Bachelor Thesis

THE INFLUENCE OF PERSONALITY AND SELF-EFFICACY ON YOUNG DRIVERS AND THEIR DRIVING BEHAVIOR.

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Abstract

Today, still one of the most threatening risks for humans is driving a car. Car accidents are one of the most common causes of death or injury, likewise more and more people worldwide own and use a car. Especially young, novice drivers of the age of 18 to 25 are prone to engage in risky driving behavior and are the largest at-risk group when it comes to being responsible for car accidents. Therefore, it is necessary to take a closer look at all the risk factors and underlying aspects in order to find solutions to make driving safer for future generations.

This specific research project focused on the influence of personality and self-efficacy on the driving behavior of young drivers, in order to show that not only ability and experience contribute to a person's driving style. Several hypotheses were formulated concerning personality factors, gender and self-efficacy and their influence on driving styles. Therefore, four broad driving categories are formulated: (1) the reckless/careless driving style, (2) the anxious driving style, (3) the angry/hostile driving style and (4) the patient/careful driving style. Respondents of this research were supposed to fill in a short online questionnaire, by first indicating their agreement to ten personality items on the Ten-Item Personality Inventory, followed by ten items on self-efficacy from the General Self-Efficacy Scale and lastly fourteen items from an adapted version of the Multidimensional Driving-Style Inventory. The results turned out to be mixed, half of the hypotheses are accepted, while the others are rejected. An association between female gender, conscientiousness and the adoption of the anxious driving style and the patient/careful driving style was found. Moreover, high scores on measures of neuroticism and low scores on measures of self-efficacy rather promoted the adoption of the anxious driving style, while high score on conscientiousness and high scores on self-efficacy were associated with the adoption of the patient/careful driving style. It turns out that not only skills and experience of a person determine their driving behavior, but also gender, personality aspects and motivational factors like self-efficacy. Hence, this field of research seems worth looking into in more detail. By adjusting some of the materials and having a more diverse sample different results could be reached. However, this study can serve as a starting point for implementing practical implications directly in the field.

1. Introduction

Road safety seems one of the most important topics when it comes to Peoples' safety in general. Due to the fact that many people own and use a car, safety on the road is an important aspect of modern society. Young drivers are especially responsible for a high number of accidents which raises the question of what factors are underlying this phenomenon (Pearson, Murphy, & Doane, 2013).

Young drivers aged between 18 and 25 years still have the highest risk of being involved in an accident in both Germany and the Netherlands (Statistisches Bundesamt, 2018; CBS, 2017). A total of 62 966 young male and female drivers were involved in an accident in Germany in 2017; of which 394 accidents ended in death (Statistisches Bundesamt, 2018). Further, the statistical reports mention that in the majority of cases, these accidents happen out of lack of experience and overestimation of one's own skills (Statistisches Bundesamt, 2018). While young male drivers tend to rather exceed the speed limit or drive under the influence of alcohol, female drivers tend to violate priority rules and adapt a rather anxious driving style (Statistisches Bundesamt, 2018). However, other scientific approaches acknowledge that driving skills are not necessarily what makes a person a safe driver or an unsafe driver (Oltedal, & Rundmo, 2005). So, a skilled driver who is willing to take risks, is more dangerous than a less skilled driver who is cautious (Oltedal, & Rundmo, 2005).

Apparently, many different underlying factors tend to come into play when it comes to young peoples driving behavior. Demographic factors, personality factors, but also motivational factors like an individual's self-efficacy seem interesting to investigate for the purpose of getting more information about driving style and driving behavior in general. In the following paragraphs some interesting theoretical constructs will be discussed in more detail.

1.1 Driving Styles among Young Drivers

The above given numbers clearly show that young drivers are at an elevated risk of being involved in accidents and crashes when compared to other age groups (Pearson, et al., 2013). When it comes to young drivers' driving styles, the most prominent risky, negative behaviors are: driving violations, driving lapses, mobile phone usage, traffic collisions and so on (Pearson, et al., 2013). Significant research has been conducted on this field of study and its connections to impulsivity, lack of experience, and other behavioral patterns that could be related to the risk-taking attitudes of young drivers (Oltedal, & Rundmo, 2005; Taubman-Ben-Ari, & Yehiel, 2011; Pearson, et al., 2013). It appears to be that for young drivers, perceived risk is an especially important determinant of their behavior. Compared to other age groups young people are more likely to underestimate risks posed by diverse traffic situations (Ulleberg, & Rundmo, 2003). Moreover, younger drivers also seem to experience risky situations in traffic as less important or threatening. They often overestimate their own abilities and skills to cope with risky situations when it comes to driving.

Research mainly suggests that novice drivers' elevated risk for traffic accidents may stem from two main factors, namely age and inexperience (Deery, 1999). Regarding age, young drivers are

often seen as to take more risks and more importantly, be willing to take more risks. Being able to drive a car on their own signifies the first bit of autonomy from the parents and also appears to be impressive to the opposite sex (Deery, 1999). So, it can be said that novice drivers just lack skills that are important in specific traffic related situations.

Many campaigns have been conducted in order to change the attitude of young drivers as well as their risk perceptions when it comes to driving. However, the majority of those campaigns have failed to show an effect on accident rates (Ulleberg, & Rundmo, 2003). One reason for the failure of these campaigns could be that they overlook individual personality factors of the target group. Maybe these campaigns would be more successful if they also incorporated the association between personality and motivational factors on driving style (Ulleberg, & Rundmo, 2003).

