Artificial Intelligence-Assisted Driver Alert System

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*Abstract –*Artificial intelligence-supported systems can play a key role in preventing accidents by minimizing human errors in critical areas such as traffic safety. This study aims to develop an artificial intelligence-supported driver monitoring and alert system to prevent distraction while driving and reduce traffic accidents. The developed system works on the Nvidia Jetson Nano platform and uses object detection technology with the YOLOv4-tiny model. Through visual and aural alerts, the system helps the driver refocus his attention on the road by identifying distracting behaviors like using mobile devices. The accuracy rate obtained in the tests performed is at an acceptable level. The developed system can appeal to both fleet managers and individual drivers due to its low cost. Road safety, as well as the safety of drivers and passengers, can be improved by lowering the likelihood of accidents.

Keywords – Driver alert system, Artificial intelligence, Image processing, Alerts

I. INTRODUCTION

These days, there is a serious risk to traffic, driver, and passenger safety due to the quick proliferation of mobile technologies and their use while driving. Research on this topic indicates that using a mobile device while driving increases the risk of accidents. For instance, a road safety research conducted in Germany, Austria, and Switzerland that looked at the relationship between the increased use of information, communication, and entertainment systems in cars and the rise in traffic accidents for the first time was presented in [1].

Accidents are closely linked to the use of mobile devices and other technological tools, according to research conducted by the Allianz Technology Center (AZT) [2]. The research carried out in collaboration with the Institute for Applied Psychology and Makam Market Research reveals significant findings regarding the impact of mobile device usage on drivers' attention in traffic. In [2], it was interviewed with 1,600 drivers and concluded that interest in technological devices while driving significantly increases the risk of accidents. It was found that 60% of drivers involved in accidents over the past three years had actively used their mobile devices while driving. In contrast, among drivers who have not been involved in accidents, the rate of mobile device usage is only around 37%. This clearly demonstrates how much mobile devices distract drivers and increase safety risks.

Studies that have been conducted in Türkiye support the findings given above. Specifically, the study in [3] looked closely at how addiction to mobile devices affects traffic safety. According to the study, there is a strong correlation between using a mobile device while driving, committing ordinary and aggressive infractions, and being careless. When it comes to drivers under 24, this correlation is especially str

ong. According to the study's findings, 27% of drivers in this age group read incoming messages while driving, and 23% text while driving. This demonstrates that using mobile devices while driving significantly increases the risk of an accident. Furthermore, according to 29% of participants across all age groups, they check their phones while driving to see if anyone is attempting to contact them via phone or text [3]. These values demonstrate the extent to which mobile devices impair traffic safety by distracting drivers while they are driving.

To address the potential risks caused by mobile device use, various application solutions have been developed. These applications aim to make drivers safer while using mobile devices. Although all these solutions and applications aim to reduce the safety risks experienced by drivers while using mobile devices, it is clear that current applications are not sufficient to eliminate these risks. Drivers should avoid any technological devices that will distract them while driving and should be more careful about safety measures. It is of great importance for application developers to produce more effective solutions in this regard to increase drivers' traffic safety. The real problem is the risk of an accident that will occur due to the perception shift that occurs when the driver picks up the mobile device.

According to traffic data for 2021 published by the Turkish Statistical Institute (TÜİK), 87.1% of the 224,418 faults that caused traffic accidents in Turkey were caused by drivers [4]. This shows that driver faults have the largest share in traffic accidents, and therefore solving this problem is of great importance to ensure traffic safety. When studies conducted to limit drivers' mobile device use and eliminate the negative effects of this problem on traffic safety are considered, it can be seen that there are several different approaches and technological solutions developed for this purpose.

Diferent from the existing solutions that typically focus on a limited range of distracting factors and give alerts about the phone use, the system developed in this study can analyze the driver's eye movements, hand and arm movements or body position to determine whether the driver's attention is really on the road. This increases the system's ability to provide accurate alert and makes it more effective than existing solutions.

The remaining sections of this paper are organized as follows. The next section provides a literature review in the related domain. The third section presents information about the methodology used and the application developed in this study. The fourth section reports results and provides discussion on the topic. Finally, this paper is concluded in the fifth section.

