

USER GUIDE



SCAN TO ACCESS YOUR
INSTRUCTOR MATERIALS



ALCOHOL/THC

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INTRODUCTION

INTRODUCTION

Understanding the Impairment Effect of Alcohol

Ethyl alcohol, referred to as alcohol in this document, is an intoxicating ingredient found in liquor, beer, and wine. Consumption of alcohol causes several types of impairment as a person's BAC (blood alcohol concentration) rises. Impairments include slowed reaction time, loss of motor coordination, speech, vision, and impaired judgment and perception.

Understanding Cannabis: THC, CBD, and Impairment Effects

Cannabis is a green, brown, or gray mixture of dried, shredded leaves, stems, seeds, and flowers of the Cannabis sativa and Cannabis indica plant. Cannabis can be consumed several ways, including smoking, inhaling vapors, or eating. Some varieties of Cannabis contain the mind-altering (psychoactive) chemical Delta-9-Tetrahydrocannabinol (THC), plus more than 400 other chemicals. Some types of medical cannabis contain minimal levels of THC and a high percentage of the non-psychoactive chemical cannabidiol (CBD). CBD is a compound in cannabis believed to have medicinal effects, but it does not necessarily make people feel "stoned" or "high" and can counter the psychoactive effects of THC. Medical cannabis users typically seek symptom relief. Recently, a category of THC called delta-8 THC has become more widely available. Most delta-8 products are produced synthetically by converting cannabidiol from hemp into the less potent delta-8 THC or THCO. Delta-8 THC (or THCO) can still cause the same impairment as delta-9 THC, as individuals can consume more to create similar effects.

Our activities do not apply to the hemp plant. While Hemp plants are the same species as Cannabis plants; Hemp plants contain less than 0.3% of THC.

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Impact of Alcohol Use: Cognitive Effects on Driving and Adolescent Development

The adolescent brain continues developing decision-making ability, social skills, foresight, and abstract reasoning until about age 25. Adolescence alcohol misuse might cause reductions in the size of the frontal lobe (responsible for planning and decision-making), hippocampus (the portion of the brain involved in learning and memory), amygdala (fear-sensing), and corpus callosum (communication between the two sides of the brain).

Impact of THC Use: Cognitive Effects on Driving and Adolescent Development

Acute THC use has been shown to impair cognitive functions on several levels – from basic motor coordination to more complex executive function tasks, such as planning, organizing, solving problems, making decisions, remembering, and controlling emotions and behavior.

Studies have shown that drivers under the influence of THC have decreased car handling performance, increased reaction times, impaired time and distance estimation, unintentional lateral travel movement, and impaired ability to sustain vigilance while driving.

There are other significant cognitive effects from THC use, particularly for adolescents. The adolescent brain continues developing decision-making ability, social skills, foresight, and abstract reasoning until about 25. However, these same domains of executive function, attention, and social cognition are those most consistently affected by THC use. Young people may be more vulnerable to developing dependence because their brains are still developing. Studies have shown that structural changes in the brains of young THC users can lead to functional impairments, including cognitive and emotional deficits to educational and social underachievement.

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Driving Regulations and Impairment Awareness

It is important to convey not to drive under the influence of any substance, including Alcohol and THC, even if the substances are legal in a state. The focus should always be on responsible and safe driving practices to prevent crashes and protect lives.

Alcohol

The Widmark formula is the recognized standard to predict a person's BAC based on gender, weight, and consumption pattern. Most countries have a legally defined level of blood alcohol concentration (BAC) that determines when a driver is considered impaired. In the United States, this level is set at 0.08% BAC. Consequently, if a driver's BAC reaches or exceeds this limit, they can be subject to arrest for driving under the influence (DUI). It is important to note that a driver can still be arrested for DUI, even if they are below the legal BAC limit, if they exhibit signs of impairment.

Some countries have established a minimum legal drinking age. If a driver is below the specified age and found to be operating a vehicle under the influence of alcohol, they can be arrested and detained, regardless of their BAC level.

Cannabis

Some states have legalized cannabis for medicinal and recreational use. In the states where it is legalized for recreational use, the legal age to purchase, possess and consume cannabis containing THC varies by state. At the time of the development of this material, some states are setting legal limits for THC that can be in the bloodstream when driving. However, there is no established formula to predict THC levels based on consumption because cannabis is available in varying potencies of THC.