Furthermore, when it comes to people and driving, two things are essential, namely driving skills (or performance) and driving style (or behavior) (Taubman-Ben-Ari, & Yehiel, 2011; Deery, 1999). To specify, driving skill includes limitations of performance while driving, meaning aspects such as response-time to traffic hazards. Driving skills are also supposed to improve over time through practice or training (Deery, 1999). Driving style on the other hand, includes decision making tasks on the road. More specifically, driving style is the way in which people choose to drive or also behaviors while driving that they have developed over time (Deery, 1999). Driving skills and driving style come together into play when it comes to a driver's safety, for example, by driving faster (driving style), a need for fast reaction time (driving skill) to respond to a possible dangerous situation is required (Deery, 1999). According to Taubman – Ben-Ari, Mikulincer, and Gillath (2004), four broad driving styles that people can adopt can be defined. These are: (1) *the reckless and careless style*, which is characterized by deliberately violating driving norms, seeking for thrill, and high speed; (2) *the anxious style*, which means a feeling of no relaxation during driving, constant tension, stress and alertness; (3) *the angry and hostile style*, refers to rage, hostility and aggressive behavior behind the steering wheel; and lastly (4) *the patient and careful style*, describes patience, attention, calmness as well as obedience to traffic regulations and it also includes planning ahead in traffic situations (Taubman-Ben-Ari, & Yehiel, 2011). These different types of driving styles were confirmed by research on young drivers by means of the driving style inventory scale (Taubman – Ben-Ari, et al., 2004). Correlations of these four categories of driving styles to performance measures, that were collected by means of a simulator, are established. Also, demographic and personality variables seemed to be related to driving style (Taubman-Ben-Ari, & Yehiel, 2011). By assessing the driving style of young drivers, important conclusions can be drawn with regards to road safety and lowering accident rates in this specific age group.

All in all, this raises the question if a more personal approach to the problem could be beneficial. Personality traits are dimensions of individual differences when it comes to patterns of thought, feelings and behaviors (Ulleberg, & Rundmo, 2003). Hence, it is important to investigate the possible connection between personality traits and driving styles of young drivers in traffic.

1.2 Taking into Account Personality Types based on the Big Five Personality Theory

Like already addressed in the above paragraph, personality can turn out to be interesting when it comes to driving style. Not only factors like age or inexperience contribute to novice drivers' behaviors, but also factors like personality and individual traits can be part of why someone adapts a certain driving style. Therefore, the concept of personality will be examined in further detail.

Probably, the world's most popular model when it comes to describing personality is the Big Five Personality model. This framework divides five distinct types of personality with sub-traits belonging to every category of personality (McCrae, & Costa, 1999). Research has consistently validated that the Big Five factors represent personality relevantly, while also the psychometric properties of Big Five measures show excellent results of reliability and validity (Gosling, Rentfrow, & Swann, 2003). However, it needs to be mentioned that there are individual differences when it comes to personality and therefore the Big Five should rather be seen as a broad construct than a set-in-stone analysis of a person's personality (Gosling, et al., 2003). The Big Five traits are extraversion, neuroticism, conscientiousness, openness and agreeableness which can be roughly defined as follows (Gosling, et al., 2003; Ackerman, 2017):

- *Extraversion* - Extraverts approach life with enthusiasm and activity and are very sociable and assertive. People high on extraversion have a need for companionship and social stimulation. Those people seem to draw their energy from interaction with other people, they always seek opportunities for social interaction and are often the "center of the party". People that are low on extraversion, are rather silent, they enjoy being alone or with few others. They are more introspective, reserved and caught up in their own thoughts.
- *Neuroticism* - People that score high on neuroticism tend to experience more negative emotions and are unstable in their emotions, while people low on measures of neuroticism are more emotionally stable. Neuroticism can be seen as the only factor of the Big Five in which high scores rather stand for more negative traits. Low self-esteem, anxiety, and worry are aspects that can be attributed to people high on neuroticism.
- *Conscientiousness* - Individuals high on conscientiousness tend to be achievement-striving and goal-oriented. They follow norms, rules and tasks until completion, have a high aspiration level and a strong sense of purpose. The control of impulses and the facilitation of goal-directed behaviors seem important aspects of individuals who score high on conscientiousness measures. They tend to be excellent in planning and organizing while also effectively work with rules and orders. Procrastination, impulsiveness and impetuousness do not seem to be manners found in conscientious people.

- *Openness* - Individuals who score high on openness are generally broad-minded, and open to many new experiences and activities. Moreover, they have a strong need for variety, change and novelty. Love of learning, a rather creative career or hobby, and meeting new people is important to people high in openness. On the other hand, people who score low on measures of openness tend to prefer routine over variety, stick to things they know and prefer a rather uncreative, or abstract career or hobby.
- *Agreeableness* - The traits that best describe individuals high on agreeableness are for example altruism, trust or modesty. Agreeable people have a tendency to defer to other people in conflict situations and they have a high need for compliance. In comparison to extraversion, agreeableness rather includes someone's orientation to others, meaning how people generally interact with each other. Agreeable people have few enemies, are very sympathetic, respected and sensitive to other people. People low on agreeableness are more sarcastic, less likely to be trusted and rude.

Previous research has tried to combine factors of personality measured with Big Five instruments to driving styles and found significant connections between a person's driving style and a person's personality aspects (Taubman-Ben-Ari, & Yehiel, 2011). Due to that, it seems worth looking into someone's personality when it comes to investigating driving styles, accident prevention and so forth. However, for this research not all five factors of personality are taken into consideration. Only three factors are put under investigation, namely extraversion, neuroticism and conscientiousness. With the current studies aim being on the influence of personality and self-efficacy on driving styles, the chosen factors seem most suitable. Extraversion and conscientiousness seem to be strongly associated with high levels of self-efficacy, whereas neuroticism rather implies low levels of self-efficacy. This can be supported by the notion that high levels of self-efficacy can help in coping with stress (Miller, & Taubman – Ben-Ari, 2009). Individuals with high self-efficacy levels tend to be emotionally stable which fits for extraverted individuals as well as conscientious individuals. Neuroticism is therefore expected to be negatively correlated with self-efficacy; hence it is connected to emotional instability, lack of steadiness and confidence (Schyns, & von Collani, 2002). Accordingly, these three factors of the Big Five will be investigated with regards to self-efficacy and driving style in this study.

Nonetheless, research also found that besides personality there are most often also other factors of human behavior involved (Taubman-Ben-Ari, & Yehiel, 2011). One example is demographics, meaning that young males tend to be more aggressive drivers, while young females seem more anxious and fearful while driving (Taubman-Ben-Ari, & Yehiel, 2011). In essence, this factor can be explained by the underlying fact that personality traits associated with more risk-taking behavior tend to be found more in young males than females. So again, we can find a connection of driving behavior to factors of personality. Furthermore, there are also aspects involved like, for instance, motivation, but for this particular study like already indicated above, focus will be put on the factor of people's self-efficacy when it comes to their driving behaviors. Self-efficacy is an important

driver in a human's effectivity and achievement and can therefore be a crucial predictor in peoples driving performance and eventually help in improving knowledge about risk behavior and accident prevention. The concept of self-efficacy will be explained in more detail in the following paragraphs.