II. LITERATURE REVIEW

Traffic accidents are a major problem for road safety. Drivers' behaviors can be affected by various external stimuli while driving, and this can lead to distraction. In recent years, the use of mobile phones while driving has become widespread worldwide. Therefore, governments have enacted laws to prevent mobile phone use, seeing the effects of this problem on traffic safety. But most of the legal regulations have not still succeeded in completely preventing mobile phone use while driving.

Mobile phones can distract drivers' attention and may lead to traffic accidents [12]. Mobile phone use not only makes it difficult for drivers to focus, but also the potential dangers of this behavior cause serious concerns in terms of road safety [13]. A study conducted by the Traffic Presidency of the General Directorate of Security revealed the negative effects of mobile phone use on driving safety. In this analysis, the general result obtained regarding the use of both handheld and hands-free mobile phones while driving shows that this use significantly increases the risk of having a traffic accident and that the use of different mobile phone models leads to an increase in the driver's reaction time by approximately 40% and an increase in the risk of an accident up to 4 times. These findings clearly show that mobile phone use poses a serious threat to driving safety and is an important cause of road accidents [4]. Another finding that further highlights the negative effects of mobile phone use on road safety is that mobile phone use can cause 25% to 50% of traffic accidents involving injuries. In [15], it is shown that a phone call can increase the risk of a driver being involved in a road accident by three times. These findings reveal how mobile phone use poses a great threat to road safety, especially due to the distraction of drivers. In conclusion, it is an undeniable fact that mobile phone use while driving significantly distracts drivers' attention and increases the risk of accidents. Both drivers and traffic safety experts should understand the seriousness of this problem and more effective methods should be developed to control mobile phone use. In this context, drivers should be made aware, legal regulations should be tightened and mobile phone use should be managed safely with technological solutions.

In recent years, various technologies and applications have been proposed and developed to limit the frequent use of mobile phones while driving [5]. One of them is Google Glass, but its use has not been shown as a reliable method for this purpose [6]. It has been demonstrated that an Android smartphone with a three-axis accelerometer and multiple sensors can raise the driver's awareness to optimize safety [7].

Road accident monitoring and control may be greatly aided by a hardware device that can identify and block mobile communications after detecting cell phone use while driving [5]. For example, a Radio Frequency (RF) blocker can be used to block a mobile phone, and Radio Frequency IDentification (RFID) technology can be used to record data when the driver uses the mobile phone and send the vehicle license plate number to a control center [5].

Phone signal blocking systems are among the technologies developed to increase vehicle driving safety. These systems aim to restrict drivers' mobile phone signals while driving using RF blockers. This approach seeks to reduce distraction caused by phone calls, text messaging, and other mobile device activities, especially while driving [8]. Phone signal blocking systems are an effective method to prevent distraction. However, due to difficulties such as the need for communication in emergency situations and legal regulations of some countries, the application of these systems remains limited. The impact of this technology on traffic safety can be increased by developing more advanced and adaptive solutions.

In order to monitor and estimate the vehicle status, smartphone accelerometer sensors employ the Principal Component Analysis (PCA) algorithm with the time, frequency, and power spectral density features of the sensor data. These sensors can be used to identify driving behavior [9]. However, to do this, the smartphone application must either be cloud-deployed or have high-performance computing capabilities [5]. Heads-Up Display (HUD) is a display technology that displays necessary information directly on the windshield to vehicle drivers. These systems allow drivers to access important data about the vehicle without taking their attention off the road. HUD systems were initially designed for use in military aircraft and have been integrated into commercial vehicles over time [10]. However, HUD systems only work to keep the driver connected to the road and do not prevent the driver from using their phone.

Driver monitoring systems are an important component of modern automotive technologies and are among the innovative solutions aimed at increasing traffic safety. These systems are designed to detect possible dangerous situations in advance by monitoring the attention level, behaviors and physiological state of the driver using the vehicle. Technology is seen as an effective tool in detecting driver distraction, fatigue and inattention, especially on long-distance journeys or in conditions with high traffic density. One of the basic components of driver monitoring systems is the cameras placed inside the vehicle and the analysis of the data obtained from these cameras. The cameras monitor the driver's eye movements, head position and, if possible, facial expressions. These images are analyzed to identify possible risky situations such as lack of attention, drowsiness or mobile device use [11].

