the track while maintaining a typical speed of 50 MPH. Go ahead.”* (DRS will comment on participant’s driving: reminding him or her to maintain appropriate speed, signal when changing lanes, etc.) (2 minutes of normal driving)

▪ Overall Review & Self-Assessment: Summarize the session by individual section. (5 minutes)

Potential aspects to discuss: lane position; maintaining speed; ability to pay attention to signs, traffic signals, other cars (if applicable), etc.; ability to respond to feedback from the DRS (can provide examples); using turn signal appropriately (or vocalizing turn signal if hardware is nonfunctional); how participant performed on cognitive task (how it compared to past performance); etc.

**Session 5**

Self-Assessment & Review

At the beginning of the session, the NeuroDRIVE Driving Rehabilitation Specialist (DRS) will welcome the participant. Next, the DRS will query the participant on driving issues that they may currently be experiencing during real world driving. Use Self-Report Driving Assessment form for this portion. If issues are reported, prompt the participant to rate the frequency of the issue on a Likert scale of 1-10 (1 = very rarely, 5 = sometimes, 10 = almost always).

*“With last week’s driving fresh in your mind, let’s talk about specific issues that you or your passengers have noticed.*

*For example: some people have a hard time staying in their lane, while others find that they end up sitting at traffic lights even after they have turned green. What sort of driving issues have you had over the past week?”*

Then the DRS will review issues seen during the VR assessment:

*“Do you remember the driving tasks that you completed the last time you were here? You did really well on X, Y, and Z* (e.g., maintaining your speed, staying within your lane, giving yourself enough room to stop safely, etc.)*. You had some difficulty on A, B, and C…*(report issues.) *These are some things you may want to keep in mind while driving the simulator today.”*

\*\*Throughout intervention session, DRS should be careful to pay special attention to any driving issues participant reports and any issues observed in earlier VR sessions.

Time: 5-10 minutes

**Component Training**

Training Intro

*“We are going to do a variety of tasks during the session today. You may find some of these tasks to be easy, while others may be more difficult. Even if they are easy, try to do them carefully. If you find something difficult, just give your best effort.* ***You are not being graded on your performance.”***

Driving

▪ Driving Route: Tactical 3

**[Download Tactical Scenario A3 from DGS site, using Driver username and Study name corresponding to participant and intervention session]** Here, the participant will drive a guided route. The DRS will provide immediate feedback of inappropriate driving behaviors. At the end of the driving session, the DRS will review the number of inappropriate behaviors.

Script for Tactical 3:

*“For this task, the computer will tell you driving directions as you go, and I will provide you with feedback on your driving. In this task you will also have to deal with other moving vehicles. Just like in the real world, these other vehicles can sometimes behave unpredictably, so be sure to pay close attention to both your driving and the other vehicles around you. Do you have any questions?”* [Answer any questions, then **click “Begin” on DGS control panel and allow instructions to play. Next, click “Bypass Practice” on DGS control panel, then click “Test”]**

Time: 15 minutes

Cognitive

* Working Memory: **Size Judgment B Largest to Smallest** (10 minutes total: 2 min for instructions + 8 min for task)

**[Begin new Free Play session]** *“For this task, you will drive around the city for about 8 minutes, doing your best to follow the rules of the road and practice safe driving. As you drive, I will provide you with directions on where to go and feedback on your driving. I’m also going to say some sets of words, which may include animals, vehicles, household items, or other common objects. Listen carefully, I can only say each set one time. When I am through, I want you to tell me the words, in order by size, from largest to smallest. The objects are meant to have average, straightforward sizes, so just do the best you can to repeat them back in order from largest to smallest. For example, if I said “table, carrot, barn,” what would you say?”*

1. If response is incorrect, say *“That’s not quite right. I said “table, carrot, barn,” so to put them in size order from largest to smallest, you would say “barn, table, carrot,” because a barn is larger than a table, which is larger than a carrot. Let’s try another. If I said ‘house, orange, suitcase,’ what would you say?”*
	1. If response is incorrect, say *“That’s not quite right. I said ‘house, orange, suitcase,’ so to put them in order by size, from largest to smallest, you would say ‘house, suitcase, orange’ because a house is larger than a suitcase, which is larger than an orange. Any questions?”* Answer any questions then say, *“Let’s try some while you drive in the simulator. Remember to say them in order from largest to smallest.”*
	2. If response is correct, say *“That’s right. Any questions?”* Answer any questions then say, *“Let’s try some while you drive in the simulator. Remember to say them in order from largest to smallest.”*

b. If response is correct, say *“That’s right. Any questions?”* Answer any questions then say, *“Ok, now let’s try some while you drive in the simulator. Remember to say them in order from largest to smallest.”*

*“Start driving forward.”* **[**Start stopwatch.] Administer Set 1 from subtest sheet then proceed to Set 2a if the Alternate Set criterion has not been met:

