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Summary
The Differential Associations of Functional and Dysfunctional Impulsivity with Driving Skills

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The two main domains in which human factors in driving have been examined are driving skills and driver behaviors (Näätänen & Summala, 1976; Reason, Manstead, Stradling, Baxter, & Campbell, 1990). Driving skills were first classified as technical and defensive skills by Spolander (1983) and later on Lajunen and Summala (1995) developed the Driver Skill Inventory (DSI) verifying the two-factor structure as perceptual-motor and safety skills. Perceptual-motor skills factor of DSI is assumed to reflect drivers' ratings of their level of skilled and fluent driving; and safety skills factor measures the extent to which the driver sees herself/himself as a safe driver including rule obedience and risk avoidance (Lajunen & Özkan, 2011). The perceptions of drivers regarding their driving skills are important in determining what they choose to do while driving (Summala, 1985). Therefore, it is important to examine the factors related to driving skills. It is an established finding in the literature that drivers evaluate their both perceptual-motor skills (e.g., Glendon, Dorn, Davies, Matthews, & Taylor, 1996; McKenna, Stanier, & Lewis, 1991) and safety skills as being higher than other drivers (e.g., Horswill, Waylen, & Tofield, 2004). However, the studies examining the links between personality traits and self-reported driving skills are limited. In the present study, the relationship between impulsivity and self-reported driving skills is investigated. Impulsivity has been mostly studied in the *driver behavior* context and the results of a recent literature review study indicated that no study up to date has examined the links between impulsivity and driving skills (Bıçaksız & Özkan, 2016a). Therefore, the aim of the present study is to contribute to addressing this limitation in the relevant literature.

Impulsivity is defined as the inability to delay gratification or the inverse of self-control (Monterosso & Ainslie, 1999). Although there is a high volume of research on impulsivity, an agreement about the definition and measurement of this construct is still lacking (Evenden, 1999). Barratt and colleagues integrated findings of research that used different measures of impulsivity and developed the Barratt Impulsiveness Scale (BIS) yielding a three-factor structure: motor impulsiveness (acting without thinking), cognitive/attentional impulsiveness (difficulty in focusing on the task at hand and making quick cognitive decisions) and nonplanning (a lack of future orientation).

Another comprehensive effort to clarify the factor structure of impulsivity was Whiteside and Lynam` study (2001), in which they factor analyzed the items of a number of commonly used impulsivity scales in the literature and reported a four-factor solution. The first dimension is *urgency*, reflecting a difficulty in resisting cravings and it is similar to the *motor impulsivity* dimension of Barratt and colleagues. The second dimension is *lack of premeditation* and it involves lack of careful thinking and planning orientation before acting, which is similar to *nonplanning* dimension of Barratt and colleagues. The third one is *lack of perseverance* that reflects the attentional dimension of impulsivity and it is similar to *attentional/cognitive impulsivity* dimension of Barratt and colleagues. The fourth dimension is sensation seeking, but later research suggests that sensation seeking is a distinct construct and should not be included in in impulsivity scales (Dahlen et al., 2005; Steinberg et al., 2008). To summarize, it can be argued that impulsivity is conceptualized as having three general dimensions in the literature; the first one involving difficulty in inhibiting the urges or behaviors, the second one involving lack of careful planning or thinking about the consequences of actions, and the third one reflecting a general difficulty in focusing on the task at hand. It can also be observed that all these definitions and dimensions involve a negative connotation. Dickman (1990) argued that impulsive responding could not have remained intact in evolutionary history if it did not have any function. He coined the term 'functional impulsivity' and defined it as a way of acting rapidly without elaboration when this is the optimal way of acting. He also showed that functional and dysfunctional impulsivity have different patterns of relationships with other constructs (1990).

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In the present study, the differential associations of functional and dysfunctional impulsivity with self-reported driving skills are examined. In addition, by using the driving context specific impulsivity scale that was developed based on the above mentioned three dysfunctional impulsivity dimension definitions (urgency, lack of premeditation, lack of perseverance) and includes a functional impulsivity dimension as well (Bıçaksız & Özkan, 2016b), the variance accounted by both general and driving context specific impulsivity in self-reported driving skills are compared. It is expected that functional impulsivity, reflecting a kind of skill in rapid thinking and decision making (Reeve, 2007) positively relates to perceptual-motor skills, whereas it has negative association with safety skills, as drivers gain experience and skill in driving, their interest in safe driving decreases (e.g., Sümer et al., 2006). On the other hand, it is expected that dysfunctional impulsivity has negative relations with both perceptual-motor driving skills, due to its general detrimental effect on tasks that require constant attention (Dickman, 2000); and with safety skills, due to the fact that the core of safety concept involves being cautious and thinking about a future hazard that is not readily available in the immediate environment.