III. METHODOLOGY

A significant portion of traffic accidents are caused by driver faults. The most important of these faults is the distraction of drivers and especially the use of mobile devices. Using mobile devices while driving prevents drivers from focusing their attention on the road and traffic and invites accidents. This situation seriously endangers the safety of both drivers and other road users. A technological solution that can detect the distraction caused by mobile device use and provide instant feedback to drivers has great potential in terms of increasing

traffic safety. The development of such a system can contribute to a significant reduction in accidents, injuries and deaths by minimizing distraction while driving.

As current applications are inadequate and the fact that technological innovations can contribute to traffic safety, a system is proposed in this study to minimize accidents, injuries and deaths that may occur due to the use of mobile devices by the driver. The purpose of the proposed system is to prevent the driver from being distracted by the use of mobile devices while driving and to ensure that the driver focuses on the road. The system involves a camera that records the driver's movements and analyzes the data gathered by the camera with image processing techniques. In this way, instant data can be collected about the driver's movements and attention levels, and this data can be processed by microcontroller cards and audible and visual alerts can be given to the driver. These alerts can help the driver focus on the road. Targeted correct detection rate of mobile device use with this system is over 90%.

Although the accuracy rate of the image processing algorithms used in this system is targeted to be over 90%, this rate may be lower than expected under various driving conditions. Especially night driving, bad weather conditions such as heavy rain, fog, snow, or vibrations on the road surface may negatively affect the performance of the algorithms. Such situations may cause the system to give false positive or false negative alerts and reduce the accuracy of the feedback given to the driver. The system uses cameras, microcontroller cards, and similar equipment to monitor the driver's behavior in the vehicle. However, the fact that vehicles have different hardware and that there may be compatibility problems with this equipment may limit the system's wide-scale applicability.

When drivers feel that they are constantly being monitored in the vehicle, this situation may be perceived as disturbing. This perception may lead users to resist adopting the system or to stay away from technology altogether. Although the system is effective in detecting the driver's use of mobile devices, it may not be sufficient to completely prevent certain types of use of these devices. For example, even if distracting activities such as playing games or watching videos are detected, it may not be possible to directly prevent these activities. In addition, the driver's attention may be distracted not only by mobile devices but also by other factors such as billboards on the side of the road, other vehicles or environmental elements. In the face of such distractions, the system's intervention capacity may be limited.

A. System Components

The components of the proposed system are explained in the following. Jetson Nano is a compact computer developed by NVIDIA that allows performing artificial intelligence applications. Jetson Nano, an example of System on Module (SoM) in terms of its structure, is one of the embedded systems that can operate a system with a single circuit by integrating digital and analog signals on a single card. This SoM feature allows the developer kit to perform artificial intelligence applications such as image classification, object detection, segmentation and natural language processing on a single circuit using multiple neural networks simultaneously [16].

You Only Look Once (YOLO) version 4 is a deep learning model developed by Alexey Bochkovskiy in 2020 for object detection, combining speed and accuracy. Designed to provide high performance in real-time applications, the model offers high accuracy and fast detection capabilities even with limited hardware resources because of its optimized architecture. Being able to perform object detection, classification and location operations in a single step is one of its important features [17].

YOLO architecture contains two fully connected layers, four max-pooling layers, and twenty-four convolutional layers [18]. This is how the architecture functions. Prior to passing through the convolutional network, the input image is first resized to 448x448. The number of channels is then decreased using a 1x1 convolution, and a cuboidal output is produced using a 3x3 convolution. With the exception of the last layer, which employs a linear activation function, the activation function under the hood is ReLU after that. Lastly, a few more methods, such dropout and batch normalization, regularize the model and keep it from overfitting [18].

In this study, the YOLOv4-tiny model is used to perform real-time object detection using a camera. This model, which was developed and put into use in 2020, has been preferred due to its speed and efficiency and higher success rate. In addition, the software is one of the software models that has proven itself by being used in many areas such as security and monitoring, autonomous vehicles, medical imaging, industry and production [17].

JetPack Software Development Kit (SDK) is a comprehensive software package from NVIDIA for artificial intelligence and deep learning projects. This SDK was developed specifically for devices running on the NVIDIA Jetson platform, and offers software optimized with hardware accelerators for applications such as robotics, artificial intelligence, machine learning, computer vision, and automated systems. JetPack SDK provides both software components and tools together, allowing developers to quickly develop applications on NVIDIA Jetson devices. JetPack SDK is designed for use on devices such as NVIDIA Jetson Nano, Jetson Xavier NX, Jetson AGX Xavier. JetPack includes popular libraries such as CUDA, cuDNN, TensorRT, OpenCV, and also offers components such as NVIDIA's DeepStream SDK, Jetson Multimedia API, Tegra hardware-supported features [16].