* If participant misses three consecutive items within the same set, begin administering items from the fixed length Size Judgment Span B sheet corresponding to span length of the previous set.
	+ If this occurs on the Set 1, administer 3-item subtest sheet for duration of the task
	+ Slow pace of administration if necessary.
	+ **Please note, some leniency can be given at the DRS’s discretion if the participant misses a trial because he/she was interrupted by the DRS.**
* End task at 8 minutes.
* If participant continues to violate laws and/or regulations and is unresponsive to DRS feedback in all three trial sets of the same sequence, discontinue the task early]

Driving Directions

*Follow the road as it curves to the left then merge onto E HWY 20*

*Merge onto E HWY 20*

*Left at Expressway (Keep 40 mph)*

*Left on Jefferson*

*Left on 6th*

*Left on E HWY 20*

*Follow E HWY 20 -* [End task at 8 minutes]

* Attention: **Cognitive** **Divided/Selective Attention** (7 minutes)

**[Download Cognitive Divided/Selective Attention scenario, using Driver username and Study name corresponding to participant and intervention session]** Introduce the task and explain that it is a computer based task that will have fixed speed and steering, but they will need to pay attention to what is on the screen. Initiate the task and allow automated directions to play. If necessary, have participant replay instructions and/or answer questions as needed. Proceed with Practice and then Test. Record answers for each trial on DGS control panel.

“*Ok, for this task, the computer will control your speed and steering, but you will need to pay close attention to what is on the screen and tell me what you saw after each trial. Now, listen to the instructions and let me know afterwards if you have any questions or need to hear the instructions again. You will have a chance to practice before the task itself.”*

**[Click “Begin” on DGS control panel and allow instructions to play. Next, click “Practice” and allow participant to complete practice, then click “Test” and allow participant to complete test. Record answers for practice and test in DGS control panel]**

* **Break (5 minutes)**
* Working Memory: Executive Working Memory (12 minutes)

**[Download Executive Working Memory scenario from DGS site, using Driver username and Study name corresponding to participant and intervention session]**

*“For this task, you’ll be doing another automated task, similar to some from earlier visits. You will need to steer and brake according to the instructions, but you will not be able to control your speed. You will, however, need to maintain consistent pressure on the gas pedal.*

*A high-pitched tone means that you’re pushing too hard on the gas. A low-pitched tone means you aren’t pushing hard enough. You will also need to pay attention to road signs along the course and you will be asked at the end of each trial to identify the signs you saw, in the order that you saw them.*

*Ok, now I’ll load the task. Listen carefully to the computer’s instructions, and please let me know if you have any questions or want to hear the instructions again before proceeding with the task. You will have a chance to practice before the task itself.”*

**[Click “Begin” on DGS control panel and allow instructions to play. Next, click “Practice” and allow participant to complete practice, then click “Test” and allow participant to complete test. Record answers for practice and test in DGS control panel]**

▪ Review Component Task (5 minutes)

**[Note: These Integration scenarios are more easily administered with two examiners:**

**Person 1 should sit at the computer, playing the audio files and giving driving directions.**

**Person 2 should sit to the right/rear of the participant, scoring the participant’s responses and providing driving feedback.]**

Integration

▪ Real World Scenario: **Scenario 5** (15-20 minutes)

[**Begin new Free Play session**, encourage participant to get comfortable in the seat and buckle seat belt, then read instructions.]

*“The next task I will have you do in the simulator is meant to be like a situation someone might experience in real life. As always, remember to follow all the normal rules of the road and pay attention to the driving directions and feedback I provide as you go through the task.”*

**List of items + 2:**

*“We are headed to the Grene Willows grocery store to pick up food and supplies to help a friend set up for a cook-out at his house. He gave us a list of items he wants us to pick up, but I need you to add 2 to the amount of each item and say the items and new amounts back to me. This way, we make sure there’ll be enough for you and me. For example, if I tell you we need “2 watermelons, 3 limes,” you would say “4 watermelons, 5 limes,” because you are adding* ***2 to the amount of each item on the list****. Does that make sense?”*

Make sure they understand the task, then say: *“As you drive, I will also be giving you directions on how to get to the Grene Willows grocery store. If there’s time, I may also ask you questions about your surroundings, such as what was the last road sign you passed.* [Questions are in **bold**]

*Do you have any other questions?”* [Answer any questions] “*Ok, start driving.”* [Start stopwatch.]

Directions to Grene Willows from standard start point: (~7min)

*“Go forward...ok now I’ll start reading the items.”* [If necessary, prompt them to remember to add 2 to the amount of each item.]

