SAR x 2 = SSAARR*

An Effective Traffic Search Procedure*

Developed by

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*** Author Note:** *Initial work on this project began before 2010 with reviews of the literature on right-of-way violation caused motorcyclist crashes. Also reviewed were the articles about inattentional blindness and the research regarding tasks to overcome inattentional blindness. I labeled the early look/search procedure "Stop, Rock and Roll." A 2012 version was titled RR & AA (rock, roll & ask, answer). A 2017 version of this procedure was titled "Stop and F.A.R.M. for stop, focus on three distances, rock and move forward in a cautious manner.*

The title is important only as a memory aid. I have settled on SAR x 2 as it identifies each of the important components of a traffic search procedure that holds great potential of reducing crashes between cars/trucks and vulnerable road users (pedestrians, bicyclists and motorcyclists). While this paper focuses on motorcyclists the SAR x 2 procedure is also relevant for pedestrians and bicyclists.

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Introduction

SAR x 2 creates a conscious task for drivers to perform specific to the identification of motorcyclists, bicyclists and pedestrians. The procedure focuses driver attention to various distances, alters the angle of the driver's visual path and slows down the time allocated to searching. SAR x 2 addresses the multiple physiological phenomena associated with motorcyclist right-of-way violation caused crashes

Looked but Failed to See (LBFTS) intersection right-of-way (ROW) violations are caused by a combination of factors. Understanding the Four Chances for Error and the associated physiological phenomena associated with how our eyes and mind work to perceive provide the underpinning of the SMARTER developed contemporary driver search procedure SAR x 2 (SSAARR) - Stop fully, Search with specificity, Ask, Answer, Rock, and Roll forward slowly.

In this paper, the Skilled Motorcyclist Association - Responsible, Trained and Educated Riders, Inc. (SMARTER at www.smarter-usa.org) suggests a new and innovative intersection traffic search procedure.

The Problem: Car drivers pull out in front of motorcyclists

Motorcyclist right-of -way violations are a major cause of two-vehicle motorcyclist crashes. The iconic Hurt Report of 1981 found the following:

1. In multiple vehicle accidents, the driver of the other vehicle violated the motorcyclist's right-of-way and caused the crash in two-thirds of those crashes.

2. The failure of motorists to detect and recognize motorcycles in traffic is a predominate cause of motorcycle accidents. The driver of the other vehicle involved in the collision with the motorcycle did not see the motorcycle before the collision or did not see the motorcycle until too late to avoid the collision.

3. Deliberate hostile action by a motorist against a motorcycle rider is rare.

4. The most frequent accident configuration is the motorcycle proceeding straight and the automobile makes a left turn in front of the oncoming motorcycle.

5. Intersections are the most likely place for a motorcyclist crash a vehicle because the other vehicle violated the motorcyclist's right-of-way and often violating traffic controls.

SAR x 2 - The Potential

Stop, Search, Ask, Answer, Rock, Roll is a traffic search procedure designed to reduce LBFTS ROW violations of vulnerable road users. SAR x 2 creates a conscious task to perform specific actions to aid the identification of motorcyclists, bicyclists and pedestrians. It focuses driver attention to various distances, slightly increases the time drivers spend searching for vulnerable road users and varies the angle of the driver's visual search pattern. Lastly the procedure suggests moving slower into the traffic mix.

Replacing the outdated "look left, look right, look left again and proceed" procedure used by drivers at intersections is critical to address LBFTS ROW violations that cause crashes. This old procedure simply is not effective. Visual phenomena such as inattentional blindness, saccadic masking and motion camouflage, all of which impact perception, have been identified as factors for more than two decades. In that time, no changes to the traditional, outdated "look" procedure used by car drivers, have been tried, tested or even suggested.

SAR x 2 addresses the problems of the physiological phenomena of attention, perception and cognition. This new intersection search procedure holds the promise of reducing motorcyclist crashes, where the predominate cause is the failure of motorists to detect and recognize the approaching motorcyclists. The procedure also addressing similar LBFTS caused crashes with bicyclists and pedestrians.

The Past: Decades following an incorrect path

In addition to recommending formal training for riders, there were two other major countermeasures implemented as a result by the findings of the "Hurt Study" - motorist awareness campaigns and conspicuity enhancement.