Nvidia Jetson Nano is one of the single-board computers optimized for image processing. For this reason, the Ubuntu-based Jetpack software to be run on it is installed on an SD card and inserted into the device. The software comes with the Python object-oriented programming language to be used in it [16]. Therefore, Python programming language has been used to program system components.

B. YOLOv4-tiny Model Files, Darknet Network

There are 80 different target classes in the COCO dataset used in the YOLOv4 model. As shown in Figure 1, the cell phone dataset is the target class of the dataset. The class structures in the model are as follows.
CONFIG_FILE: Configuration file for the model architecture (layers) of YOLOv4-tiny.
WEIGHTS_FILE: Contains pre-trained weights.
DATA_FILE: File that defines class names and dataset information. COCO dataset is used.
TARGET_CLASS: Defined to focus on detecting only the "cell phone" class.

```
6    CONFIG_FILE = "cfg/yolov4-tiny.cfg"
7    WEIGHTS_FILE = "yolov4-tiny.weights"
8    DATA_FILE = "cfg/coco.data"
9    TARGET_CLASS = "cell phone"
```

Figure 1. Model files

Figure 2 shows how the darknet framework is set up to work with the YOLO model.

darknet.load_network: Loads the YOLOv4-tiny model, classes, and colors.

network: Represents the network structure on which the model will work.

class_names: List of class names in the COCO dataset (for example, "cell phone").

class_colors: A color information assigned to each class.

```
12   network, class_names, class_colors = darknet.load_network(
13       CONFIG_FILE,
14       DATA_FILE,
15       WEIGHTS_FILE,
16       batch_size=1
17   )
```

Figure 2. Loading the network

In Figure 3, the YOLO model works with a fixed input size. This code retrieves the input dimensions (width and height) accepted by the network.

```
18
19   width, height = darknet.network_width(network), darknet.network_height(network)
20
```

Figure 3. Adjusting the network parameters

Figure 4 describes the camera settings. cv2.VideoCapture(0): Starts the default USB camera. The camera resolution is set to 640x480.

```
22   cap = cv2.VideoCapture(0)
23   cap.set(cv2.CAP_PROP_FRAME_WIDTH, 640)
24   cap.set(cv2.CAP_PROP_FRAME_HEIGHT, 480)
```

Figure 4. Starting the camera to record

With the codes given in Figure 5, the images given as input to the YOLO model are adapted to the input size of the model. Edge padding: To preserve the proportions, black edges are added around the image.

```
29   def resize_and_pad(image, target_width, target_height):
30       h, w, _ = image.shape
31       scale = min(target_width / w, target_height / h)
32       new_w = int(w * scale)
33       new_h = int(h * scale)
34
35       resized = cv2.resize(image, (new_w, new_h), interpolation=cv2.INTER_LINEAR)
36
37       pad_w = (target_width - new_w) // 2
38       pad_h = (target_height - new_h) // 2
39
40       padded = cv2.copyMakeBorder(resized, pad_h, pad_h, pad_w, pad_w, cv2.BORDER_CONSTANT, value=(0, 0, 0))
41       return padded, scale, pad_w, pad_h
```

Figure 5. Resizing the images and padding the borders

In Figure 6, the YOLO model returns the frame coordinates in the input dimension. These coordinates are scaled to the original image dimensions. The frames are correctly recalculated, taking into account edge padding and scaling.

```
44   def scale_bbox(bbox, scale, pad_w, pad_h, original_width, original_height):
45       x, y, w, h = bbox
46       x = (x - pad_w) / scale
47       y = (y - pad_h) / scale
48       w /= scale
49       h /= scale
50       x = int(x)
51       y = int(y)
52       w = int(w)
53       h = int(h)
54       return x, y, w, h
55
```

Figure 6. Scaling the window

In Figure 7, each frame from the video stream is processed by the model.

Image Preparation: The image is resized and converted to YOLO format.

darknet.make_image: Creates an empty image that will provide input to YOLO.

darknet.copy_image_from_bytes: Copies the resized image to the Darknet format.