1.3 Self-Efficacy

Self-efficacy can be defined as person's beliefs in his/her capabilities, what they are able to achieve and produce (Bandura, 1994). A high sense of self-efficacy can promote effectivity, personal accomplishment and well-being in general (Bandura, 1994). The construct of self-efficacy can also be described as an individual's expectations in their ability to mobilize resources needed to manage a situation effectively (Schyns, & von Collani, 2002). Moreover, Banduras concept of self-efficacy is empirically documented, used and applied in many different contexts of human life (Schyn, & von Collani, 2002). As a result, self-efficacy seems to be important when it comes to young drivers driving styles. Bandura (1994) described four main sources of which self-efficacy can arise:

- *Mastery experiences* – this determinant of self-efficacy is concerned with performance accomplishments (Bandura, 1994).
- *Vicarious experiences* – Vicarious experiences means observing others succeed and achieve their goals, which can then, in turn, strengthen peoples own self-efficacy beliefs (Bandura, 1994).
- *Verbal persuasion* – A verbal persuasion that people are able to achieve things and to reach their goals is an effective way of enhancing self-efficacy (Bandura, 1994).
- *Emotional and physiological states* – Somatic as well as emotional states of individuals also play a role in their perception of self-efficacy (Bandura, 1994).

Self-efficacy can be assessed in three different ways: as a global personality construct; as a domain-specific variable; and as a task-specific variable (Schyns, & von Collani, 2002). Hence, self-efficacy is applicable to many areas of investigation when it comes to performance related behaviors. In bringing together self-efficacy and driving styles, research found that a sense of self-efficacy is crucial when it comes to dealing with stress and stressful situations in particular (Miller, & Taubman – Ben-Ari, 2009). Therefore, in driving situations the perceived level of control and self-efficacy is very important in order to make decisions on what risk can be taken. So, the belief in one's own abilities and control over the situations is an important factor when it comes to safe driving (Miller, & Taubman – Ben-Ari, 2009). However, it needs to be mentioned that the effects of self-efficacy on driving styles have not provided homogenous results. Some studies found a correlation between high self-efficacy and therefore a higher risk for aggressive, reckless driving behavior among young people, while other studies found a correlation between high self-efficacy and a more careful driving style (Miller, & Taubman – Ben-Ari, 2009; Taubman – Ben-Ari, & Yehiel, 2011). The question remains if self-efficacy as a driver is positively or negatively related to driving style and risk of having an

accident. Following, the question arises if personality has an influence on self-efficacy and in turn on driving styles among young adults.

1.4 The Influence of Personality and Self-Efficacy when it comes to Driving Styles among Young Drivers

With all background discussed now, the research at hand tries to combine all theoretical constructs and thereby assess if there is an influence of personality and the concept of self-efficacy when it comes to the driving styles of young adult drivers in the age category of 18 to 25 years. By this, an attempt is made to contribute to the existing body of knowledge in this matter and moreover, it will be attempted to provide more information on which effect self-efficacy has on driving style since there is still much debate among researchers.

As a research question for this study stands the question: To what extend does personality and self-efficacy influence driving styles among young drivers?

Following, several hypotheses can be formulated that will be tested throughout this study:

- *Hypothesis 1:* Young male drivers tend to score higher on measures of extraversion than young female drivers and they also seem to rather adopt the reckless and careless, as well as the angry driving style.
- *Hypothesis 2:* Young female drivers tend to score higher on measures of conscientiousness than young male drivers and they also seem to rather adopt the anxious as well as the patient and careful driving style.
- *Hypothesis 3:* Females are expected to score higher on measures of self-efficacy than males.
- *Hypothesis 4*: Individuals who score high on neuroticism tend to score low on measures of self-efficacy and are therefore expected to rather adapt the anxious driving style.
- *Hypothesis 5:* Individuals who score high on conscientiousness tend to accordingly score high on measures of self-efficacy and are therefore expected to rather adapt the patient and careful driving style.
- *Hypothesis 6:* Individuals who score high on extraversion tend to also score high on measures of self-efficacy and are therefore expected to rather adapt the reckless and careless driving style.

These hypotheses are developed through the literature review of the theoretical concepts and seem to be the interesting for investigation in this study.

2. Methods and Materials

2.1 Design

The hypothesis testing approach in form of descriptive research using a cross-sectional online survey design was chosen. Based on the survey, the variables of personality, as well as self-efficacy and driving style will be measured.

2.2 Participants

For conduction of this research, a convenience sampling strategy was used. The participants were reached through the online platform of the University of Twente, called Sona Systems. This platform is offered by the Behavioral Management and Social Sciences faculty (BMS) of the university. Sona Systems offers the opportunity for students to earn credits by taking part in research studies and is therefore used as the main source for distributing this research study. Moreover, the survey was distributed in personal social networks like Facebook and WhatsApp, in order to expand the data with regards to different age groups. Further, the study received ethical approval by the Ethics Committee of the BMS faculty of the University of Twente and participants were provided with an informed consent before taking part in the study in order to inform them about their own rights and about the research itself.

A total of 196 participants were reached by means of the study, however due to insufficient data (drop-outs) and exclusion criteria (possession of a valid driver's license; age between 18 and 25) the sample was adjusted. This left a total of 181 test subjects, which seemed to be a good amount of participants for the purpose of the study. With 145 participants being female (80.1%), male participants were the clear minority with only 36 participants (19.9%). Moreover, with 86.7% Germans represented the biggest group when it comes to nationality. Dutch people made up 8.3% of the survey and other nationalities were represented with 5%. The age of the subjects ranged from 18 years to 25 years, while drivers from 18 to 22 years made up the majority of the test subjects. Most research sets 18 to 24 years of age as the age range that defines young drivers, here, due to sample size also subjects of 25 years of age were included in the data analysis. Furthermore, everyone was in the possession of a valid driver's license (100%) and 45.3% possess their own car opposed to 54.7% who did not possess their own car.

