THE EFFECT OF AGE AND PERSONALITY ON THE MAIN COGNITIVE PROCESSES IN DRIVERS

MARcin BIERNACKI1 and ADAM TARNowsKI2

1 Military Institute of Aviation Medicine, Warszawa, Poland
2 University of Warsaw, Warszawa, Poland
Faculty of Psychology

Abstract
Objectives: The purpose of this study is the evaluation of how the decline of cognitive abilities caused by aging is moderated by biologically determined personality dimensions: Neuroticism (N) and Extraversion (E).

Materials and Methods: The research was conducted with the participation of 160 men in good physical health, professional drivers, aged 20–70 (Mean = 40, SD = 11). Personality traits were measured using Eysenck’s Personality Questionnaire — Revised (EPQ-R), while Ravens Progressive Matrices, Go/noGo Task and Peripheral Perception Test were used to evaluate cognitive processes. The score of Ravens Progressive Matrices was treated as a control variable.

Results: The results of the study, based on a Hierarchical Multiple Regression Analysis, indicate that besides the intelligence level, age is the best predictor of cognitive functioning level and that this influence is additionally moderated by the N trait level as well as, less frequently, by the interaction of age and E. Conclusion: This means that high N trait level increases the influence of age on cognitive functions decline. When the N trait level was low, the age differences in measures of cognitive performance were not significant. Thus, the level of N trait may play an important role in the process of cognitive aging. The results are discussed in the context of a driving safety research.

Key words: Personality, Age, Cognition, Neuroticism, Extraversion

INTRODUCTION

The search for factors responsible for the condition of particular cognitive functions is the subject of basic as well as applied research. Professional drivers studies, such as fit-to-drive assessment [1], form an example of the latter. The advancement in medicine and the increase in one’s functioning standards constitute some of the factors influencing the increase of human lifespan. Despite the fact that societies are aging, as frequently demonstrated, age itself does not prevent being active on many different levels of social life [2]. Older people want to continue to be active and they find it hard to give up tasks which constitute their daily living. Driving a car is one such activity [3,4]. Research indicates that giving up active driving may result in a decline of the quality of life [3] or contribute to the likelihood of depression symptoms’ occurrence in older people [4]. It is important to note however, that driving, as opposed to all other daily activities, is linked to the risk of death of the driver or other traffic participants [5,6]. Therefore, the definition of factors correlating with the decline of cognitive processing or undertaking risqué behaviors gains particular importance when examining older drivers.

The research exploring particular aspects of older drivers’ cognitive functioning most frequently focuses on...
determining the role of age or specific personality traits. While the influence of age on cognitive processing is an increasingly better-known area of research, the effect of age and personality traits on the functioning of older drivers approached from an interactive perspective is rarely reported.

**Age- and driving-related cognitive factors**

The question whether age contributes to the driving ability decline and the incident frequency increase has been the subject of numerous research projects. Whereas it has been established that aging correlates with a decline of a cognitive functions level [7], the occurrence of car accidents is not only driven by the cognitive functions, but also personality traits and the level of experience [8]. Williams [9] demonstrated that on a per-mile basis, the non-fatal accident rate for 16-year-old novices is more than 10 times that of adults and almost three times that of 18-year olds. According to McKnight & McKnight [8], such results can be explained by the fact that younger persons are more prone to errors in attention, visual search, speed relative to conditions, hazard recognition, and emergency maneuvers which may be the effect of the lack of experience. Additionally, the research conducted by Ryan, Legge & Rosman [10] brings to attention the fact that when analyzing traffic accidents it is important to consider the distance traveled. When the distance traveled was taken into consideration in their study, they illustrated that the rates of crash involvement for the 75 or more age group were as high as those of the youngest age group [10]. The same results were found in the study of Evans [11]. Porter & Whitton [12] showed in their laboratory research that while older drivers drove more carefully in comparison to younger drivers, they also had more difficulty with turning, signaling, and exhibited inattention. On the other hand, Wood [13] proved that older persons had worse results in vision testing (motion sensitivity, UFOV, Pelli-Robson letter contrast sensitivity, and dynamic acuity), which appears to be congruent with Porter & Whitton’s [12] research results. It is important to emphasize that in Wood’s research [13], visual functions explained as much as 50% of the variance in overall driving scores. According to Wood [13], these results indicate that older drivers with either normal vision or visual impairment had poorer driving performance compared with younger or middle-aged drivers with normal vision.

The results of research exploring the correlation between age and response time unanimously indicate that as one ages, the response time becomes extended, which according to Birren & Fisher [14] is one of the better documented associations [15]. This relation applies more suitably to tasks testing the complex response time, as opposed to the simple response time, and it increases along with the increase in the number of possible choices [16]. These results can be explained by the fact that older persons’ nervous system operates slower and is less efficient in transmitting signals, and the difficulties caused by additional choices are the manifestations of the function of age and complexity effect [17].

Similarly to response time, the level of visual-motor coordination decreases as one is aging, which has been proven by Guan & Wade’s [18] research results. They speculate that this decline may be caused by the age-related change in strategic control and, to some extent, a decrease in spatial alignment. Another key factor in driving a vehicle, which apparently is related to age, is the speed assessment. Research indicates that the speed assessment ability decreases with age [19,20]. For instance, Staplin, Lococo, and Sim [21] found that the perceptual basis of “time-to-collision” and “traffic gap acceptance judgments” changes significantly with age. Older drivers tended to underestimate the time required for an approaching vehicle to reach their current position.

All these results strongly indicate that older drivers have less effective bottom-up, whereas younger drivers have less effective top-down processes.