However, despite years of "motorist awareness" efforts imploring car drivers to "Look Twice to Save a Life" and efforts to get motorcyclists to make themselves more visible, nothing has changed the nature of the facts identified in the "Hurt Study" related to right-of-way violations. These three major countermeasures have demonstrated little or no evidence of effectiveness.

In New Zealand, Australia and parts of Europe these types of crashes are referred to as SMIDSY for "Sorry mate, I Didn't See You." The problem is so persistent and ongoing that some motorcyclist safety advocates have promoted desperate measures such as recommending motorcyclists begin weaving within their lane as they approach a dangerous intersection. While this action might increase the likelihood of the car drivers seeing the motorcyclists, additional the control complications for the motorcyclists who might soon have to brake and/or swerve, makes weaving a potentially dangerous addition to an already problematic scenario.

Why do car drivers pull out in front of motorcyclists?

Auto drivers are trained to "look" so why do they sometimes not "see?" Are drivers who pull out in front of motorcyclists being careless and dangerous? Are they distracted? Do they not care? Does the motorcycle rider simply blend into the background becoming camouflaged from normal "looking"? Is the motorcycle and rider simply too small or narrow to see?

If any of these were major causes of LBFTS crashes, efforts to increase motorist awareness of the problem combined with rider conspicuity efforts should have had an impact on reducing these crashes. However, as stated earlier, the statistics remain unchanged. If drivers genuinely do not see the motorcyclist or do not see the motorcyclists until it is too late, something else must be going on.

Four Chances for Error

Understanding the four chances for error and the associated visual phenomena is helpful in furthering our understanding of the Looked But Failed to See (LBFTS) Right-of-way Violation (ROWV) motorcyclist/car collision scenario. Understanding these chances for error also provides a brief review of the major research underpinnings for the contemporary traffic search procedure SAR x 2 or SSAARR.

Four Chances for Error is a concept from *The Science of Being Seen* by Kevin Williams which can be accessed at: https://smarter-usa.org/wp-content/uploads/2021/01/The-Sceince-of-Being-Seen-Edited-by-SMARTER.docx.pdf

> *A crucial point to understand is the human eyes and brain is not the equivalent of the lens of a camera. The common-sense argument that "if it is visible, we will see it if we look hard enough" simply isn't true.*

First error chance

Didn't look. Did the driver fail to look? If the driver is distracted or misunderstands the road layout (for example having no experience regarding traffic flow at a roundabout), he or she might not look or might not look in the necessary direction.

- Riders need to be aware of situations that might be complicated for drivers, reduce speed and be prepared to take evasive action.

- Drivers need to eliminate distraction while driving and take extra time to focus at unfamiliar road layouts. They must ***Stop*** fully and ***Search*** with specificity.

> *The available research evidence tells us drivers failing to look is extremely rare, contrary to the claims made by many motorcyclists. If drivers regularly failed to look, no one would get very far from their starting point without being in a crash.*

Second error chance

Looked but couldn't see. The driver looks but the motorcyclist is not visible. If the motorcyclist is in the "wrong place" (for example behind a larger vehicle) or the motorcyclist is appropriately positioned but the driver's view is blocked (for example, by the car pillar or a roadway obstacle like a light pole) the driver could look but fail to see the motorcyclist.

- Riders have the responsibility to ride in a position to be seen.

- Drivers should **Rock** their upper body while looking and take more time searching – allowing the motorcyclist to "appear" if driver's vision is blocked. Drivers must understand the need to look around pillars and roadside obstacles.

Third error chance

Looked, motorcyclist visible, but didn't see. The driver looks, the motorcyclist is visible, but the driver never becomes aware of the motorcyclist. This is an example of what is called ***inattentional blindness***.

> *The term **"inattentional blindness"** was coined by Arien Mack and Irvin Rock to describe the results of their extensive studies of the visual perception of unexpected objects. Many of their studies from the early 1990s culminated in their 1998 Book entitled "Inattentional Blindness" (Mack & Rock, 1998).*

There are several explanations for this phenomenon. The long-standing explanation is that the motorcyclist is small and inconspicuous. Recent research however indicates that lack of conspicuity doesn't explain many LBFTS ROW crashes. For example, drivers pull out in front of highly conspicuous trains and emergency vehicles. Regarding motorcyclists, the research indicates that ***lack of prevalence and lack of meaning*** better explain drivers failing to perceive a motorcyclist that is clearly in the driver's line of vision.