*“Turn Right on 7th St* (***What type of official vehicle did you just pass?*** Police car)

*Turn Right on Mariner Ave* (***What type of store did you just pass?***pharmacy)

*Follow the road as it curves and turn left to stay on Mariner*

*Turn Right on 9th St* (***What was the posted speed limit you just passed?*** 40 mph)

*Turn Right on Jefferson Ave*

*Turn Left on 8th St.*

*Turn Right on Jefferson Ave.,*

(***What was the name of the business you just passed on the right?*** Bake-a-Dozen)

*Pull over and park in front of Grene Willows, on the right.”*

|  |
| --- |
| Scenario 5 - List of Items +2 |
| Items | **Response** | **Correct Response** | **Score** | **Warning** |
| *4 Plates* |  | 6 Plates | 0 1 |  |
| *3 Jars of Frosting* |  | 5 Jars of Frosting | 0 1 |  |
| *3 Sodas* |  | 5 Sodas | 0 1 |  |
| *1 Pinata*  |  | 3 Pinatas | 0 1 |  |
| *5 Gift Boxes* |  | 7 Gift Boxes | 0 1 |  |
| *10 Cups* |  | 12 Cups | 0 1 |  |
| *6 Frisbees* |  | 8 Frisbees | 0 1 |  |
| *2 Picnic Blankets* |  | 4 Picnic Blankets | 0 1 |  |
| *3 Baked Potatoes* |  | 5 Baked Potatoes | 0 1 |  |
| *5 Pairs of Sunglasses* |  | 7 Pairs of Sunglasses | 0 1 |  |
| *3 Bags of Chips,* *1 Jar of Salsa* |  | 5 Bags of Chips, 3 Jars of Salsa | 0 1 |  |
| *1 Pie, 6 Cupcakes* |  | 3 Pies, 8 Cupcakes | 0 1 |  |
| *2 Ribbons, 3 Bows* |  | 4 Ribbons, 5 Bows | 0 1 |  |
| *9 Juice Boxes,**2 Bottles of Water* |  | 11 Juice Boxes, 4 Bottles of Water | 0 1 |  |
| *5 Spoons,* *8 Candy Bars* |  | 7 Spoons, 10 Candy Bars | 0 1 |  |
| *4 Napkins,* *2 Party Hats* |  | 6 Napkins, 4 Party Hats | 0 1 |  |
| *7 Noisemakers,**3 Water Guns* |  | 9 Noisemakers, 5 Water Guns | 0 1 |  |
| *10 Party Favors,* *2 Lemons* |  | 12 Party Favors,4 Lemons | 0 1 |  |
| *1 T-Shirt, 4 Sodas* |  | 3 T-Shirts, 6 Sodas | 0 1 |  |
| *2 Baseball Gloves,* *5 Chairs,**1 Bag of Ice* |  | 4 Baseball Gloves, 7 Chairs, 3 Bags of Ice | 0 1 |  |
| *5 Plastic Cups,* *4 Trash Bags,**8 Balloons* |  | 7 Plastic Cups, 6 Trash Bags, 10 Balloons | 0 1 |  |
| *8 Apples,**3 Oranges,**6 Bananas* |  | 10 Apples, 5 Oranges,8 Bananas | 0 1 |  |
| *3 Cakes,* *20 Forks**11 Candles* |  | 5 Cakes 22 Forks, 13 Candles | 0 1 |  |
| *3 Tomatoes,**1 Pickle,* *2 Pretzels* |  | 5 Tomatoes, 3 Pickles, 4 Pretzels | 0 1 |  |
| *2 Onions**9 Hamburgers,* *6 Hot Dogs* |  | 4 Onions, 11 Hamburgers, 8 Hot Dogs | 0 1 |  |
| Total Attempted:  |  | **Total Score:**  |  | **Total Warnings:** |
| Notes: |  |

**Weather report with short delay recall**

Directions to Friend’s House from Grene Willows (~7 min)

[**Do not exit previous Free Play session,** but have participant remain parked while ensuring Session 5 Weather Report audio file is prepared, and then introduce the task.]

*“This next task is similar to something that we did in an earlier session: while you drive us safely to your friend’s house for the cook-out a city-by-city weather report will play and you’ll again need to pay attention to the letter each city starts with. This time, you are to say “****yes****” if the* ***city name begins with a vowel,*** *A, E, I, O, or U, or say “****no****” if the city name does not begin with a vowel. This task is a little different than some others we have done, however, because I do* ***not*** *want you answer**right away. The report will pause for a short time after each city, then you will hear “yes or no.” That is your cue to answer.*

*For example, if you heard “Springfield, 68 and overcast” you would wait until you heard “yes or no,” then you would say* “***no***,” *because the city “Springfield” does not start with a vowel. If you then heard “Alexandria, 71 and sunny” you would again wait until you heard “yes or no,” then you would say* “***yes***” *because the city Alexandria starts with a vowel.*

*Remember to follow all the rules of the road and listen to the driving directions and feedback that I provide. And once again, be sure to wait after each city’s weather report until you hear “yes or no” then say “****yes****” if the city name* ***starts with a vowel,*** *or “****no****” if the city name does not start with a vowel. Do you have any questions?*  **[Answer any questions]**

Driving Directions

*Ok, turn on your turn signal, check to make sure the road is clear then continue going on Jefferson*