Medical cannabis typically has less THC than the varieties bred for recreational use. Also affecting THC levels are the methods of consumption. Cannabis containing THC can be consumed in several ways, including smoking, eating,

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or ingesting concentrated substances. Each method of consumption can influence when a user experiences the onset of effects. The effects of smoking cannabis containing THC might begin within a few minutes and last two to four hours. When cannabis containing THC is eaten, the onset of effects may be delayed for an hour or more, and the duration of the high can last six hours or more. Even though cannabis may be legal for medicinal or recreational use, operating a motor vehicle while impaired by THC is illegal. If law enforcement determines that someone is driving under the influence of any substance, including THC, that person can be arrested for operating a vehicle under the influence.

Research-Based Approach: Demonstrating Alcohol and THC Impairments through Interactive Activities

The purpose of the following activities using the Fatal Vision® Polydrug [Alcohol & THC] Goggle is twofold.

- Give participants an experience of cognitive and gross motor impairment associated with the combination of alcohol and THC.
- Demonstrate the participant's susceptibility to impairment and the potentially severe consequences that can occur.

People may believe combining alcohol and THC is safe, and without consequences (optimistic bias), especially when consumed at lower levels. However, the combination of these drugs amplifies the impairments. Participants wearing the Polydrug [Alcohol & THC] Goggle will experience their susceptibility to these drugs and modeled cognitive effects on decision-making and driving skills. After each activity, the group will discuss the potentially severe consequences of this impairment.

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How the Goggles Model Impairment from Alcohol and THC

The Fatal Vision® Polydrug [Alcohol & THC] Goggle is a powerful tool to vividly demonstrate the significantly heightened risk associated with combining alcohol and THC. When these substances are used together, they create an amplified state of impairment, severely affecting coordination and distorting the brain's cognitive ability to process information. This amplified impairment profoundly impacts driving skills, leading to compromised reactions to objects and hazards while driving. The Polydrug [Alcohol & THC] Goggle effectively models the specific impairments associated with the combination of alcohol and THC, including distorted perception, poor motor coordination, slowed decision-making, and delayed reaction times.

To illustrate the extent of risk amplification, consider the findings from a study, that examined the prevalence of THC and alcohol in car drivers involved in fatal crashes. The research based on FARS data 2000 to 2018 revealed incidence of THC and alcohol combined in car drivers involved in fatal crashes rose from 9% to 21%. (Source <https://ajph.aphapublications.org/doi/full/10.2105/AJPH.2021.306466>) Additionally, a separate study showed that each 0.01 BAC unit increase amplified the odds of an impaired driving incident by about 9-11%. Furthermore, drivers who tested positive for THC alone had a 16% increased odds of an impaired driving accident. However, when alcohol and THC were combined, the odds of an impaired driving crash increased by approximately 8-10% for each 0.01 BAC unit increase over alcohol or THC alone. (source <https://pubmed.ncbi.nlm.nih.gov/25612879/>)

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These ominous consequences emphasize the critical importance of understanding the amplified impairments resulting from the concurrent use of alcohol and THC. The Fatal Vision® Polydrug [Alcohol & THC] Goggle provides a tangible and eye-opening experience that drives home the potential consequences of such substance combinations on road safety. It underscores the need for responsible decision-making and avoiding impaired driving scenarios, ultimately contributing to a safer and more aware community.

Another reference

<https://www.bu.edu/articles/2021/deadly-car-accidents-involving-cannabis-and-alcohol-have-doubled/>

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INSTRUCTOR MATERIALS



SCAN TO ACCESS YOUR
INSTRUCTOR MATERIALS

<https://fatalvision.com/alcohol-marijuana-instructor-materials/>

Note: there is a QR code inside your goggle that will lead you to the materials as well.

Maze Driving Mat

- Review the Instructor Video: <https://bit.ly/2UQkCRD>
- Review the Intro Whiteboard: <https://bit.ly/3dpH3n4>

Tic Tac Two - Table Top and Floor

- Review the Instructor Video: <https://bit.ly/3y1SgC5>
- Review the Intro Whiteboard: <https://bit.ly/3w27dCK>



ACTIVITY MAZE DRIVING MAT

ACTIVITY – MAZE DRIVING MAT

Modeled Impairments

The Fatal Vision® Polydrug [Alcohol & THC] Goggle models the amplified impairments of using both drugs and the increased dangers on driving. This drug combination increases impaired coordination and cognition distorting the brain's ability to accurately process information. These impairments can negatively impact an individual's driving skills and ability to react appropriately to objects and hazards while driving. The Fatal Vision Polydrug [Alcohol & THC] Goggle models specific impairments associated with combining alcohol and THC and includes distorted perception, poor motor coordination, slowed decision-making, and slowed reactions.

