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Development of a valid measurement instrument to understand self-regulatory driving practices among older drivers in Malaysia

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ABSTRACT

Self-regulatory driving is a term used to describe a strategy used by older drivers to preserve mobility and safety, through the adjustment of driving behaviors to match declining physical functions. It can be regarded as a way to prolong driving, or as a process leading to the cessation of driving. Previous studies have striven to explore and understand how older drivers self-regulate their driving. This paper aims to provide an overview of the relevant theories, to explicate the factors that contribute to the adoption of self-regulated driving and the scales used to measure self-regulatory behaviors. This paper also reports on the development and psychometric testing of a Self-Regulatory Driving Practices (SRDP) scale in the Malaysian context. Based on the reviewed theories, adoption of self-regulatory driving practices is a process and involves cognitive thinking that reflects a set of actions. Existing instruments to measure self-regulatory driving practices have been developed and used to identify the behavioral components of self-regulation. Based on literature reviews and a thematic analysis from focus group discussions, a SRDP scale was developed, accommodating the Malaysian context. There were 498 surveys completed by older drivers for further psychometric testing purposes. Results revealed that the final 12-item SRDP scale ($\alpha = 0.81$) consists of four subscales that are planning, avoidance, reduction and alternatives. Suggestions for future research are also recommended.

1. Introduction

Aging studies at the individual micro level have focused on how an individual manages their resources to achieve goals and demonstrate that self-regulation (related to health behaviors and driving practices) may play an important role in maintaining independent living and mobility. Yet, mobility is one of the key indicators of quality of life for older adults, especially in terms of driving one's own vehicle (Gabriel and Bowling, 2004). Compared to younger age groups, however, older drivers have a relatively higher risk of hospitalization and death if involved in a crash, (Finison and Dubrow, 2002) partly due to then range of age-related changes, including fragility, functional limitations and onset of medical conditions (Hakamies-Blomqvist et al., 2004). Despite this, older drivers perceive driving a car as the most convenient and preferred transportation mode to achieve their mobility needs and a high quality of life (Marottoli et al., 2000). With increasing age, however, it is inevitable that at some point, many older drivers with functional deficits will need to alter their driving behavior, reduce time spent driving or cease driving completely. Older drivers may either consciously or unconsciously self-regulate their driving. If this process is not well-managed, some older drivers who reduce or cease driving may experience some negative social consequences such as reduced out-of-home activities and opportunities for social participation (Burkhardt et al., 2000; Fonda et al., 2001; Marottoli et al., 2000; Mezuk and Rebok, 2008; Ragland et al., 2005). They may also experience negative psychological consequences such as depressive symptoms, feelings of isolation and higher negative emotional risk integrated with loss of independence (Mezuk and Rebok, 2008). In contrast, successful adoption of self-regulatory driving practices could help older drivers reduce crash risk (De Raedt and Ponjaert-Kristoffersen, 2000) while mitigating some of the potential negative mobility and associated psychological consequences (Wrosch et al., 2006).

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Apart from understanding the outcomes of self-regulatory driving practices, it is also important to fully understand the definition and background of this term to ensure that interventions aimed at managing the safe mobility of seniors are evidence-based. Historically, self-regulation has been used interchangeably with self-control and self-management. Self-regulation is equal to goal pursuit, a process where an individual self-adjusts his/her responses or personal states to achieve certain goals (Baumeister et al., 2007). Goals can be achieved through structural actions, and this term was used before the terminology of self-regulation was introduced (Miller et al., 1986). Self-regulation is also described as a process that starts from a plan, followed by strategy and tactics, and ends with execution (Miller et al., 1986). This article provides a brief overview of theories that have the potential to explain the process of adopting self-regulatory driving practices and evaluates the instruments used to measure self-regulatory driving practices. This study aims to develop a Self-Regulatory Driving Practices (SRDP) scale that is applicable to older Malaysian drivers and to test the psychometric properties of the scale.

2. Background

The ability to self-regulate as one grows older is dependent on available resources, cognition ability and health condition (Gerstorf and Ram, 2009). An individual's ability to self-regulate is accompanied by a series of cognitive processes ranging from problem recognition to deciding on an appropriate compensatory strategy. However, age-related declines in speed of information processing, attention and multitasking abilities may present specific challenges for many older drivers to appropriately self-regulate their driving.