Motorcyclists are a small fraction of road users. There are not many motorcyclists on the road compared to other vehicles. Most road users don't own or operate a motorcycle and have little connection to motorcycling. People tend to "see" (perceive or become aware of) things within their visual field that they expect to see and/or have meaning to them. An example of low prevalence but high meaning is when antique car lovers can spot vintage cars in the traffic mix even though there are few on the road. This may explain why drivers who also have a motorcycle operator's license (dual drivers) are more likely to spot motorcyclists in the traffic mix than drivers who have only a license to operate a car.

Saccade masking is another phenomenon about the way our eyes work that could account for when drivers look, the motorcyclist is visible but the driver does not "see" the motorcyclist. When we move our head and eyes quickly to scan a scene, the background moves rapidly through our zone of vision. Drivers (and riders) on average look in each direction for less than a half second before turning their head to look in the other direction. When we turn our heads quickly, our vision is shut down in a series of saccades. Without saccades, our rapid head and eye movement would cause disorientation and dizziness. Our eyes don't move smoothly across the background, as we commonly think. Instead, our eyes move very rapidly from one selected fixation point to another.

This works very effectively for processing complex scenes but there is a drawback. The brain

ceases to process retinal images between saccades. It is only during the stationary fixations that an image is processed. The result is all drivers and riders are left with gaps in visual perception whenever scanning quickly both ways at an intersection. This is known as ***saccadic masking or saccadic suppression***. The brain "fills in" the missing visual data giving us the impression of continuous vision during the scan. We believe we have completed a full continuous scan but the truth is our scan is more like a series of snapshots which, without our awareness, our brain has stitched together. Even an attentive driver looking in both directions to check for oncoming traffic may fail to see an approaching motorcyclist if he/she falls within a saccade.

- Research does indicate that riders can benefit from making themselves more conspicuous (visible). Riders should strongly consider wear Hi-Viz gear and adding auxiliary lights.

- Drivers should look near, middle-distance and far while **Asking** themselves if there a is pedestrian, bicyclist or motorcyclist approaching? Next, **Answering** that question to focus their attention. Drivers should take more time moving their head and should keep their eyes moving in lock-step with their head. This will lessen the chance a motorcyclist will be lost in a saccade and provide time for the motorcyclist to appear if blocked from the driver's vision.

The left turn scenario presents another problem - ***motion camouflage***. Many motorcyclists ride in the left third of their lane. This position is often recommended as the best position for seeing and being seen. However, a motorcyclist riding in the left third of the lane and approaching a stopped car waiting to turn left is positioned directly in front (straight ahead) of the driver. The motorcyclist is moving toward the car. However, from the driver's perspective the motorcyclist appears stationary because the motorcyclist remains on the same line of travel between the driver and a landmark behind the motorcyclist.

- Motorcyclists, approaching an intersection with a vehicle waiting to turn left, should consider moving toward the right portion of the lane. In this position the view from the driver to the motorcyclist is at an angle that presents a changing background and results in the perception of movement, which heightens identification.

- The car driver, waiting to turn, looking ahead, and aware of this phenomenon can increase their chance of seeing a motorcyclist traveling directly at them by **Rocking** their upper body side to side while looking. The rocking will remind them to search hard to see motorcyclists and at the same time change their line of vision creating the same result as the motorcyclist can create by changing lane position.

Fourth error chance

Looked, saw but miscalculated. The driver looks, the motorcyclist is visible, the driver sees the motorcyclist but fails to correctly judge the speed and distance of the motorcyclist. Research indicates that the motorcyclist's speed as they approach an intersection is often higher than that of other vehicles.

The phenomenon termed ***size-arrival effect*** is in play in this scenario. Our mind judge's larger objects to be closer to collision than smaller objects, even if the larger object is farther away. Because motorcycles, and their riders, are small compared to other vehicles on the road, drivers may judge them as being farther away (longer time to arrive) than they actually are.