Object Detection: darknet.detect_image: Detection is performed with the YOLO model.

thresh=0.5: The detection threshold ensures that detections above 50% confidence score are taken into account.

Drawing Results: If the target class "cell phone" is detected, a frame (bbox) is drawn and the class name and confidence score are added to it.

cv2.rectangle: Draws a green rectangle around the detected object.

cv2.putText: Adds class and confidence score information.

```
56   def detect_and_draw(frame):
57
58       resized_frame, scale, pad_w, pad_h = resize_and_pad(frame, width, height)
59       darknet_image = darknet.make_image(width, height, 3)
60       darknet.copy_image_from_bytes(darknet_image, resized_frame.tobytes())
61
62       detections = darknet.detect_image(network, class_names, darknet_image, thresh=0.5)
63       darknet.free_image(darknet_image)
64
65       for label, confidence, bbox in detections:
66           if label == TARGET_CLASS:  # Yalnızca telefonları tespit et
67               x, y, w, h = scale_bbox(bbox, scale, pad_w, pad_h, frame.shape[1], frame.shape[0])
68               left, top = x - w // 2, y - h // 2
69               right, bottom = x + w // 2, y + h // 2
70               cv2.rectangle(frame, (left, top), (right, bottom), (0, 255, 0), 2)
71               cv2.putText(frame, f"{label} [{confidence}%]", (left, top - 5), cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0, 255, 0), 2)
72
73       return frame
74
```

Figure 7. Detection and visualization

In Figure 8, the camera reads every frame as long as it is open. It runs the detect_and_draw function for each frame. The detection time per frame is measured and the FPS (frames per second) is printed on the screen.

Visualization: cv2.imshow: Shows the detections to the user in real time.

Termination: When the q key is pressed, the camera feed is stopped and all windows are closed.

```
75   while cap.isOpened():
76       ret, frame = cap.read()
77       if not ret:
78           print("Kamera akışı durdu!")
79           break
80
81       start_time = time.time()
82       frame = detect_and_draw(frame)
83       fps = 1 / (time.time() - start_time)
84       cv2.putText(frame, f"FPS: {fps:.2f}", (10, 20), cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0, 255, 255), 2)
85
86
87       cv2.imshow("Mobil Cihaz Algilandi", frame)
88
89
90       if cv2.waitKey(1) & 0xFF == ord('q'):
91           break
92
```

Figure 8. Main loop of the program

In Figure 9, when the driver picks up the mobile device with the program running, the software detects the mobile device and highlights the relevant area on the screen.

Figure 9. Detection of the mobile device

In our experimental study, the system has successfully detected the target class "cell phone" object. As shown in Figure 10, the system has not detected an object (bottle). However, detection accuracy of the proposed system can vary depending on factors such as camera angle, lighting conditions, and visibility of the cell phone. False positives (for example, a shiny surface being detected as a cell phone) or false negatives (not being detected as a cell phone) can occur. To increase detection accuracy, it is important that the camera angle is in a position where the driver can clearly see it. An infrared camera or additional lighting can be used for low-light conditions. The model can be retrained with a more specific dataset to reduce false positives.

Figure 10. Not detecting objects other than the phone

The most important features and trends in the results should be described but should not interpreted in detail.

IV. RESULTS AND DISCUSSION

Nowadays, drivers' use of mobile phones has become one of the most important causes of traffic accidents. The use of mobile devices causes drivers to be distracted, greatly increasing the likelihood of accidents. If drivers check their phones, write messages or answer calls while driving, it becomes difficult for them to focus on the road. Such behaviors endanger road safety and cause accidents to occur more frequently. According to TÜİK data, considering that 87% of fatal and injury accidents in Turkey occur due to driver-related faults. Therefore, preventing distraction while driving can significantly reduce the number and severity of accidents. A system that address this problem can reduce the dangers that mobile device use can cause while driving and can significantly reduce the number and severity of traffic accidents. In order to address this problem, the system must send audible and visual alerts to the driver in case of distraction by continuously monitoring and analyzing the driver's behavior. These alerts can help prevent accidents by encouraging the driver to give up faulty behavior and focus on the road again.

