

**MAINTAINING SAFE DRIVING: RELATING DECLINES IN
CRITICAL DRIVING SKILLS TO ADVANCED DRIVER
ASSISTANCE (ADAS) SYSTEM TECHNOLOGIES**

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16. Abstract As people age and begin to experience health conditions and take medication for these conditions, the driving skills that are needed for safe driving may also decline. Based on research conducted by the University of Michigan Transportation Research Institute (UMTRI), we have developed a table that provides recommended ADAS technologies for those who are experiencing increasing difficulties in performing 15 critical driving skills. The names of each ADAS are active links that can be clicked to obtain further information about the technology.					
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Introduction

As people age and begin to experience health conditions and take medication for these conditions, the driving skills that are needed for safe driving may also decline. Based on research conducted by the University of Michigan Transportation Research Institute (Eby et al., 2008a; 2008b, 2015; Molnar et al., 2010), we have developed a table that provides recommended ADAS technologies for those who are experiencing increasing difficulties in performing certain critical driving skills. The names of each ADAS are active links that can be clicked to obtain further information about the technology.

Note that that this list is not just for the older drivers but can be useful for anyone who is experiencing issues with critical driving skills. Also, if you or someone you know is experiencing any of these driving problems, it is recommended that you or they have a conversation with a primary care provider and/or an occupational therapist. It may also be beneficial to have a combination of ADAS to best support your driving needs. Finally, keep in mind that these technologies may not be sufficient to assure a driver's safety, as each driver's needs and abilities are unique.

Table of Critical Driving Skills, Definitions, and Potential ADAS for Drivers who Are Experiencing Difficulties in Driving Skills.

Critical Driving Skill	Definition	ADAS Technologies
Pre-Trip Planning	Pre-trip planning involves all of those things that you can do to make driving easier and safer before you even start your vehicle, such as making sure you are well-rested, ensuring that you are not impaired from the side-effects of medications, planning your trip route in advance, and wearing your seat belt.	<ul style="list-style-type: none">• Drowsiness alert• Navigation assistance• Push button start• Temperature warning
Way Finding	Way finding is your skill in being able to drive to places where you want to go without getting lost. A driver who is lost can be dangerous because he or she often makes mistakes while driving that can lead to traffic crashes.	<ul style="list-style-type: none">• Blind spot warning• Level 2 automated driving system• Navigation assistance• Voice activated controls

<p>Yielding</p>	<p>Yielding involves knowing which vehicles have the right-of-way and waiting until those vehicles have passed before pulling into the road. Proper yielding is important for safe driving because drivers of other vehicles will be expecting you to know who has the right-of-way.</p>	<ul style="list-style-type: none"> • Bicycle detection • Blind spot warning • Brake assist • Forward collision warning • Left turn crash avoidance • Level 2 automated driving system • Obstacle detection • Pedestrian detection • Rear cross traffic alert • Sideview camera
<p>Turning</p>	<p>Skill in turning the vehicle is a basic part of safe driving. Turning, however, involves more than just using the steering wheel, it also involves approaching and exiting turns at the correct speed.</p>	<ul style="list-style-type: none"> • Bicycle detection • Blind spot warning • Curve speed warning • Forward collision warning • Left turn crash avoidance • Obstacle detection • Pedestrian detection • Sideview camera
<p>Responding to Traffic Signals/Signs</p>	<p>Traffic signs, signals, and pavement markers (such as stop signs) are designed to help traffic move efficiently and safely. They are only effective if people notice them, know what they mean, and respond to them appropriately.</p>	<ul style="list-style-type: none"> • Brake assist • Forward collision warning • Left turn crash avoidance • Level 2 automated driving system • Obstacle detection • Pedestrian detection
<p>Changing Lanes</p>	<p>Changing lanes involves checking to make sure the traffic lane is free of other vehicles, signaling your intent to change lanes, and then steering the vehicle into the next lane. The most dangerous part of changing lanes is that a vehicle can be in your blind spot.</p>	<ul style="list-style-type: none"> • Blind spot warning • Brake assist • Lane departure warning • Lane keeping assist • Level 2 automated driving system
<p>Passing</p>	<p>Passing another vehicle involves knowing where passing is legal, being able to judge the speed of oncoming vehicles, and being able to safely accelerate and drive your car around a slower-moving vehicle that is in front of you.</p>	<ul style="list-style-type: none"> • Blind spot warning • Curve speed warning • Forward collision warning

<p>Observing</p>	<p>An important skill for safe driving is to maintain awareness of what is happening around you. Observing involves both paying attention to what is happening in front of you and also using the vehicle’s mirrors to keep track of what is happening behind you. A person with good observing skills is aware of how traffic is changing and can make appropriate driving adjustments to avoid potentially dangerous situations.</p>	<ul style="list-style-type: none"> • Bicycle detection • Blind spot warning • Curve speed warning • Drowsiness alert • Navigation assistance • Obstacle detection • Pedestrian detection • Sideview camera • Voice activated controls
<p>Gap Acceptance</p>	<p>An important driving skill is to be able to pull into or across traffic only when there is a large enough “gap” in traffic so that you can safely complete your maneuver. The gap is the length of time in which there is no traffic crossing your intended path and is determined both by the distance between vehicles and the speed they are traveling. Research shows that many crashes are caused by drivers inappropriately judging a gap length.</p>	<ul style="list-style-type: none"> • Brake assist • Forward collision warning
<p>Speed</p>	<p>The appropriate driving speed is based on the posted speed limit and the conditions of the roadway. Speeds should be reduced, for example, if the road is slippery. Note that traffic crashes can be caused by drivers traveling too fast and by drivers traveling too slow</p>	<ul style="list-style-type: none"> • Adaptive cruise control • Brake assist • Curve speed warning • High speed alert • Hill descent assist • Hill start assist • Level 2 automated driving system
<p>Backing Up/Parking</p>	<p>Backing up is an important driving skill because it is difficult to see what is behind your car and it can be hard to steer while traveling in reverse. This skill involves being able to use mirrors and being able</p>	<ul style="list-style-type: none"> • Automatic parallel parking • Obstacle detection • Parking sensors • Rear cross traffic alert • Sideview camera

	to turn your neck and body to see what is behind the vehicle.	
Maintaining Proper Lane Position	The lines on the road are designed to show drivers where cars should be driven. Exceeding these lines can lead to traffic crashes. Proper lane position is important not only while traveling in a traffic lane but also while negotiating intersections.	<ul style="list-style-type: none"> • Adaptive cruise control • Blind spot warning • Lane departure warning • Lane keeping assist • Level 2 automated driving system
Following	Maintaining a proper following distance behind the vehicle in front of you is important for the prevention of rear-end crashes. The proper following distance is determined by the distance between you and the next vehicle, as well as the speed at which you are traveling. With greater travel speeds, a larger distance between vehicles is needed for safe following.	<ul style="list-style-type: none"> • Adaptive cruise control • Forward collision warning • Level 2 automated driving system
Signaling	Signaling your intent to turn or change lanes is important for safe driving because it lets other drivers and pedestrians know what you are about to do. It is equally important to remember to turn off the signal after you turn or change lanes so that others know you are done.	<ul style="list-style-type: none"> • Blind spot warning • Level 2 automated driving system
Use of Headlights	Headlights are important for being able to see while driving at night and during bad weather. They are also important for letting other drivers and pedestrians know where you are when seeing is difficult. Remembering to turn off the bright “high-beam” for approaching vehicles is also important for safe driving because high-beam lights	<ul style="list-style-type: none"> • Adaptive headlights

	can make seeing difficult for the other driver.	
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