A total number of 65 participants (35.9%) received a ticket for speeding, while 116 participants (64.1%) never received a ticket for driving above the speed limit. Further, the majority of participants, namely 146 (80.7%), were never involved in a car accident in which they were responsible for the accident. But still 35 participants (19.3%) were involved in a car accident with them being responsible for it.

2.3 Materials and measures

A questionnaire was constructed that included several already existing inventories. In order to identify an association between personality, self-efficacy and driving style a personality measure, a self-efficacy scale and an inventory to measure driving style were used, which will be introduced in the next paragraph. Participants were further given an informed consent which had to be confirmed by each participant in order to be able to take part in the online survey. Moreover, participants were asked to indicate some demographic data about themselves.

Ten Item Personality Inventory. For measuring the concept of personality for each and every participant, the Ten Item Personality Inventory (TIPI) (Gosling, Rentfrow, &Swann, 2003) was used as one part of the questionnaire. The TIPI offers an alternative to the common multi-item inventories like the Big-Five Inventory or the NEO-PI-R because these measures often include about 90 to 100 items or more. The content of the inventory consists of ten items which contain two personality traits that are part of one of the Big Five dimensions (Meschtscherjakov, Gärtner, Mirnig, Rödel, & Tscheligi, 2016). The extent to which each item applies to the participants is rated on a seven-point Likert scale, ranging from *1 – disagree strongly* to *7 – agree strongly*. To mention one example, the first item belongs to the dimension of extraversion and participants had to indicate their agreement with the following statement: *"I see myself as extraverted, enthusiastic".* The more the participant agrees with the statement, the higher the tendency for high scores on the extraversion dimension. Also reversed items are contained in the TIPI measure. Item 8 states *"I see myself as disorganized, careless",* this item belongs to the personality dimension of conscientiousness. Hence, the more the participant agrees to this item, the less conscientious the participant is.

However, it needs to be mentioned that, probably because of the number of items, the TIPI may possess inferior psychometric properties when compared with more complex, multi-item measures. Nevertheless, research found that the differences between these measures are only slightly visible (Meschtscherjakov, et al., 2016). Test-retest reliability ($r = 0.72$) is at an adequate level, convergent and discriminant correlations for the TIPI were comparable to other inventories containing more items ($r = 0.77$) and in general, correlations between the TIPI and other multi-item measures resulted in very similar results. As a result, it was concluded that the TIPI offers a reliable and valid measure for the purpose of short and quick personality measurement. In this research the correlations between the items for each personality domain showed mostly good results: extraversion (r = 0.58); neuroticism (r = 0.46); conscientiousness (r = 0.47); agreeableness (r = 0.04); openness (r = .183). The correlations for agreeableness and openness are less satisfying and do not show strong confidence, but for this study the focus is put on the other three personality domains. Hence, extraversion, neuroticism and conscientiousness showed good correlations.

General Self-Efficacy Scale. The General Self-Efficacy Scale (GSE) is a self-report measure of the concept of self-efficacy. The scale consists out of ten items and was therefore suited as one part of the questionnaire in order to measure each participant's self-efficacy levels (Schwarzer, &

Jerusalem, 1995). Hence, followed by the TIPI participants in the research study also filled out the GSE. All items in the GSE belonged to one factor and there are no different dimensions to the scale. As an example, item 3, participants have to indicate on a Likert type scale how much they agree to "*it is easy for me to stick to my aims and accomplish my goals".* Cronbach's alpha for the GSE ranges between 0.76 and 0.90 across different nationalities (Schwarzer, & Jerusalem, 1995). In this research study, Cronbach's alpha for the GSE turns out to be very high with a value of 0.92. Moreover, the total score can be calculated by adding all the items and dividing them by the number of items, the higher the total score, the higher the persons self-efficacy. With that information given, the GSE turned out to be a good fit for the study at hand because it allows a short measure of self-efficacy.

Multidimensional Driving-Style Inventory (MDSI). With regards to the length of the MDSI an adapted version of the Chinese version was implemented. The Chinese version contains 35 items which were reduced to 14 items for this specific research. These 14 items focus on the four broad driving types that were defined in the introduction. To give an example, item 1 states "I feel nervous while driving" and participants indicated on a Likert-type scale their agreement with the statement.

Looking at the psychometric properties of the MDSI it can be said that the scale proves to be excellent. However, the adapted version used here was checked for reliability and validity by factor analysis. This analysis revealed four broad factors, which fits with the four driving styles defined before, the scale is chi-square distributed and significant. In the first check for internal consistency, Cronbach's alpha turned out to be quite low (0.65), but when looking at the different categories of driving styles each Cronbach's alpha shows acceptable results. For the anxious driving style Cronbach's alpha was 0.76 which is a satisfying value and for the reckless/careless driving style the computed Cronbach's alpha was at 0.75 which is also an acceptable result. Further, the angry/hostile driving style had a Cronbach's alpha of 0.65 which is a little bit less satisfying than the first two results but still in an acceptable range. The patient/careful driving style showed a Cronbach's alpha of 0.66 and possesses thereby not the most convincing internal consistency but again still in a range where it can be kind of accepted.

Due to the fact that this research study already asked participants personality questions, followed by a self-efficacy scale, the adapted version of the MDSI Chinese version, proved to be time efficient. Even if the psychometric properties were slightly lower than in the original version, the scale still yielded reliable and valid results.

2.4 Procedure

The online survey was distributed by means of the Sona Systems platform of the University of Twente, as well as through social media networks like Facebook and WhatsApp in the personal environment of the researcher. The survey was available online for a timespan of about three weeks and it took participants about ten minutes to complete the whole online questionnaire.