Materials

- Fatal Vision® Polydrug [Alcohol & THC] Goggle
- DIES® (4' x 14') Maze Mat Activity with steering wheel



ACTIVITY – MAZE DRIVING MAT

Introduction

Introduce the activity using the Whiteboard #1 Maze Driving Activity.



<https://bit.ly/3dpH3n4>

Activity Objective

Navigate from one side of the mat to the other at a consistent speed without making driving errors by using the wrong path or driving off the road.

ACTIVITY – MAZE DRIVING MAT

Setup - Mat Layout Guide

Black paths represent drivable roads.

Blue paths represent opportunities to change lanes. They also function as drivable roads.

Red lanes represent restricted roads. These restrictions could be due to construction, hazards, or events where roads are blocked off, or private roads. Do not drive on these roads.

Purple paths represent paths for pedestrians (or bikes). The participant can cross this purple path but not drive on it.



See Presentation Tips for suggestions to engage spectators by projecting the image of the mat.

ACTIVITY – MAZE DRIVING MAT

Activity Overview

Participants navigate through the DIES® Alcohol and THC Impairment Mat following a route of their choice while “driving” a small model car through a maze.

Participants perform the activity twice.

1. The participant performs an unimpaired baseline attempt.
2. The participant wears the Fatal Vision® Polydrug [Alcohol & THC] Goggle.

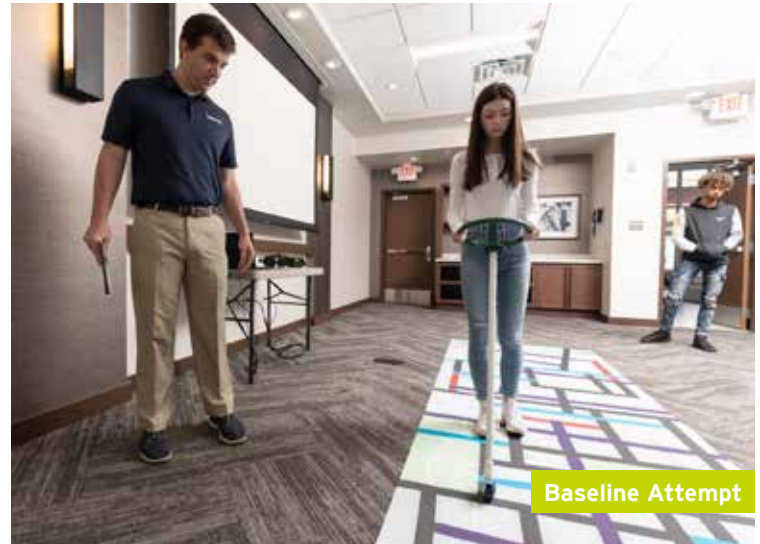
Spectators are engaged in the activity by observing and contrasting the participants' two attempts and identifying the potential impacts on safe driving.

ACTIVITY – MAZE DRIVING MAT

Activity Steps

Baseline Attempt

1. Instruct the driver to travel from one end of the mat to the other, on the route of their choice. The driver starts at any black line. Have each new participant start from a new spot on the mat.
2. Stop only to make turns or stop momentarily at pedestrian crossings.
3. Drive on the blue and black roads only.
4. Do not drive on the red or purple paths. However, the driver may cross the purple paths.



ACTIVITY – MAZE DRIVING MAT

Impaired Attempt

1. Repeat the activity from the opposite side of the mat.
2. Have the participant wear the Alcohol and Marijuana Combo goggle. Place spotters along the mat.
3. Instruct spectators to identify moments where the participant experienced imbalance and decision-making errors.
4. Process the experience with the driver and the spectators. See Talking Points below for suggestions.