*Turn Right on 6th St.*

*Turn Left onto East Highway 20*

*Turn Right on Expressway (keep speed at or below 35 mph)*

*Turn Right onto Lynx*

*Friend’s House is the last one on the right, pull over and park on the street in front of the house*

|  |
| --- |
| **Weather Report - Session 5**  |
| **City** | **Weather** | **Pause Time** | **Response** |  **Score** | **Warning** |
| Minneapolis | 68, clear | 2 |  | 0 1 |  |
| **Anchorage** | 55, overcast | 6 |  | 0 1 |  |
| Nashville | 83, cloudy | 6 |  | 0 1 |  |
| Providence | 76, mostly cloudy | 2 |  | 0 1 |  |
| San Francisco | 64, clear | 5 |  | 0 1 |  |
| Detroit  | 65, clear | 1 |  | 0 1 |  |
| **Indianapolis** | 66, thunderstorms | 3 |  | 0 1 |  |
| **El Paso** | 75, mostly cloudy | 6 |  | 0 1 |  |
| Kansas City | 66, clear | 6 |  | 0 1 |  |
| **Omaha** | 67, mostly sunny | 0 |  | 0 1 |  |
| Sacramento | 76, partly cloudy | 2 |  | 0 1 |  |
| Dallas | 84, clear | 1 |  | 0 1 |  |
| Tucson | 89, clear | 4 |  | 0 1 |  |
| Wichita | 68, mostly cloudy | 3 |  | 0 1 |  |
| Charlotte | 79, thunderstorms | 2 |  | 0 1 |  |
| Baltimore | 75, heavy rain | 5 |  | 0 1 |  |
| Los Angeles | 74, clear | 1 |  | 0 1 |  |
| **Annapolis** | 78, light rain | 3 |  | 0 1 |  |
| Portland | 64, overcast | 1 |  | 0 1 |  |
| San Diego | 71, partly cloudy | 6 |  | 0 1 |  |
| Boston | 78, light rain | 3 |  | 0 1 |  |
| Las Vegas | 85, partly cloudy | 1 |  | 0 1 |  |
| **Albuquerque** | 80, mostly sunny | 1 |  | 0 1 |  |
| Miami | 88, clear | 3 |  | 0 1 |  |
| Washington, DC | 71, overcast | 0 |  | 0 1 |  |
| Denver | 79, clear | 2 |  | 0 1 |  |
| Houston | 93, scattered clouds | 1 |  | 0 1 |  |
| Milwaukee | 59, overcast | 3 |  | 0 1 |  |
| Colorado Springs | 76, partly cloudy | 2 |  | 0 1 |  |
| **Atlanta** | 79, clear | 0 |  | 0 1 |  |
| Memphis | 88, mostly cloudy | 5 |  | 0 1 |  |
| San Antonio | 88, overcast | 3 |  | 0 1 |  |
| Honolulu | 75, mostly cloudy | 5 |  | 0 1 |  |
| **Austin** | 82, partly cloudy | 5 |  | 0 1 |  |
| **Oklahoma City** | 73, partly cloudy | 3 |  | 0 1 |  |
| Seattle | 67, light rain | 1 |  | 0 1 |  |
| Tulsa | 68, sunny | 2 |  | 0 1 |  |
| Fresno | 81, sunny | 1 |  | 0 1 |  |
| **Iowa City** | 67, sunny | 4 |  | 0 1 |  |
| New York City | 78, heavy rain | 5 |  | 0 1 |  |
| New Orleans | 84, thunderstorms | 4 |  | 0 1 |  |
| **Oakland** | 68, overcast | 6 |  | 0 1 |  |
| Jacksonville | 88, mostly cloudy | 0 |  | 0 1 |  |
| Chicago | 64, rain | 0 |  | 0 1 |  |
| Phoenix | 99, light rain | 2 |  | 0 1 |  |
| Fort Worth | 90, partly cloudy | 2 |  | 0 1 |  |
| Cleveland | 75, mostly cloudy | 5 |  | 0 1 |  |
| St. Louis | 71, partly cloudy | 5 |  | 0 1 |  |
| **Arlington** | 69, light rain | 0 |  | 0 1 |  |
| Rochester | 63, light rain | 4 |  | 0 1 |  |
| Salem | 65, sunny | 2 |  | 0 1 |  |
| **Total Errors:** |  | **Total Score:** |  | **Total Warnings:**  |  |
| **Notes:** |  |

\*Grey text indicates that the city name begins with a vowel

▪ Review (2-5 minutes)

Closing

* Race Track (8 minutes total: 2 min for instruction + 6 min for task)

[**Download Warrior Speedway scenario from DGS site, using Driver username and Study name corresponding to participant and intervention session. Next, click “Begin” on DGS control panel to initiate scenario]***“As a reward for your hard work, before you leave today, you will get to drive around the race track in the simulator again. Here, you should still attempt to stay on the track and avoid any collisions. Go ahead and start.”* **[Click “Bypass Practice” on DGS control panel, then click “Test”]**

(4 minutes of racing)

*“Okay, come to a stop. To get you back into the mindset of following regular driving laws, we will have you drive around the track while maintaining a typical speed of 50 MPH. Go ahead.”* [DRS will comment on participant’s driving: reminding him or her to maintain appropriate speed, signal when changing lanes, etc.] (2 minutes of normal driving)

▪ Overall Review & Self-Assessment: Summarize the session by individual section. (5 minutes)

[Potential aspects to discuss: lane position; maintaining speed; ability to pay attention to signs, traffic signals, other cars (if applicable), etc.; ability to respond to feedback from the DRS (can provide examples); using turn signal appropriately (or vocalizing turn signal if hardware is nonfunctional); how participant performed on cognitive task (how it compared to past performance); etc.]