The survey started with a short introduction and some limited information about the research itself. Moreover, participants were supplied with an informed consent in which they were informed about their rights, meaning that the data were treated confidential and that participants could withdraw from the study at any moment they felt like. After reading the informed consent participants had to indicate if they agree or disagree, which determined if they could take part in the survey or not. Meaning, that if participants agreed they were able to continue the questionnaire. This led participants to the next page of the questionnaire where they were asked to fill in some demographic data, like their gender, nationality and age. Further, they were asked to indicate if they possess a valid driver's license, if they own their own car, if they ever received a fine for speeding and if they were involved in an accident which they were responsible for. Following the questions about demographics, participants, on the next page, had to answer questions on personality. Hence, they had to indicate on a seven-point Likert scale on how they agreed or disagreed with the items of the Ten Item Personality Inventory. After the completion of this part, participants were led to the next page where they filled out the items of the General Self-Efficacy Scale likewise on a seven-point Likert scale. Then participants were led to the next page where they had to answer the 14 items of the adapted version of the Multidimensional Driving-Style Inventory. Here as well, participants used the seven-point Likert scale to indicate their agreement with the items.

Lastly, participants reached the last page where a debriefing occurred, and participants found out more about the aim of the research study. Furthermore, they were thanked for their participation and again obtained the contact details of the researcher in case of any further questions or remarks.

3. Results and Findings

For the purpose of data analysis, the statistical program IBM SPSS 25 is used. In the following sections, the results of the research study will be calculated and described. The focus will be on descriptive statistics, correlations, t-tests and multiple regression analyses.

3.1 Descriptive statistics

Aiming to provide a good overview of the collected data, the first part of the results section consists of the descriptive statistics and Pearson correlations of the data. Hence, for all variables the following measures were computed: means, standard deviations as well as the correlation coefficients of the Pearson correlation. This provided a gross indication of the data and a deeper insight in the results.

For each of the three personality categories of the Big Five personality traits considered in this research the mean scores and standard deviations were calculated. As a reminder, this research study focused on extraversion, neuroticism and conscientiousness. On average, participants scored highest on the personality dimension of conscientiousness (M = 5.33; SD = 1.13), followed by extraversion (M = 4.51; SD = 1.43) and lastly by neuroticism (M = 3.39; SD = 1.36). Apart from these scores, the variable of self-efficacy was created by adding up all the items regarding self-efficacy and dividing those by ten. Likewise, the mean score and standard deviation for the variable of self-efficacy were calculated (M = 5.24; SD = 0.86).

Moreover, the mean scores and standard deviations for each of the four driving styles were computed. These four categories were (1) the reckless/careless driving style (M = 2.13; SD = 1.13), (2) the anxious driving style (M = 3; SD = 1.28), (3) the angry/hostile driving style (M = 2.91; SD = 1.16) and (4) the patient/careful driving style (M = 5.50; SD = 0.95). The results showed, that participants scored highest on the patient/careful driving style and lowest on the reckless/careless driving style. With regards to the high amount of female participants this result was eventually not surprising, because women were predicted to score higher on the patient/careful driving style than men. Also, women were predicted to score higher on measures of conscientiousness, which in these results also turned out to be the item with the highest scores and therefore the most agreement. However, the independent t-test will give provide clarity on this.

With regards to this research, it is also noteworthy to look at some correlations in more detail. Therefore, the three personality dimensions (Conscientiousness, extraversion and neuroticism) each served as an independent variable in order to find an association with the dependent variable of self-efficacy. The results are given below.

Conscientiousness. It was predicted that there is an association between conscientiousness and self-efficacy in that people who score high on conscientiousness also tend to score high on measures of self-efficacy. When looking at the data a moderately positive correlation between conscientiousness and self-efficacy can be found and the correlation is significant because the p-value is lower than .01

($r = .38$; $p < .01$). Therefore, it can be concluded that conscientiousness and self-efficacy are positively correlated with each other.

Extraversion. High scores on items of extraversion were likewise predicted to be positively associated with high scores on self-efficacy measures. The Pearson correlation between extraversion and self-efficacy confirmed the prediction ($r = .25$; $p < .01$). There is again a positive association between the two variables and the measure is significant with $p < .01$.

Neuroticism. The prediction was that high scores on neuroticism would indicate low scores on self-efficacy items. Therefore, the association between neuroticism and self-efficacy is a negative one. Taking a look at the data this can be confirmed ($r = -.54$; $p < .01$), a moderately strong negative correlation between neuroticism and self-efficacy can be found and the correlation is significant because $p < 0.01$. Table 1 gives an overview on all means, standard deviations and Pearson correlations of all variables.

Table 1. M, SD and Pearson correlations for all variables in this study (N = 181).

	M	***SD***	**1.**	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**
1. Extraversion	4.51	1.43	-----							
2. Neuroticism	3.39	1.36	-.32**	----						
3. Conscientiousness	5.33	1.13	.12	.21**	----					
4. Self-efficacy	5.24	0.86	.25**	-.54**	.38**	----				
5. Anxious DS	3.00	1.28	-.21**	.41**	-.04	-.21*	----			
6. Reckless DS	2.13	1.13	.14	.00	-.07*	-.02	-.12	----		
7. Angry DS	2.91	1.16	.13	.00	.07	.05	-.17	.37**	----	
8. Patient DS	5.50	0.95	-.18	.05	.19**	.12	.16*	-.48**	-.22**	----

*p < 0.05

**p < 0.01

*** All scales used 7-point Likert systems, with 1 indicating a low score on the variable and seven indicating a high score.

3.2 Hypothesis testing

In this section of the results, focus will be on testing the above stated hypotheses that were formulated in the introduction. By means of independent t-test and multiple regression analyses the hypotheses will be checked and accepted or rejected.

In order to compare if differences between male and female exist, an independent sample t-test is used. The stated hypotheses prognosed a difference for males and females when it comes to personality types, self-efficacy levels and driving styles.

Hypothesis one prognosed that young male drivers tend to score higher on measures of extraversion and they also seem to rather report the reckless/careless, as well as the angry driving style compared to females. Starting with the personality domain of extraversion, it can be said that males ($M = 4.81$; $SD = 1.41$) scored higher on measures of extraversion than females ($M = 4.44$; $SD = 1.43$), however, the difference was not significant $t\ (179) = 1.38$, $p = .17$. Moreover, when taking a look at

the mean scores, males (M = 2.59, SD = 1.48) also scored significantly higher than females (M = 2.01; SD = 1.00) on the reckless/careless driving style, t (43.27) = 2.24, p = .03. Same accounts for the angry driving style, here, it was also predicted that men score significantly higher. Results show that males (M = 3.09; SD = 1.27) scored higher than females (M = 2.86; SD = 1.14), however, the difference is not statistically significant, t (179) = 1.05, p = .29. This implies, that for hypothesis one values of the mean scores turn into the direction that was predicted, but due to lack of statistical significance, it can only be assumed that male gender is associated with rather adopting the reckless/careless driving style. Therefore, it can be said that hypothesis one is rejected.