ACTIVITY – MAZE DRIVING MAT

Optional Traffic Elements

Option 1

- Change the activity by having two people 'in the car'. In this version, instead of impairing the person holding the wheel, impair the person walking with them and have them as the 'passenger' give directions to the driver. Be prepared to follow up with questions regarding the competence of the person giving directions to the driver. Think of real-world examples where a driver might depend on the passenger to give directions. How could an impaired passenger affect driving safety in this scenario? Also, discuss a potential scenario where both driver and passenger are impaired. How could this make driving even more hazardous?

Option 2

- Add another driver on the road, traveling in the opposite direction. This addition represents another traffic element a driver must be aware of and react to, and they can see how impairment could impact traffic safety.

ACTIVITY – MAZE DRIVING MAT

Talking Points

1. Ask the observers what kind of errors in performance and decision-making they saw with the participant.
2. Ask the participant how many of these errors they realized they made while impaired.
3. Alcohol affects gross motor coordination, judgment, concentration, visual acuity, and reaction time. THC use affects perception, short-term memory, problem-solving, and reaction time. In what ways did you observe the participants struggling with these types of impairments?
4. List some traffic situations where you have needed to, or would need to, assess and respond to a potential hazard immediately. Describe the impact a delay on your processing and reaction time could have in that situation.

Sample Takeaway Message: Each drug (Alcohol and Marijuana) by itself increases crash risk. When a user combines these two drugs, the impairment effects are amplified more than either one alone. This means the crash risk is also amplified.

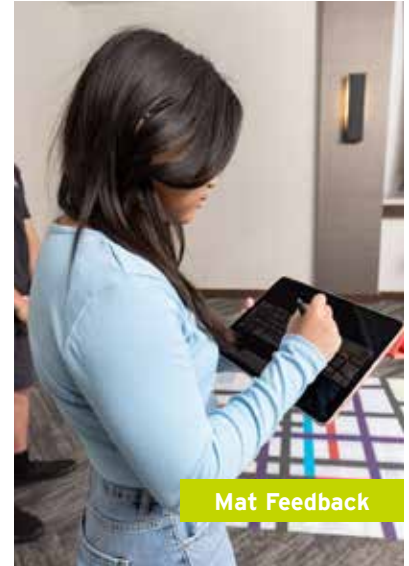
ACTIVITY – MAZE DRIVING MAT

Presentation Tips

- Use the image of the Maze Driving Mat to follow the participant's path.
- Project the image of the Maze Driving Mat.
- Then, ask a spectator to trace the path the participant wearing the goggle follows.
- After the participant finishes their impaired walk, show them how they actually did on the walk.
- This method gives the participant feedback on their performance.

For example, to use an IOS device to project the image.

1. Connect your device to your projector using Screen Mirroring
2. Open the jpg file
3. Select Edit
4. Select [...] in the upper right-hand corner
5. Select Markup
6. Select a pen and color
7. Trace the participant's path on the picture



Mat Feedback

ACTIVITY – MAZE DRIVING MAT

Presentation Tips

Background information on alcohol, THC, and combined impairments.

Some common reactions to the gross motor impairment caused by alcohol's depressant effects on the central nervous system are:

- Driving slower or much faster
- Dizziness
- Inability to stay in one's lane
- Confusion
- Overconfidence in one's ability
- Forgetting driving instructions or cues that they previously responded to without hesitation.

Some common reactions to the cognitive overload/stress due to reduced processing capacity caused by THC impairment are:

- Driving slower
- Hesitation
- Frustration
- Confusion
- Lack of proper focus
- Lack of confidence, nervousness
- Giving up
- Forgetting driving instructions or cues that they previously responded to without hesitation.

ACTIVITY – MAZE DRIVING MAT

Presentation Tips

Some notable impacts from the combination of alcohol and THC can be:

- THC inhibits the body's need to vomit. The body's reflex to vomit toxins can save a person's life in a binge-drinking/alcohol poisoning situation. However, when a person also consumes THC, it can inhibit the body's protective response of expelling excess toxins. ¹
- Doubled odds of drunk driving, social consequences, and harms to self. ²
- Increased crash risk 8-10% for each .01 BAC unit increase with both substances on board. ³

¹ <https://www.ncbi.nlm.nih.gov/pubmed/11509190> ² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4399000/> ³ <https://www.ncbi.nlm.nih.gov/pubmed/25612879>

ACTIVITY – MAZE DRIVING MAT



Keep the Focus on the Impairment

Often, the participants will focus on what they couldn't see because of the goggles.