Method

Participants

Convenience sampling with snowball technique was used to reach individual drivers. The announcement of the study along with the link to the online version of the questionnaire package was posted to social media websites. In addition, the paper-pencil version of the questionnaire package were distributed to acquaintances who are "drivers" by volunteers. A total of 676 drivers filled out the questionnaire package; but, 170 cases were eliminated from the data, since the total mileage of these participants were lower than 3000 km. The final sample was composed of 506 individual drivers, 348 (68.8 %) of whom completed the online version, and 158 (31.2 %) filled out the paper-pencil version of the questionnaire package. In terms of gender distribution, 32.6 % of the sample were women (n = 165) and 67.4 % were men (n = 341). Ages of the participants ranged between 19 and 76 with a mean of 33.87 years (SD = 11.72). The average number of years having a driver's license was 13.05 years (SD = 10.16) and the mean total mileage reported by the participants was 141684.36 km (SD = 236932.77).

Instruments

Participants filled out the questionnaire package composed of demographic and driving information form, Dickman Functional/Dysfunctional Impulsivity Scale, Impulsive Driver Behavior Scale, and Driver Skill Inventory.

Dickman Functional/Dysfunctional Impulsivity Scale: The scale was developed by Dickman (1990) and adapted to Turkish by Bıçaksız and Özkan (2016b). The Turkish version of the scale is composed of 21 items with a two-factor structure. The functional impulsivity factor consists of ten items with an internal consistency coefficient of. 73. The dysfunctional impulsivity factor consists of 11 items with an internal consistency coefficient of. 83. The items required responding on a four-point scale (1 = does not apply to me at all; 4 = totally applies to me) and higher scores indicate higher levels of impulsivity.

Impulsive Driver Behavior Scale: The scale was developed by Bıçaksız ve Özkan (2016b) and it consists of 42 items with a four-factor structure. Driver urgency factor is composed of 11 items with an internal consistency coefficient of .86. Driver lack of premeditation factor consists of ten items with an internal consistency coefficient of .83. Driver lack of perseverance factor is composed of eight items with an internal consistency coefficient of .75. Finally, driver functional impulsivity factor includes 13 items with an internal consistency coefficient of .90. The items required responding on a five-point scale (1 = does not reflect me at all; 5 = completely reflects me) and higher scores indicate higher driving context specific impulsivity.

Driver Skill Inventory. The 20-item Driver Skill Inventory developed by Lajunen and Summala (1995) and adapted to Turkish by Lajunen and Özkan (2004) was used. The two subscales of the DSI measures perceptual-motor skills and safety skills. The items require responding on a five-point scale by considering how they rate themselves on each skill (0 = very weak; 4 = very strong) and higher scores indicate higher level of skills. In the present study, the internal consistency reliability coefficients of the subscales were found to be .85 for perceptual-motor skills, and .77 for safety skills.

Results

Correlations

The functional impulsivity factor of Dickman Functional/Dysfunctional Impulsivity Scale was found to be positively related to perceptual-motor skills (r = .34, p < .001) and not related to safety skills. However, dysfunctional impulsivity was negatively related to both perceptual-motor (r = -.17, p < .001) and safety skills (r = -.17, p < .001).

Driver urgency was not related to perceptual-motor skills, whereas it was significantly negatively related to safety skills (r = -.50, p < .001), as expected. Driver lack

of premeditation was significantly negatively related to both perceptual-motor skills (r = -.26, p < .001).and safety skills (r = -.49, p < .001), having a much stronger association with the safety skills, which was the expected pattern. Driver lack of perseverance was also significantly negatively related to both perceptual-motor skills (r = -.17, p < .001).and safety skills (r = -.36, p < .001), having a much stronger association with the safety skills, again meeting the expectations. Finally, driver functional impulsivity factor of the Impulsive Driver Behavior Scale was found to be significantly positively associated with both perceptual-motor skills (r = .67, p < .001) and safety skills (r = .33, p < .001), having a much stronger relationship with the perceptual-motor skills as expected.

Regressions

First, hierarchical regression analyses were conducted with Dickman Functional/Dysfunctional Impulsivity Scale factors as the predictors, and with one of the DSI factors as the DV in each analysis. In all these analyses, age, gender and total mileage were controlled in the first step.