**Session 6**

Self-Assessment & Review

At the beginning of the session, the NeuroDRIVE Driving Rehabilitation Specialist (DRS) will welcome the participant. Next, the DRS will query the participant on driving issues that they may currently be experiencing during real world driving. Use Self-Report Driving Assessment form for this portion. If issues are reported, prompt the participant to rate the frequency of the issue on a Likert scale of 1-10 (1 = very rarely, 5 = sometimes, 10 = almost always).

*“With last week’s driving fresh in your mind, let’s talk about specific issues that you or your passengers have noticed.*

*For example: some people have a hard time staying in their lane, while others find that they end up sitting at traffic lights even after they have turned green. What sort of driving issues have you had over the past week?”*

Then the DRS will review issues seen during the VR assessment:

*“Do you remember the driving tasks that you completed the last time you were here? You did really well on X, Y, and Z* (e.g., maintaining your speed, staying within your lane, giving yourself enough room to stop safely, etc.)*. You had some difficulty on A, B, and C…*(report issues.) *These are some things you may want to keep in mind while driving the simulator today.”*

\*\*Throughout intervention session, DRS should be careful to pay special attention to any driving issues participant reports and any issues observed in earlier VR sessions.

Time: 5-10 minutes

**Component Training**

Training Intro

*“We are going to do a variety of tasks during the session today. In particular, we are going to practice some of the tasks that may have been a bit more challenging for you during the earlier sessions. These tasks involved...*(e.g. remembering numbers and city names while you drove from place to place in the VR simulator.) *As always, you are not being graded on your performance, so just try to give your best effort.”*

Driving

▪ Driving Route: Tactical 3 (15 minutes)

**[Download Tactical Scenario A3 from DGS site, using Driver username and Study name corresponding to participant and intervention session]** Here, the participant will drive a guided route. The DRS will provide immediate feedback on inappropriate driving behaviors. At the end of the driving session, the DRS will review the number of inappropriate behaviors.

*“For this task, the computer will tell you driving directions as you go, and I will provide you with feedback on your driving. In this task you will also have to deal with other moving vehicles. Just like in the real world, these other vehicles can sometimes behave unpredictably, so be sure to pay close attention to both your driving and the other vehicles around you. Do you have any questions?”***[**Answer any questions, then **click “Begin” on DGS control panel and allow instructions to play. Next, click “Bypass Practice” on DGS control panel, then click “Test”]**

▪ Abbreviated Review (2-5 minutes)

Cognitive

* Remediation Training A (10 minutes)

Before the session, DRS should review participant’s performance on tasks from across the 5 sessions as well as their self-report IDS responses and self-evaluations. Based on these criteria, DRS should select one Cognitive Component task for the participant to repeat. This task should be selected carefully to provide the most benefit possible to the participant, and focus on an area where the participant is still having difficulty. **[Download scenario from DGS site if necessary, using Driver username and Study name corresponding to participant and intervention session, OR begin new Free play session. Next, give instructions for selected remediation task]**

*“Before today's session, I reviewed some of your earlier sessions and some of your self-evaluations of your own driving. It seems like you are still having some trouble with (X, Y, and Z,) so this part of today's session will focus on improving those areas by practicing a task you did in a previous session.* [Provide specific task instructions for selected task, beginning with rehabilitative purpose]

* **Break (5 minutes)**
* Remediation Training B (10 minutes)

Before the session, DRS should prepare at least 3 potential Cognitive Component tasks for the participant to choose from. These options should be selected for their potential to benefit the participant, but should not directly repeat the task done for Remediation Training 1. Explain each task, including the rehabilitative purpose, as needed.

*“For this task, we want you to choose from a few options of tasks that you’ve done before, that were relatively difficult. Feel free to pick whichever one you like. The \_\_\_\_\_\_ task involved* **[describe the task]**...*the \_\_\_\_\_\_ task involved* **[describe the task]***, and the \_\_\_\_\_\_ task involves* **[describe the task]**. *Which one would you like to do?”... ...“Ok, good choice.”* **[Download scenario from DGS site if necessary, being careful to select Driver username that corresponds to that participant, or begin new Free play session, and give instructions for selected remediation task]**

Integration

**[Note: These Integration scenarios are more easily administered with two examiners:**

**Person 1 should sit at the computer, playing the audio files and giving driving directions.**

**Person 2 should sit to the right/rear of the participant, scoring the participant’s responses and providing driving feedback.]**

▪ Real World Scenario**: Scenario 6** (25 minutes)

**Executive Route Planning Task**

[**Begin new Free Play session,** encourage participant to get comfortable in the seat and buckle seat belt, then read instructions.]