Address it by helping the audience understand that the Fatal Vision Polydrug [Alcohol & THC] Goggles use a filter that blocks certain information from reaching the eyes but leaves other information unaffected. This filter effect models THC's filtering effect on the brain – it affects how information is perceived and processed. This mental chemical filter does not necessarily affect color, but it will affect random objects and events perceived by the driver's senses and how the brain processes that information. The reality is that traffic does not slow down to compensate for a driver's impairment. Still, an impaired driver's ability to perceive and respond to multiple traffic events will slow down. That results in lost reaction time and possibly a crash.

Help drivers focus on how the impairment affects their thinking, decision making, and confidence in driving safely, rather than what they didn't see.



ACTIVITY

TIC TAC TWO – TABLE TOP

ACTIVITY – TIC TAC TWO – TABLE TOP

Modeled Impairment

The Fatal Vision® Polydrug [Alcohol & THC] Goggle models the amplified impairments of using both drugs and the increased dangers on driving. This drug combination increases impaired coordination and cognition distorting the brain's ability to accurately process information. These impairments can negatively impact an individual's driving skills and ability to react appropriately to objects and hazards while driving. Fatal Vision Polydrug [Alcohol & THC] Goggle models specific impairments associated with combining alcohol and THC and includes distorted perception, poor motor coordination, slowed decision-making, and slowed reactions.

Materials

- Fatal Vision® Polydrug [Alcohol & THC] Goggle
- 10 feet of walk-the-line tape
- 9 small black cones
- 4 black balls, 4 red balls, 4 orange balls
- 1 timer
- Table – you provide



ACTIVITY – TIC TAC TWO – TABLE TOP

Introduction

Introduce the activity using the Whiteboard #2 Tic Tac Two Activity.



<https://bit.ly/3w27dCK>

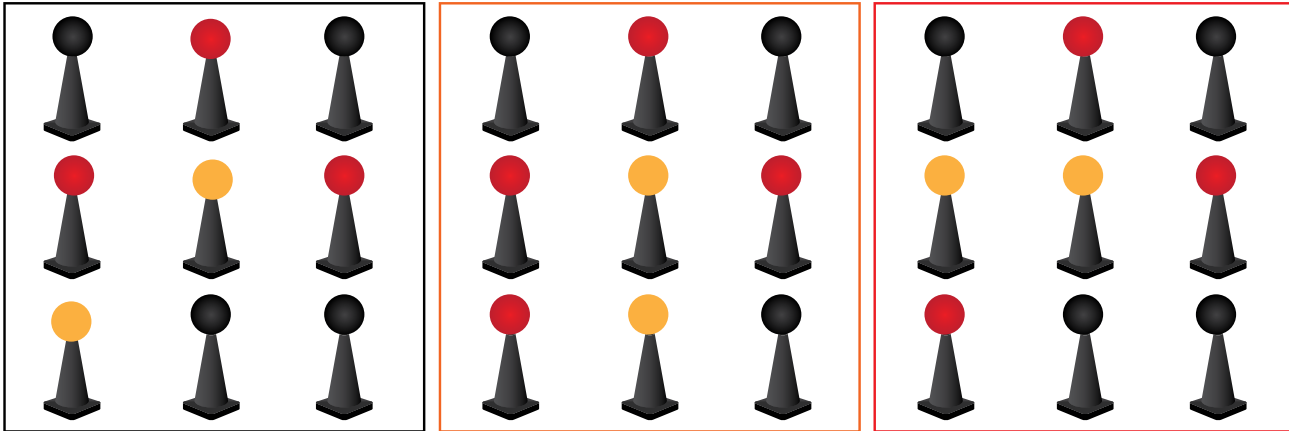
Activity Objective

The goal is to complete one row of three red balls and one row of three black balls by moving, replacing, and switching the balls on the cones.

ACTIVITY – TIC TAC TWO – TABLE TOP

Setup - Ball Pattern

1. Place a 10-foot long line of walk-the-line tape in front of the table.
2. Set the cones upside-down in a 3x3 pattern on the table.
3. Setup the balls in one of three different patterns. The patterns can face any direction. Note that in the first pattern, there are 2 orange, 4 black and 3 red balls. In the second pattern there are 2 orange, 4 red and 3 black. In the third pattern there are 2 orange, 3 red and 4 black.