Hypothesis two stated that young female drivers tend to score higher on measures of conscientiousness than males and they rather report the anxious driving style and the patient/careful driving style. For this hypothesis, conscientiousness turns out to be significantly different for males and females. Females (M = 5.42; SD = 1.70) on average scored significantly much higher than males (M = 4.94; SD = 1.25), t (179) = -2.31, p = .02. Then, it was predicted that females would also rather report the anxious and the patient/careful driving style. For the anxious driving style, females (M = 3.15; SD = 1.27) scored significantly higher than males (M = 2.60; SD = 1.24), t (179) = -2.32, p = .02. The patient/ careful driving style likewise confirms the predictions, with females (M = 5.54; SD = 0.86) scoring significantly higher than males (M = 5.29; SD = 1.26), t (179) = -1.10, p < .01. The results indicated clearly that hypothesis two can be accepted.

Hypothesis three predicted that females would score higher on measures of self-efficacy than males. However, against the prediction of the hypothesis, it turned out differently. Men (M = 5.59; SD = 0.90) scored significantly higher than females (M = 5.16; SD = 0.83), t (179) = 2.77, p = .01. Thereby, hypothesis three can be rejected. Table 2 gives a summary of the independent t-test for all variables.

Table 2. Independent t-test of the research study (N = 181).

Factors	Gender	N	*M*	*SD*	*Df*	*t*	*Sig. t*
Extraversion	Male	36	4.81	1.41			
					179	1.38	.17
	Female	145	4.44	1.43			
Conscientiousness	Male	36	4.94	1.25			
					179	-2.31	.02
	Female	145	5.42	1.07			
Neuroticism	Male	36	2.86	1.37			
					179	-3.16	.01
	Female	145	3.51	1.31			
Self-efficacy	Male	36	5.59	0.90			
					179	2.77	.01
	Female	145	5.16	0.83			
Reckless/careless driving style	Male	36	2.59	1.48			
					43.27	2.24	.03
	Female	145	2.01	1.00			
Angry driving style	Male	36	3.09	1.27			
					179	1.05	.29
	Female	145	2.86	1.14			
Anxious driving style	Male	36	2.60	1.24			
					179	-2.32	.02
	Female	145	3.15	1.27			
Patient/careful driving style	Male	36	5.29	1.26			
					43.43	-1.10	.01
	Female	145	5.54	0.86			

In order to show that relationships between the different variables existed, a multiple regression analysis was executed. In this research study there was the need to measure if more than one independent variable had an influence on one dependent variable, in this case personality domain and self-efficacy (independent variables) on a driving style (dependent variable).

In hypothesis four it was hypothesized, that individuals that score high on neuroticism and low on self-efficacy would rather adopt the anxious driving style. Therefore, for the first multiple regression analysis neuroticism and self-efficacy served as the independent variables while the anxious driving style served as the dependent variable. For this regression the independent variables accounted for about 15% of the variance in the dependent variable, $F\,(2,178) = 17.47$, $p < .01$ with an adjusted R^2

of 0.15. This implied that the adoption of the anxious driving style was affected by someone's scores on neuroticism and self-efficacy. This means that hypothesis four can be accepted. Table 3, at the end of this paragraph, also gives an overview of all betas and other statistics concerning the multiple regression analyses.

Further, it was stated in hypothesis five, that individuals that score high on conscientiousness and on self-efficacy tend to adopt the patient/careful driving style. Hence, another multiple regression analysis was run with conscientiousness and self-efficacy serving as independent variables and the patient/careful driving style as the dependent variable. The independent variables accounted for about 3% of the variance in the dependent variable F (2,178) = 3.51, p = 0.03, with an adjusted R^2 of 0.03, which in this case also implied a relationship between scores on conscientiousness, self-efficacy and driving style. Even though, the independent variables accounted for only a very small portion of the variance in the dependent variable, hypothesis five was accepted.

Moreover, hypothesis six suggested, that people who score high on extraversion and likewise score high on self-efficacy would rather adopt the reckless/careless driving style. So, in the next multiple regression analysis with the independent variables of extraversion and self-efficacy and the dependent variable of the reckless/careless driving style, the independent variables accounted only for 1% of the variance in the dependent variable F (2, 178) = 2.02, p = 0.14 and an adjusted R^2 of 0.01, but the results suggested no statistical significance. As a result, hypothesis six was rejected. Again, in table 3 all results from the three multiple regression analyses can be found.

Table 3. Multiple Regression Analyses of this study (N = 181).

		t	*p*	*ß*	*F*	*df*	*p*	*Adj. r²*
Anxious driving style	**Overall model**				17.47	2	.01	0.15
	Neuroticism	5.04	.00	.41				
	Self-efficacy	0.09	.93	.01				
Patient driving style	**Overall model**				3.51	2	.03	0.03
	Conscientiousness	2.07	.04	.16				
	Self-efficacy	0.76	.45	.06				
Reckless/careless driving style	**Overall model**				2.02	2	.14	0.01
	Extraversion	1.99	.05	.15				
	Self-efficacy	-0.70	.48	-.05				

4. Conclusion and Discussion

4.1 Conclusion and Discussion

In conclusion, it can be said that this studies purpose was to bring more knowledge to the already existing body of research on the driving behavior of young drivers. Especially since more and more people possess and drive a car, it is very important to try to make driving as safe as possible. Car driving is by far still one of the most threatening dangers to a person's life and especially young, novice drivers cause most of the accidents that are happening worldwide (Pearson, Murphy, & Doane, 2013). This research shows that there needs to be a change to the way we tackle solutions to the problem. Above experience and skills, it should also be taken into account that motivational factors like in this case self-efficacy and personality aspects influence young drivers (Taubman – Ben-Ari, & Yehiel, 2012). Furthermore, demographic factors, like gender, can also play a role in what driving style an individual adopts. It can be said with confidence that male gender is significantly associated with adopting the reckless/careless driving style and that female gender is associated with high levels of conscientiousness and the adoption of the anxious-, as well as the patient/careful driving style. Also, personality domains and self-efficacy are found to be related to the adoption of certain driving styles which supports the notion of taking into account not only driving skills, but also other aspects.