- Riders have the responsibility to slow down and approach intersections with caution and readiness to brake.

- To compensate for the size-arrival effect, drivers should assume the motorcyclist they see will arrive at the collision point sooner than they think - and choose to wait. Choosing to wait will cost a few seconds in time. Misjudging the motorcyclists' arrival and turning across his/her path causing a collision could result in a catastrophe. Extra time for the driver to search and for the motorcyclists to act is provided if the driver **Rolls** slowly into the intersection as opposed to concluding all is clear and just accelerating quickly.

Review

Blocked vision, inattentional blindness, saccadic masking, motorcyclist speeding, motion camouflage and size-**arrival effect** all come together at intersections (including informal intersections such as driveways) to create a perfect storm that can result in a tragic crash. Riders and drivers need to understand these phenomena. Both can take action to lessen the chances of such a disastrous result.

- For drivers, stopping (S) completely, Searching (S) carefully to specific distances, rocking (R) side to side or back and forth while looking, thinking about vulnerable road user by asking (A) if a pedestrian, bicyclist or motorcyclist is approaching, and answering (A) the focusing question. If a motorcyclist is identified, drivers must assume the motorcyclist will arrive quicker than the driver expects. Once the driver has decided there are no nearby vulnerable road user and the gap is sufficient for safe movement, rolling (R) forward slowly provides additional time to identify any vulnerable road users that may have been missed.

- For the rider Hi-Viz gear, auxiliary lights, slowing down and making informed choices about positioning are the main measures to take.

SAR x 2 in more detail

The cause of ROW violation motorcycle crashes is not strictly due to driver carelessness, distraction or misjudgment. Nor does the cause derive primarily from the motorcyclists smaller size or the bike and rider blending into the background.

The main reason auto drivers don't "see" motorcycles is a function of how our eyes and mind work together to filter from the large number of stimuli that are available in our external world, what we in reality "see." Suffice it to say only a small and selected part of the available stimulation (what is meaningful) in the world around us is actually registered by an individual for processing and the rest is filtered out.

SAR x 2 is a SMARTER developed traffic search procedure to address physiological phenomenon of attention and perception and reduce unintentional "Looked but Failed to See Right-of-Way" violations of motorcycle riders, bicyclists and pedestrians.

Drivers must begin by **Stopping** in a legal manner**.** While stopped drivers **Rock forward and back while looking left and right and rock side to side while waiting to turn left.** Rocking changes the angle of the driver's vision path. This helps the driver look around the pillars and addresses the research that shows that an object heading straight towards us is difficult for our eyes/brain to pick out. Motorcyclists don't need to weave back and forth in their lane because - rocking car drivers create a needed effect.

During the rock as the driver looks:

1. They **focus attention on three distances** - immediate, mid-distance and far distance, shifting attention among these distances. The immediate (or shortest) sight distance should be searched last where a vehicle could enter the area while looking the other way.
2. They **Ask/Answer** the question - What do I see? A pedestrian? A bicyclist? A motorcyclist?

If a motorcyclist is identified the driver should choose to wait because the small size of the motorcycle and rider makes it appear as if the motorcyclist is farther away than they really are.

If no vulnerable road users are perceived, the driver should **Roll** forward in a slow and cautious manner. Drivers should not conclude there is no risk and simply "gas it." Drivers should assume a vulnerable road user may have been missed and move forward in a cautious manner. This creates more time and space for both the car driver and approaching vulnerable road users.

Summary

Looked but Failed to See intersection Right-of-Way violation motorcyclist crashes are caused by a combination of factors. Understanding the Four Chances for Error and the physiological phenomena associated with how our eyes and mind work to perceive, provide the underpinnings of the SMARTER developed contemporary driver search procedure SAR x 2 (SSAARR) - Stop fully, Search with specificity, Rock, Ask, Answer, Roll forward slowly.

SAR x 2 creates a conscious task for drivers to perform specific to the identification of motorcyclists, bicyclists and pedestrians. The procedure focuses driver attention to various distances, alters the angle of the driver's visual path and slows down the time allocated to searching. SAR x 2 addresses the multiple physiological phenomena associated with motorcyclist right-of-way violation caused crashes.

SAR x 2: A contemporary traffic search procedure

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