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ACTIVITY – TIC TAC TWO – TABLE TOP

Activity Overview

Participants move balls from one cone to the other to make Tic Tac Two

Participants perform the activity twice.

1. The participant performs an unimpaired baseline attempt.
2. The participant wears the Fatal Vision® Polydrug [Alcohol & THC] Goggle.

Spectators are engaged in the activity by observing and contrasting the participants' two attempts and identifying the potential impacts on safe driving.

ACTIVITY – TIC TAC TWO – TABLE TOP

Activity Steps

Baseline Attempt

1. The participant stands at the top of the line and studies the cone and ball configuration for 10 seconds.
2. The participant turns their back on the table.
3. The instructor says “go” and starts the timer.
4. The participant turns around and walks down the line heel-to-toe with their arms at their side.
5. At the table, the participant moves the balls from one cone to the other until there are three black balls in a row and three red balls in a row.
6. The participant must say “done” out loud, and the instructor records the time.



ACTIVITY – TIC TAC TWO – TABLE TOP

Impaired Attempt

1. Reset the balls in a different pattern than the previous attempt.
2. The participant stands at the top of the line and studies the new formation for 10 seconds.
3. The participant turns their back on the table.
4. The participant puts on the Fatal Vision® Polydrug [Alcohol & THC] Goggle. Place spotters along the line.
5. The instructor says, “go” and starts the timer.
6. The participant turns around and walks down the line heel-to-toe with their arms at their side.
7. At the table, the participant moves the balls from one cone to the other until there are three black balls in a row and three red balls in a row. The participant cannot hold onto the table to steady themselves unless their safety is compromised.
8. The participant must say “done” out loud, and the instructor records the time again.
9. Process the experience: Note any loss of balance, confusion, hesitation, errors in judgment, slower decision making, and wanting to give up on the task.
10. Note any differences in the tone of voice this time, the confidence level, hesitation or increased nervousness, etc.



ACTIVITY – TIC TAC TWO – TABLE TOP

Optional

- Demonstrate the impact of increased cognitive load by asking the participant to count out loud as they walk the line and move the balls into the new pattern.
- During the baseline attempt, the participant will be able to count smoothly through the whole process. However, when the participant counts during the impaired attempt, you can expect they might slow down or forget the sequence.
- Inform your audience that increased cognitive load impacts a person's short-term memory, and problem-solving abilities are impacted by increased. For example, if someone comments that counting is not typical in a driving scenario, point out that it isn't easy to simulate a conversation in a car; by counting out loud, you can provide a similar cognitive load.

ACTIVITY – TIC TAC TWO – TABLE TOP

Talking Points

1. Point out the differences between the two problem-solving attempts.
2. The differences might be quantitative, as in the time to complete the task and accuracy of ball placement.
3. The differences might be qualitative, such as balance, hesitation, confidence, quickness in decision-making, motivation to complete the task, and decreased recall.
4. How might the modeled impairments affect assessing and solving problems in real-life situations?

Sample Takeaway Message: “Used separately Alcohol and THC have their own impairments. When the two drugs are combined, the impairment effects are amplified more than either one alone. The combination can result in an increased risk for errors in decision-making, and harm to self or others.”

Presentation Tips

When set up and used according to the patterns shown, the participant will need to make at least two correct ball placement choices to complete the activity successfully. This technique ensures that the participant will engage their executive function and short-term memory to solve the activity. The goggles will impair executive function and short-term memory. The instructor can point out the difficulty caused by impairment afterward. Discuss how THC and alcohol can affect problem-solving and making appropriate choices in real life.



ACTIVITY

TIC TAC TWO – FLOOR

ACTIVITY – TIC TAC TWO – FLOOR

Modeled Impairment

The Fatal Vision® Polydrug [Alcohol & THC] Goggle models the amplified impairments of using both alcohol and THC and the increased dangers of driving. This drug combination increases impaired coordination and cognition, distorting the brain's ability to process information accurately. These impairments can negatively impact an individual's driving skills and ability to react appropriately to objects and hazards while driving. The Fatal Vision Polydrug [Alcohol & THC] Goggle models specific impairments associated with combining alcohol and THC and includes distorted perception, poor motor coordination, slowed decision-making and slowed reactions.