When taking a look back at the results, it can be said that most findings support the fact that personality-, motivational- and demographic factors should not be overlooked when trying to assess a person's driving behavior. However, the results need to be discussed and to be looked at with caution, because for some results tendencies point into the right direction, but when there is no statistical significance, then there is also no significant difference. For example, it was suggested that young male drivers tend to score higher on measures of extraversion than young female drivers and they also seem to rather report the reckless/careless driving style, as well as the angry/hostile driving style. Even though mean scores indicated that the results are in the right direction, statistical significance could not be established which in this case could be due to a gender-skewed sample with only 36 male participants in the study. Nonetheless, existing research found young male drivers to be at specific risk of performing aggressive and reckless driving behavior and henceforth at elevated risk of being involved in a traffic accident (Constantinou, Panayiotou, Konstantinou, Loutsiou-Ladd, & Kapardis, 2011).

Further it was prognosed that women score higher on measures of conscientiousness and rather report the anxious driving style and the patient/careful driving style. This is not only confirmed by this study; already existing research found an influence of gender and personality attributes on driving style (Oltedal, & Rundmo, 2005). The readiness to perform risky behaviors, like for example speeding, is closely connected with an individual's personality (Oltedal, & Rundmo, 2005). Not only for personality but also for gender, research agrees that there are significant differences between male and female (Yagil, 1998; Oltedal, & Rundmo, 2005). Young male drivers, for example, seem to be

less interested in adhering to traffic rules and moreover they also seem to perceive traffic risks as less dangerous than females (Oltedal, Rundmo, 2005). Further, the big five personality trait of conscientiousness can be defined as a tendency towards discipline, responsibility and reliability, which is found more frequently in women than in men (McCrae, & Costa, 1987; Constantinou, et al., 2011). Also, in the current study females scored significantly higher than males on the personality domain of conscientiousness. Not surprisingly, females in this study also rather report the anxious driving style and the patient/careful driving style. High scores on the anxious driving style can be explained by the fact that females tend to experience more stress while driving, than men do (Taubman – Ben-Ari, et al., 2004). The patient/careful driving style is positively correlated with conscientiousness, and highly adaptive personality domains like conscientiousness are positively related to adaptive driving behaviors (Taubman – Ben-Ari, et al., 2004).

Next, it was prognosed that females would score higher on measures of self-efficacy than males, because self-efficacy is strongly correlated with conscientiousness and females score higher on conscientiousness than males. However, this turned out to be incorrect, because males scored significantly higher than females. Males score on average higher on measures of self-efficacy because they tend to have more self-esteem in their abilities and believe that they can do things more satisfyingly than females do (Pajares, 2002). Literature agrees with the obtained results and ascribes that males tend to possess higher levels of self-efficacy than females (Pajares, 2002).

Furthermore, it was predicted that individuals who score high on neuroticism tend to score low on self-efficacy and are therefore expected to rather report the anxious driving style. As already mentioned earlier, anxious driving is especially reported when people experience stress while driving (Taubman – Ben-Ari, et al., 2004). Neuroticism is a personality trait that shows signs of psychological maladjustment which is then also associated with a more maladaptive driving style (Taubman – Ben-Ari, et al., 2004). In this regard, low sense of self-efficacy also contributes to insecurity and feelings of not being able to perform certain tasks. Self-efficacy serves as a motivational factor, which is known to also influence the adaptation of a specific driving style (Pearson, et al., 2013). In line with other research, it can be said that people who tend to report the anxious driving style generally score higher on neuroticism and have a low feeling of self-efficacy. They also seem to experience more distress while driving and rather avoid driving if possible (Taubman – Ben-Ari, & Yehiel, 2012).

Similar things account for individuals that score high on conscientiousness. They tend to accordingly score high on measures of self-efficacy and are therefore expected to rather adapt the patient/careful driving style. Statistically significant results were found for this prediction. Conscientiousness as a personality domain combined with a high level of self-efficacy produces patient/careful drivers that are explicitly aware of the responsibility they have while driving (Taubman – Ben-Ari, & Yehiel, 2012). Further, studies also show that those sorts of drivers have a lower level of sensation seeking and they don't see driving as a means to show off, brush up their image or make themselves look better.

Furthermore, studies clearly revealed that extraversion is associated with the reckless/careless driving style and also with high levels of self-efficacy (Taubman – Ben-Ari, et al., 2004; Oltedal, & Rundmo, 2005; Taubman – Ben-Ari, & Yehiel, 2012). However, in this study, results turned out to be non-significant and therefore it cannot be assumed from this sample that there is a relationship between extraversion, self-efficacy and the reckless/careless driving style.

With all this said by now, it can be determined that not only driving skill plays a role when it comes to predicting which driving behavior a person would adopt. An important contributor to a person's driving performance is also driving style (Taubman – Ben-Ari, & Yehiel, 2012). And this study, alongside with other research confirms that an individual's driving style is not only influenced by demographic factors like age and gender, but also by personality characteristics and other motivational factors. Therefore, when trying to make driving safer and especially address the at-risk group of young, novice drivers, it is important to take all this into consideration. These additional factors contribute to a large part to a person's driving behavior and influence which driving style a person may adopt. Especially an individual's personality affects the way a person is driving, but also aspects like self-efficacy serve as contributors to how good people think they can drive (Taubman – Ben-Ari, et al., 2004; Taubman – Ben-Ari, & Yehiel, 2012). As a result, a more personal approach with individually tailored interventions could serve as the best option to influence the driving behavior of young novice drivers and make driving safer for everyone.

4.2 Limitations

There are some possible explanations why several predictions that were made in this study could not be fulfilled. First, the sample of this research study was quite gender-skewed. Even though the sample had an adequate size with 181 respondents, there were significantly more females represented than males. This could account for the fact that males' mean scores indicate that they score higher on measures of extraversion and rather adopt the reckless/careless and the angry/hostile driving style, but no statistical significance could be established. Further, the sample consisted of only students from the University of Twente of which the majority were German. These aspects taken together make the sample less acceptable, while however, sample size is quite considerable.