With regard to theoretical perspectives, we have identified seven potential theories within psychological and behavioral contexts that can explain the process of behavior all outcomes or practices in the driving context. The theories operating at a micro level and those that focus on 'self' or individual cognitive evaluation were selected. A summary of the key elements in each theoretical framework is provided in Table 1. Selection, optimization and compensation (SOC), as well as self-regulation theory explain most of the key elements (other theories only briefly mention how an individual can modify their driving). Therefore, these theories were selected and reviewed to explain the rationale behind the occurrence and adoption process of self-regulation in driving, specifically amongst older drivers.

The SOC theory is a general development theory that defines the processes of regulation development and is used extensively in models of successful aging. It is relevant to the discussion of how older drivers maintain functioning, given age-related reductions in availability of resource and changes in physical functioning (e.g. cognitive, vision and psychomotor deficiencies) (Baltes and Baltes, 1990). Thus, it is understandable that older drivers require self-regulation skills to compensate for their functional losses (Freund and Baltes, 2000). This theory suggests that an individual will select and pursue a personal goal that brings positive impact to them. The selection stage allows individuals to identify and commit to personal goals, such as driving to maintain their own mobility needs. Two domains under selection are relevant to driving self-regulation: (1) elective selection to contextualize goals within current ability (e.g. reducing driving or out-of-home activities); and, (2) loss-based selection, which refers to changing goals that are not achievable with the person in their current condition (e.g. avoiding difficult driving situations). By selecting achievable goals, older drivers could achieve personal satisfaction and control over the goals. At the optimization level, older drivers would manage various aspects of driving such as time allocation for driving (e.g. lower driving speed), effort to plan (e.g. driving strategies, prioritize activities), energy (e.g. planning to move to another community). Older drivers may also learn or practice new skills and model their behavior from successful other individuals. There are numerous compensation strategies that older drivers can adopt, including: substitution and goal modification (e.g., transition from driving); use of public transportation; rely on help from others (frequently family members) for certain trips such as travelling long distances; restrict driving to situations where they feel confident and safe; and, using aids to assist driving or maintain driving performance. When the functional ability and/or resources are not able to support continued driving, disengagement from the goal (i.e. transition to non-driver) would follow to maintain their safety.

In contrast, self-regulation theory comprises four component processes: (1) reference, (2) input, (3) comparator and (4) output (Carver and Scheier, 2001). These processes enable an individual to guide his/her goal-directed activities over time and across changing circumstances (contexts). Here, older drivers may have a plan, a goal and comparison standard that might be internally or externally available or generated as *reference*. *Input* refers to the older drivers' own cognition, thoughts, affect, behavior and attention that relates to their *reference*. The *comparator* process is the intermediate process of the input and desired output in calculating the difference between the two. This process occurs at the cognitive level. The *output* is the final outcome of the comparator process and guides the individual to determine the required responses if there is a discrepancy between the input and desired output. If there is no difference, responses of terminating the feedback loop will take place. In sum, adoption of self-regulatory driving practices is reflected as a developmental process to fulfill initial driving goals, and adjustments to stop driving to maintain their safety. In other words, self-regulation theory could explain how the individuals self-regulates their driving at the cognitive level.

To summarise, SOC theory consists all of the key elements of driving regulation. More importantly, it can be specifically used to understand aspects of the behavior of older persons, and may be applied to the driving behavior of older drivers. It suggests that older drivers should be aware of the abilities and limitations they possess and how these relate to their level of risk. This theory indicates that the process of self-regulatory driving involves the dimension of goal-setting, goal achievement and also risk avoidance. In addition, SOC theory is useful to explain both the process and outcome of driving regulation in order to achieve the well-being and mobility of older drivers. While SOC theory is the optimal framework to understand the overall process of self-regulated driving, it is limited in providing a good explanation of the cyclical process. In the driving context, the cyclical process refers to the outcome of self-regulatory driving that may contribute to future goal setting of an individual and based on whether he/she is satisfied or not. Thus, the cyclical process is very important to help older drivers to re-evaluate their driving performance and further maintain safe mobility.

Generally, published studies measure avoidance of perceived difficult driving situations to define self-regulatory driving (Ball et al., 1998; Charlton et al., 2006; Gwyther and Holland, 2012; Wong et al., 2012). However, there are additional measures that have been used to measure self-regulation. This section examines the criteria used to select the instruments to measure self-regulatory driving practices and evaluates selected measures. A review of the published literature was undertaken, addressing the measures of self-regulatory driving practices with a specific focus on older drivers, as well as publications identified with the keywords of scale and/or questionnaire. Informal communication; record keeping and non-scale measures were excluded from this review. Thus; only five measures were selected and reviewed for further understanding of how self-regulation amongst older drivers is