Materials

- Fatal Vision® Polydrug [Alcohol & THC] Goggle
- 9 large pop-up cones
- 4 black balls, 4 red balls, 4 orange balls
- 1 timer
- at least 7'x7' floor space

Introduction

Introduce the activity using the Whiteboard #2 Tic Tac Two Activity.



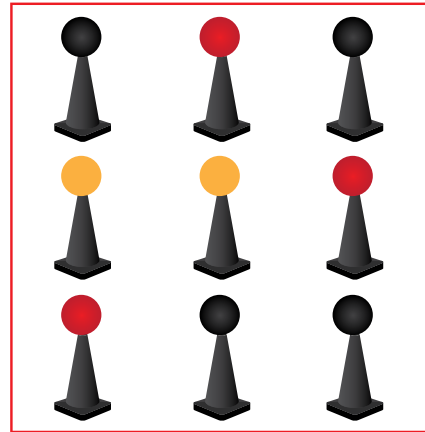
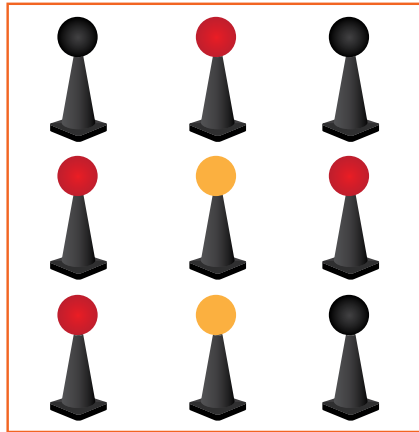
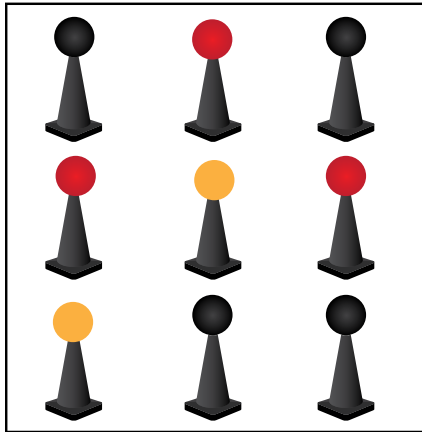
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ACTIVITY – TIC TAC TWO – FLOOR

Activity Objective

The goal is to complete one row of three red balls and one row of three black balls by moving, replacing, and switching the balls on the cones.

1. Set up the cones in a 7'x7' or 8'x8' space in a 3x3 pattern. When properly spaced, the cones should be about 23 inches (7'x7') or 28 inches (8'x8') apart. It is possible to increase the size used for the activity.
2. Set the balls in one of three different patterns. The patterns can face any direction. Note that in the first pattern, there are 2 orange, 4 black, and 3 red balls. In the second pattern, there are 2 orange, 4 red, and 3 black. In the third pattern, there are 2 orange, 3 red, and 4 black.



ACTIVITY – TIC TAC TWO – FLOOR

Activity Overview

Participants move balls from one cone to the other to make Tic Tac Two
Participants perform the activity twice.

1. The participant performs an unimpaired baseline attempt.
2. The participant wears the Fatal Vision® Polydrug [Alcohol & THC] Goggle.
Spectators are engaged in the activity by observing and contrasting the participants' two attempts and identifying the potential impacts on safe driving.

Activity Steps

Baseline Attempt

1. The participant stands in front of the cones and studies the cone and ball configuration for 10 seconds.
2. The participant turns their back on the cones.
3. The instructor says “go” and starts the timer.
4. The participant turns around, walks and moves the balls from one cone to the other until there are three black balls in a row and three red balls in a row.
5. The participant must say “done” out loud, and the instructor records the time.



ACTIVITY – TIC TAC TWO – FLOOR

Impaired Attempt

1. Reset the balls in a different pattern than the previous attempt.
2. The participant stands in front of the cones and studies the new formation for 10 seconds.
3. The participant turns their back on the cones.
4. The participant puts on the Fatal Vision® Polydrug [Alcohol & THC] Goggle. Place spotters near the cones.
5. The instructor says, “go” and starts the timer.
6. The participant turns around, walks, and moves the balls from one cone to the other until there are three black balls in a row and three red balls in a row.
7. The participant must say “done” out loud, and the instructor records the time again.
9. Process the experience: Note any loss of balance, confusion, hesitation, errors in judgment, slower decision-making, and wanting to give up on the task.
10. Note any differences in the tone of voice this time, the confidence level, hesitation or increased nervousness, etc.