Another aspect is that the scales for personality and self-efficacy may be too short to assess a person's personality type or self-efficacy level. These scales only give an indication on an individual's personality and self-efficacy. Further, the driving style scale was an adapted version from the original and could use some further exploration. This all may have contributed to the lack of statistical significance in some of the results, but it needs to be mentioned that alphas, betas and other statistical indicators still showed acceptable or even good results. Also, in the light of sample size, this study achieved good results with 181 respondents. And even though personality and self-efficacy measures may be too short to assess an individual's personality or self-efficacy it needs to be mentioned that this

research is very time-efficient. Respondents only needed about ten minutes to fill out the questionnaire which seems good with regards to a person's attention span.

4.3 Implications and Future Research

Taking all this into account, some implications can be drawn and advice for future research on this topic can be given. This research is the first in the field that assesses the relationship of personality on self-efficacy and the relationship of personality and self-efficacy on driving style. When taking a look at the results, this area of research seems worth looking into in more detail. More universal conclusions could be drawn, and more statistical significance could be found by using a more diverse sample. Also, incorporating more extensive measures for assessing personality and self-efficacy may improve the picture of the relationships between personality, self-efficacy and driving style. More extensive measures for personality and self-efficacy could be implemented in order to assess an individual's personality with more confidence. However, it is still important to keep a balance with regards to the length of the research study. Future research could also focus on age differences and changes in personality and self-efficacy over time. A further implication that can be drawn from this study is that practical applications could be invented in order to tailor interventions in this field. In order to change young driver's attitudes and behaviors toward driving, it needs to be acknowledged that not only skills and experience matter, but also other underlying factors like personality, motivational aspects like self-efficacy and demographic factors like gender, age or nationality. As an implementation it could also be tested if driving instructors can already use measures of personality and motivational aspects in order to individually tailor driving lessons to the special needs of their students. Another practical implication can be that insurance companies assess individual scores for their clients and thereby customize insurance costs more individually.

Concluding, it can be said that this topic needs more research as well as more practical implications directly in the field. However, the above given implications show that there are possible links that can be drawn from this research to future studies.

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6. Appendices

Appendix A. Informed Consent

Your Driving Style!

You are being invited to participate in a research study titled "Your Driving Style". This study is being done by Saskia Hildebrandt, from the Faculty of Behavioral, Management and Social Sciences at the University of Twente, Department Conflict, Risk, & Safety as part of a bachelor's thesis.

The purpose of this research study is to contribute to existing research on driving styles. Thereby, it will be aimed to collect more information about driving behavior in general, as well as road safety. This questionnaire will take you approximately 10 minutes to complete. The data will be only used for the purpose of a bachelor's assignment and will be treated safely.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any question.

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by not using any names or personal details.

In case of any further questions or remarks with regards to the research study please contact Saskia Hildebrandt, s.hildebrandt@student.utwente.nl.

Do you agree with the above given information?

- I agree
- I disagree

Appendix B. Ten-Item Personality Inventory

	Disagree Strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
I see myself as extraverted and enthusiastic.	○	○	○	○	○	○	○
I see myself as critical and quarrelsome.	○	○	○	○	○	○	○
I see myself as dependable and self-disciplined.	○	○	○	○	○	○	○
I see myself as anxious and easily upset.	○	○	○	○	○	○	○
I see myself as open to new experiences and complex.	○	○	○	○	○	○	○
I see myself as reserved and quiet.	○	○	○	○	○	○	○
I see myself as sympathetic and warm.	○	○	○	○	○	○	○
I see myself as disorganized and careless.	○	○	○	○	○	○	○
I see myself as calm and emotionally stable.	○	○	○	○	○	○	○
I see myself as conventional and uncreative.	○	○	○	○	○	○	○

Appendix C. General Self-Efficacy Scale

	Disagree Strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
I can always manage to solve difficult problems if I try hard enough.	○	○	○	○	○	○	○
If someone opposes me, I can find the means and ways to get what I want.	○	○	○	○	○	○	○
It is easy for me to stick to my aims and accomplish my goals.	○	○	○	○	○	○	○
I am confident that I could deal efficiently with unexpected events.	○	○	○	○	○	○	○
Thanks to my resourcefulness, I know how to handle unforeseen situations.	○	○	○	○	○	○	○
I can solve most problems if I invest the necessary effort.	○	○	○	○	○	○	○
I can remain calm when facing difficulties because I can rely on my coping abilities.	○	○	○	○	○	○	○
When I am confronted with a problem, I can usually find several solutions.	○	○	○	○	○	○	○
If I am in trouble, I can usually think of a solution.	○	○	○	○	○	○	○
I can usually handle whatever comes my way.	○	○	○	○	○	○	○

Appendix D. Driving Style Inventory

	Disagree Strongly	Disagree moderately	Disagree a little	Neither agree nor disagree	Agree a little	Agree moderately	Agree strongly
I feel nervous while driving.	○	○	○	○	○	○	○
I enjoy the excitement of dangerous driving.	○	○	○	○	○	○	○
I swear at other drivers.	○	○	○	○	○	○	○
At an intersection where I have to give right-of-way to oncoming traffic, I wait patiently for cross-traffic to pass.	○	○	○	○	○	○	○
I drive cautiously.	○	○	○	○	○	○	○
I feel distressed while driving.	○	○	○	○	○	○	○
When someone does something on the road that annoys me, I flash them with the high beam.	○	○	○	○	○	○	○
I base my behavior on the motto "Better safe than sorry".	○	○	○	○	○	○	○
Driving makes me feel frustrated.	○	○	○	○	○	○	○
I like to take risks while driving.	○	○	○	○	○	○	○
Honk my horn at others as a way of	○	○	○	○	○	○	○

expressing frustrations.							
When a traffic light turns green and the car in front of me doesn't go immediately, I try to urge the driver to move on.	○	○	○	○	○	○	○
It worries me when driving in bad weather.	○	○	○	○	○	○	○
I like the thrill of flirting with death or disaster.	○	○	○	○	○	○	○