The system developed in this study is suitable not only for individuals but also for fleet management companies, transportation companies and bus companies. Using image processing techniques and data analysis, the system constantly monitors the driver's attention during vehicle use and intervenes immediately in potential dangerous situations after detecting the driver's mobile device use. In this way, drivers' attention can be prevented from being distracted, especially during long journeys, and driving safety can be ensured.

The rate at which the developed system provides accurate alert to the driver in real time is a fundamental criterion that ensures the system's success. The targeted detection rate was over 90% percent and it has been achieved in the trials. The developed system can be useful not only in preventing accidents but also in the field of driver training. But the accuracy and reliability of the system should be tested extensively under different driving conditions and various environmental factors. Observations in real-life scenarios typically reveal that system performance is directly affected by variables such as camera angle, lighting conditions, and driver facial and hand movements. It is assumed that there may be decreases in detection accuracy, especially under low-light conditions or variable lighting.

Some optimizations need to be made to increase the reliability of the system and prevent false positive or negative detections. In this context, retraining the model with a wider and more diverse data set will allow it to better learn different driver behaviors and environmental conditions. For example, the generalization ability of the model can be increased by using data sets that include drivers from different age groups and ethnic backgrounds, as well as different weather and light conditions [19].

Audio based alerts can be integrated into driver monitoring systems in addition to visual alerts to improve the user experience and provide an effective feedback mechanism [20]. Audible alerts can minimize distraction by allowing the driver to receive feedback without taking their eyes off the road, but the system's adaptive structure and ability to dynamically change feedback methods according to the driver's reactions will further increase ease of use and effectiveness [21]. These improvements are important to ensure that the obtained results are more consistent and reliable and make the system suitable for real-world applications. In the long term, it is expected that such systems will have a groundbreaking effect on road safety by increasing their adaptability to different vehicle types and driving scenarios.

The hardware and software components of the system may be far from accessible to individual users or small-scale businesses in terms of production and development costs.

Integrating the technology into different vehicle models may require additional engineering work, time and cost. This situation is another obstacle that makes it difficult for the system to be widely used. In addition, continuous monitoring of drivers' behavior may also bring about important legal and ethical discussions regarding personal privacy. Drivers' feeling that their privacy is being violated may make it even more difficult for the technology to be adopted and accepted in society. At the same time, this situation may create various difficulties in terms of compliance with legal regulations. For these reasons, a comprehensive evaluation process must be carried out from both technical and social perspectives for the successful implementation and acceptance of the technology.

A. Advantages and Limitations

Jetson Nano used in the project is one of the ideal platforms preferred in such applications with its flexibility, energy efficiency and compact structure for artificial intelligence applications. As it provides low cost and easy integration features, Jetson Nano can be used effectively in projects that target driver monitoring and attention detection. It offers a great advantage in mobile applications by keeping energy consumption at a minimum level while allowing deep learning-based algorithms to be run in real time.

However, some limitations of Jetson Nano should be taken into consideration in long-term use and harsh environmental conditions. The cooling needs of Jetson Nano should be met correctly to prevent performance loss in cases where it has high processing power. Especially in hot climates or scenarios with high processing load, optimizing cooling systems is of critical importance. In addition, a durable housing design should be applied to protect the hardware against vibrations and sudden movements that may occur in the vehicle.

V. CONCLUSION

The main goal of the project was to prevent traffic accidents and improve road safety by increasing the driver's attention. The system developed for this goal provides instant alerts to the driver by detecting mobile phone use while driving and helps prevent potential risk situations. The rate at which the developed system provides accurate alert to the driver was over 90% percent. But the accuracy and reliability of the system should be tested extensively under different driving conditions and various environmental factors.

Compliance with legal regulations and ethical standards is of great importance for the proposed system's acceptance. As a future work, the following features can be bded. If larger data sets and state-of-the-art algorithms are used, the system can provide higher accuracy and reliability. Based on users' preferences, visual, auditory and vibration alert options can be provided. Finally, the data collected by the system can be further analysed using cloud-based systems to obtain various reports to be used in fleet management.

Authors' Contributions

G.B. developed the theoretical framework and performed the experiments. G.B. and G.T. aided in the analysis. G.B. and G.T. discussed the results and contributed to the final manuscript.

Statement of Conflicts of Interest

There is no conflict of interest between the authors.

Statement of Research and Publication Ethics

The authors declare that this study complies with Research and Publication Ethics

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