ACTIVITY – TIC TAC TWO – FLOOR

Talking Points

1. Point out the differences between the two problem-solving attempts.
2. The differences might be quantitative, as in the time to complete the task and the accuracy of ball placement.
3. The differences might be qualitative, such as balance, hesitation, confidence, quickness in decision-making, motivation to complete the task, and decreased recall.
4. How might the modeled impairments affect assessing and solving problems in real-life situations?

Sample Takeaway Message: “Used separately Alcohol and THC have their own impairments. When the two drugs are combined, the impairment effects are amplified more than either one alone. The combination can result in an increased risk for errors in decision-making, and harm to self or others.”

Presentation Tips

When set up and used according to the patterns shown, the participant will need to make at least two correct ball placement choices to complete the activity successfully. This technique ensures that the participant will engage their executive function and short-term memory to solve the activity. The goggles will impair balance, executive function, and short-term memory. The instructor can point out this difficulty caused by impairment afterward. Discuss how THC and alcohol can affect safety, problem-solving, and making appropriate real-life choices.

REFERENCES

REFERENCES

FARS data:

Using 2006-2008 US traffic data for fatal injury crashes: Marijuana use alone increases fatal injury crash risk by 1.5 times. Alcohol use alone increases fatal injury crash risk by 16 times. Combining both Alcohol and Marijuana increases fatal injury crash risk by 25 times.

<https://www.ncbi.nlm.nih.gov/pubmed/28286930>

Using 1993-2014 data for Fatally Injured in 2 vehicle crashes, Marijuana alone was 1.6x greater risk for a fatally injured crash, alcohol alone was 5.3x greater risk, and combined Marijuana and alcohol was 6.4x greater risk.

Role of alcohol and marijuana use in the initiation of fatal two-vehicle crashes. From <https://www.ncbi.nlm.nih.gov/pubmed/28595738>

Articles based on above study:

<https://www.menshealth.com/health/a19521641/marijuana-car-accidents/>

<https://www.studyfinds.org/crash-accident-drunk-high/>

Human Performance Studies:

Combining alcohol and Marijuana significantly increases active THC concentration in the blood.

<http://clinchem.aaccjnls.org/content/early/2015/05/05/clinchem.2015.238287>

<https://www.ncbi.nlm.nih.gov/pubmed/11543984>

Marijuana and alcohol combination increased standard lane deviation, increased speed, and decreased awareness of attempting to compensate for impairment.

<https://www.ncbi.nlm.nih.gov/pubmed/26889769>

<https://www.ncbi.nlm.nih.gov/pubmed/26144593>

Marijuana has an antiemetic effect that can prevent the body from vomiting excess alcohol to prevent blood alcohol poisoning in a binge drinking situation.

<https://www.ncbi.nlm.nih.gov/pubmed/11509190>

Combined use of Marijuana and alcohol produced severe impairment of cognitive, psychomotor, and actual driving performance in experimental studies and sharply increased the crash risk .

[https://www.drugandalcoholdependence.com/article/S0376-8716\(03\)00284-9/fulltext](https://www.drugandalcoholdependence.com/article/S0376-8716(03)00284-9/fulltext)

Compared to the use of alcohol alone, simultaneous use of alcohol and Marijuana approximately doubled the odds of drunk driving, social consequences, and harms to self.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4399000/>

Combined Marijuana and alcohol increased crash risk 8-10% for each .01 BAC unit increase with both substances on board.

<https://www.ncbi.nlm.nih.gov/pubmed/25612879>

French study shows the crash risk is 2.3x for cannabis alone (THC \geq 1 ng/mL), to 9.4x for alcohol alone (\geq 0.5 mg/L), and to 14.1x for the alcohol-cannabis combination.

<https://www.tandfonline.com/doi/abs/10.1080/15389580701737561?scroll=top&needAccess=true&journalCode=gpci20>

<https://www.bu.edu/articles/2021/deadly-car-accidents-involving-cannabis-and-alcohol-have-doubled/>

<https://ajph.aphapublications.org/doi/10.2105/AJPH.2021.306466>

<https://www.bu.edu/articles/2021/deadly-car-accidents-involving-cannabis-and-alcohol-have-doubled/>



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