*“For this next task, you will need to do some prioritizing. I will give you a short list of errands that you need to do around town and a map of the area.”* **[Show participant paper map]**

*“There are a few things to keep in mind about this map. First, the* ***arrows*** *show one-way streets. For example, for this one”* [**point to North Roundabout**]*, “you can only drive west. Next, even though this street is called “Roundabout,” you cannot actually drive all the way around. If you need to see more of the map, the other side contains the full map of Jefferson City.”* **[Flip map over to show full map.]**

*“Your job is to use the map and your own preferences to determine the order that you will complete the errand. After I give you the list, look for the different places and use your finger to draw out the best route for us to take. Then as you drive, I’ll remind you of the directions to each location. When you complete an errand, I will add another to your list and I’ll let you look at the map again so you can update the route. You can create a whole new route each time I add an errand, or you can add the new errand to the end of your previous route. It’s up to* ***you****.*

***Just keep in mind that we have a limited amount of time, some errands may be closer or further away, and some may be more or less important to you.*** *But ultimately, there are no right or wrong answers to how you complete the errands; I just want to understand your reasoning.*

*As always, remember to follow all the normal rules of the road and pay attention to the feedback and driving directions I provide as you go through the task. Any questions?”*

**[Answer any questions then start with the first 3 errands, adding another after each errand is completed. At each stop, recap the other two errands not yet completed and add the next one on the list. Allow the participant to hold the map and re-plan their route at each stop.]**

List of Errands

*“We’ll start with these three errands:*

*1. Pick up dinner from your favorite restaurant [Chowtown]*

*2. See a movie at the theater*

*3. Drop off a prescription at Agate Pharmacy*

*4. Buy a new book at Barns Books*

*5. Get coffee* (or tea, etc.) *at Java = MC2*

*6. Check engine light went on [go to KARS Full Body Auto Repair to get it checked out]*

*7. Get doughnuts for the office at Bake A Dozen*

*8. Buy groceries at Grene Willows Grocery* (task usually ends about here)

*9. Visit a friend at the hospital*

*10. Pick up concert tickets at the Convention Center*

*11. Get some socks at Jen/Eric*

*12. Volunteer for the food drive at the church.”*

▪ Review (5 minutes)

Closing

▪ Race Track (8 minutes total: 2 min for instruction + 6 min for task)

[**Download Warrior Speedway scenario from DGS site, using Driver username and Study name corresponding to participant and intervention session. Next, click “Begin” on DGS control panel to initiate scenario]***“As a reward for your hard work, before you leave today, you will get to drive around the race track in the simulator. Here, you should still attempt to stay on the track and avoid any collisions. Go ahead and start.* **[Click “Bypass Practice” on DGS control panel, then click “Test”]**

(4 minutes of racing)

*Okay, please come to a stop. To get you back into the mindset of following regular driving laws, we will have you drive around the track while maintaining a typical speed of 40 MPH. Go ahead.* [DRS will comment on participant’s driving: reminding him or her to maintain appropriate speed, signal when changing lanes, etc.] (2 minutes of normal driving)

▪ Overall Review & Self-Assessment: Summarize the session by individual section. (5 minutes)

[Potential aspects to review: maintaining lane position; maintaining speed; ability to pay attention to signs, traffic signals, other cars (if applicable), etc.; ability to respond to feedback from the DRS (can provide examples); using turn signal appropriately (or vocalizing turn signal if hardware is nonfunctional); how participant performed on cognitive task (how it compared to past performance); etc.]

Appendix 2: Task Descriptions

**Measures**

**Attention (Non-Operational):**

1. *Alphabetized City Names.* The Alphabetized City Names task consists of 7 sets of word strings comprised of both foil words (e.g., news, radio) and the names of familiar cities (e.g., Charlotte, Austin). The initial strings consist of three words, two of which are city names, and increase to nine words, four of which are city names. Participants are presented with the word strings, and must determine if the city names in each string are listed in alphabetical order, responding “yes” or “no” accordingly. Progressive strings alternate between adding an additional city name or foil word as the participant correct repeats word strings from each set. **If the participant responds incorrectly to three consecutive trials within a set, then the participant is presented with Alphabetized City Name sequences that are one item shorter for the remainder of the task (e.g., if participant misses three consecutive Alphabetized City Names trials in the 5 item set, they would be presented with 4 item sequences for the remainder of the task.) This will ensure their attention remains divided during the driving task and they are challenged at a level appropriate for them. Please note, some leniency can be given if the participant misses a trial because he/she was interrupted by the DRS.**
2. *Digit Span Forward.*Digit Span Forward follows the format of the Digit Span Forward subtest in the Wechsler batteries, consisting of seven sets of random number sequences that begin with two numbers per sequence and increase to eight numbers per sequence Participants are presented with the series of numbers at the rate of one digit per second and must repeat the sequence in the same order. The sequence length is progressively increased as the participant correctly repeats sequences from each set. **If the participant responds incorrectly to three consecutive Digit Span Forward trials within a set, then the participant is presented with Digit Span Forward sequences that are one digit shorter for the remainder of the test (e.g., if participant misses three consecutive Digit Span Forward sequences in the 5 digit set, they would be presented with 4 digit sequences for the remainder of the task.) This will ensure their attention remains divided during the driving task and they are challenged at a level appropriate for them. Please note, some leniency can be given if the participant misses a trial because he/she was interrupted by the DRS.**
3. *Target Spotting.* Participants are shown a picture of a particular building within the virtual environment, and are instructed to look for the building while driving. The participant then drives with guided directions, and must inform the DRS when he or she sees the building.