After age, gender and total mileage were controlled in the first step (R^2 = .05, p < .001), Dickman functional and dysfunctional impulsivity factors entered in the second step ($R^2change$ = .16, p < .001) explained a significant amount of variance in perceptual-motor skills. Functional impulsivity (β = .37, p < .001) was positively and dysfunctional impulsivity (β = -.19, p < .001) was negatively associated perceptual-motor skills.

In the second analysis, after age, gender and total mileage were controlled in the first step (R^2 = .08, p < .001), Dickman functional and dysfunctional impulsivity factors entered in the second step ($R^2change$ = .08, p < .001) explained a significant amount of variance in safety skills. Functional impulsivity (β = .11, p = .015) was positively and dysfunctional impulsivity (β = -.27, p < .001) was negatively associated with safety skills.

Then, the same analyses were conducted by using the four dimensions od the Impulsive Driver Behavior Scale this time. After age, gender and total mileage variables were controlled in the first step (R^2 = .05, p < .001), the Impulsive Driver Behavior Scale factors ($R^2change$ = .41, p < .001) explained a significant amount of variance in perceptual-motor skills Driver urgency (β = .10, p = .015) and driver functional impulsivity (β = .64, p < .001) were significantly positively associated with perceptual-motor skills; while driver lack of perseverance and driver lack of premeditation was not significantly associated with perceptual-motor skills.

Finally, after age, gender and total mileage were controlled in the first step (R^2 = .08, p < .001), the four Impulsive Driver Behavior Scale factors entered in the second step ($R^2change$ = .38, p < .001) explained a significant amount of variance in safety skills. Driver urgency (β = -.41, p < .001) and driver lack of premeditation (β = -.26, p < .001) were negatively, driver functional impulsivity (β = .23, p < .001) was positively associated with safety skills; while driver lack of perseverance was not significantly associated with safety skills.

After these separate analyses conducted for general versus driving context specific impulsivity, two hierarchical regression analyses were conducted with each DSI factor as the DV in each analysis, entering age, gender and total mileage in the first step as control variables; factors of Dickman Funcitonal/Dysfunctional Impulsivity scale in the second step; and factors of the Impulsive Driver Behavior Scale in the third step. The aim of utilizing such a stringent sequential approach is to determine whether the Impulsive Driver Behavior Scale explains variance in driver skills (DSI perceptual-motor and safety skills) beyond the general functional and dysfunctional impulsivity factors. The results of these series of analyses showed that, the four factors of the Impulsive Driver Behavior Scale, entered in the third step increased the explained variance significantly in both of the DSI factors, namely perceptual-motor skills ($R^2change$ = .28, p < .001); and safety skills ($R^2change$ = .30, p < .001).

Discussion

The differential associations of functional and dysfunctional impulsivity were investigated in the present study. The analyses were conducted by using both the general impulsivity concept (and corresponding scale) and the driving context specific impulsivity. The second aim of the current study was to compare the amount of variance in self-reported driving skills explained by the general versus driving context specific impulsivity scales.

The hypotheses regarding the strength and directions of the associations of functional and dysfunctional impulsivity with driving skills were supported with one exception. A positive relationship between functional impulsivity and perceptual-motor skills was found. On the other hand, dysfunctional impulsivity yielded negative relationships with both perceptual-motor and safety skills was. These findings were all supporting the hypotheses. However, a negative relationship between functional impulsivity and safety skills was expected due to the general finding in the literature that as the perceptual-motor skill level of the drivers increase, their consideration for safety, and thereby, safety skills decrease (Lajunen et al., 1998; Martinussen et. al., 2014; Sümer et al., 2006). But this relationship was found to

be positive. It can be argued that individuals with high levels of functional impulsivity still consider for safety although their primary focus is speed than accuracy, thanks to their alertness and attentional capacity. In the driving context, this consideration for safety combined with their perceptual-motor skills may be the feature that makes them "functionally impulsive".

The results of the analyses conducted for comparing the amounts of variance explained by general impulsivity and driving context specific impulsivity showed that the Impulsive Driver Behavior Scale explained higher amount variance than Dickman`s (general) functional and dysfunctional impulsivity in both perceptual-motor and safety skills. In addition, in the hierarchical regression analysis, in which the driving context specific impulsivity dimensions entered the analysis after the general impulsivity dimensions were controlled in the preceding step, the incremental variance explained beyond general impulsivity by driving specific impulsivity was still significant in both analyses for perceptual-motor and safety skills. These results indicate that the driving context specific impulsivity construct has the potential to contribute to the explanation and understanding of driving related variables.