**Attention (Operational)**

1. *VR Cognitive Divided Attention Task*: Participants are placed in a scenario where the car speed and steering are automatically controlled. As the vehicle is moving, a truck will briefly appear on the screen, facing either to the left or right. When the truck appears, a safety barrel will also appear in one of five locations. The participant must note whether the truck was facing to the left or the right, and in which of the five locations the barrel was located.
2. *VR Cognitive Divided/Selective Attention Task*: Participants are placed in a scenario where the car speed and steering are automatically controlled. As the vehicle is moving, a truck will briefly appear on the screen, facing either to the left or right. When the truck appears, a safety barrel will also appear in one of five locations. Speed limit signs will appear at the remaining locations, and serve as distractors. The participant must note whether the truck was facing to the left or the right, ignore the distractor speed limit signs, and identify in which of the five locations the barrel was located.

**Working Memory (Non-Operational)**

1. *Digit Span Backward.*Digit Span Backward follows the format of the Digit Span Backward subtest in the Wechsler batteries, consisting of seven sets of random number sequences that begin with two numbers per sequence and increase to seven numbers per sequence. Participants are presented with the series of numbers at the rate of one digit per second and must repeat the sequence in the reverse order of how it was presented. The sequence length is progressively increased as the participant correctly repeats sequences from each set. **If the participant responds incorrectly to three consecutive Digit Span Backward trials within a set, then they are presented with Digit Span Backward sequences that are one digit shorter for the remainder of the task (e.g., if participant misses three consecutive Digit Span Backward sequences in the 5 digit set, they would be presented with 4 digit sequences for the remainder of the task.) This will ensure their attention remains divided during the driving task and they are challenged at a level appropriate for them. Please note, some leniency can be given if the participant misses a trial because he/she was interrupted by the DRS.**
2. *Size Judgment Span.*The Size Judgment Span task consists of 7 sets of word strings comprised of common words from different areas, including animals (e.g., frog), transportation (e.g., bus), furniture (e.g., chair), and fruit (e.g., watermelon). The initial wordstrings consists of two words per string and increase to eight words per string. Participants are presented with the word string at the rate of one word per second and must repeat the word list, in order by size, from smallest to largest (e.g., “frog, watermelon, chair, bus”) on Form A, and from largest to smallest on Form B. The sequence length is progressively increased as the participant correctly repeats sequences from each set. **If the participant responds incorrectly to three consecutive Size Judgment Span trials within a set, then the participant is presented with Size Judgment Span sequences that are one item shorter for the remainder of the task (e.g., if participant misses three consecutive Size Judgment Span sequences from the 5 item set, they would be presented with 4 item sequences for the remainder of the task.) This will ensure their attention remains divided during the driving task and they are challenged at a level appropriate for them. Please note, some leniency can be given if the participant misses a trial because he/she was interrupted by the DRS.**
3. *Digit Span Sequencing.* Digit Span Sequencing follows the format of the Digit Span Sequencing subtest in the Wechsler batteries, consisting of seven sets of random number strings that begin with two numbers per string and increase to eight numbers per string Participants are presented with the series of numbers at the rate of one digit per second and must repeat the numbers in proper numerical sequence (e.g., ‘1, 4, 7, 9’). The sequence length is progressively increased as the participant correctly repeats sequences from each set. **If the participant responds incorrectly to three consecutive Digit Span Sequencing trials within a set, then the participant is presented with Digit Span Sequences that are one digit shorter for the remainder of the task (e.g., if participant misses three consecutive Digit Span Sequences in the 5 digit set, they would be presented with 4 digit sequences for the remainder of the task.) This will ensure their attention remains divided during the driving task and they are challenged at a level appropriate for them. Please note, some leniency can be given if the participant misses a trial because he/she was interrupted by the DRS.**

 **Working Memory (Operational):**

1. *Executive Dual Processing:* Participants must follow a lead car. Two different tones will sound when the participant is driving too close or too far from the lead car, respectively. The participant must also brake in response to brake lights on the lead car. Additionally, the participant must maneuver away from potholes, while remaining in the lane.
2. *Executive Response Inhibition:* Participants must follow a lead car, and the lead car will brake for either short or long periods. The participant must take their foot off of the gas pedal in response to a short brake period by the lead car, but must take their foot of the gas and press their brake pedal in response to a long brake period by the lead car. Furthermore, the driver must also swerve around unfilled potholes (dark colored) while remaining in the lane, but can drive over filled potholes (light colored).
3. *Executive Working Memory:* The executive working memory task involves the same directions as executive response inhibition task, but also has road signs that appear on the side of the road. The participant must follow all of the directions of the executive response inhibition task, and remember which road signs they saw, in order.

Appendix 2: Self-Report Driving Assessment

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| --- |
| Self-Report Driving AssessmentParticipant Number:\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_Administrator:\_\_\_\_\_\_\_\_\_\_\_  |
| Reported Issue:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1 2 3 4 5 6 7 8 9 10 |
|  |
| Reported Issue:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1 2 3 4 5 6 7 8 9 10 |
|  |
| Reported Issue:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1 2 3 4 5 6 7 8 9 10 |
|  |
| Reported Issue:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1 2 3 4 5 6 7 8 9 10 |
|  |
| Reported Issue:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1 2 3 4 5 6 7 8 9 10 |
|  |
| Reported Issue:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| 1 2 3 4 5 6 7 8 9 10 |

Appendix 3: Simulator Sickness Protocol

***When stopping at stop signs and red lights, pull up to the line and come to a complete stop. Go straight at intersections and do not make any turns unless instructed otherwise. If at any time you start to feel dizzy or nauseated, please tell me right away. There are some things we can do help make you feel better.***

***We understand that even good drivers make some mistakes and the simulator can be tricky for anyone to get used to, so just do the best you can and let us know if you experience any discomfort.***

**Driver Orientation and Simulation Sickness Protocol Cont.**

***Before we begin, how are you currently feeling on the following scale?***(Show participant printed scale while reading options)

**0 = Feel fine**

**1 = Feel a little light headed or woozy**

**2 = Uncomfortable**

**3 = Very uncomfortable**

**4 = I feel so poorly that I could not drive.**

**Three-Minute Drive Instructions**

***Ok, to start off I will have you drive for three minutes. Please let me know right away if you start to feel any nausea, headache, or other discomfort during the drive and we can pause or stop altogether. After you have stopped, we will talk about what it is like for you and whether you are having any difficulty getting used to the simulator.***

Start the timer, proceed with the following route and/or have the participant pull over after 3 minutes have elapsed:

* *Put the car into drive and drive forward*
* *Turn right S. Broadway*
* *Stop at the stop sign, turn your right blinker on, look both ways then turn right onto Mariner Ave*
* *Follow the road as it curves then continue going straight on 8th St*
* *Take a right on Roundabout*
* *Stop the car in front of Comicover*

*Okay, let’s take another rating. How are you feeling on the following scale?*

**0 = Feel fine**

**1 = Feel a little light headed or woozy**

**2 = Uncomfortable**

**3 = Very uncomfortable**

**4 = I feel so poorly that I could not drive.**

* If rating has increased from baseline, offer to turn on the fan and offer the *Sea-Bands®* to the participant, explaining as follows:

*These are the Sea-Bands®. They are US Food and Drug Administration (FDA) approved, over-the-counter elastic bracelets that you wear on both wrists. The Sea-Band® device is a latex-free product, has no electronics or moving parts, and no associated risks or side-effects. Each bracelet has a plastic “button” designed to be placed so it contacts the Pericardium-6 (or P6) acupressure point.* **[See figure below for placement]**

**

*P6 is located about two to three fingers’ width below your wrist, between the two central tendons. P6 is associated with the vagus nerve, which affects symptoms of nausea and vomiting. By placing the Sea-Band® so it contacts P6, this may relieve some of those symptoms.*

* Also offer participant some water, a break from the simulator, getting some fresh air in the hall or outside, etc.
	+ Administrator can also turn on the simulator sickness mitigation built in to the VR DS software. The best options are **Static, Standard, or Virtual Reality Headset** mode. Demonstrate each for the participant, as needed.
	+ If simulator sickness becomes too severe (at least 2 above baseline), testing may need to be rescheduled and/or terminated. **Consult with PI if this occurs**.
* If rating has not increased, allow participant to continue driving for 4 minutes, encouraging them to test out how the virtual car functions in terms of braking, accelerating, steering, etc. This is not meant to provide corrective feedback, but to provide them with a better understanding of how this virtual car operates before the actual test begins.

**Four-Minute Drive Instructions**

* *Drive forward on roundabout*
* *Follow the road as it curves to the left and merge onto Highway 20*
* *Turn right on 6th St.*
* *Turn right at Mariner Ave.*
* *Stop at Broadway* (or whenever 4 minutes has elapsed).

***Okay, let’s take one more rating. How are you feeling on the following scale?***

**0 = Feel fine**

**1 = Feel a little light headed or woozy**

**2 = Uncomfortable**

**3 = Very uncomfortable**

**4 = I feel so poorly that I could not drive.**