Engagement in violations among young moped riders – Using a qualitative approach to reveal underlying beliefs

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ABSTRACT

Introduction: Moped riders have a comparably high risk of getting seriously injured or killed in road traffic crashes. The moped is the first motor vehicle legally available to adolescents, but knowledge about young moped riders is limited. The few existing studies indicate that violations are a key factor in crash involvement.
Method: Using the Theory of Planned Behaviour, the purpose of this study is to explore and identify key beliefs underlying engagement in violations among adolescent moped riders. We conducted four focus groups including 35 participating adolescents aged between 15 and 17. We analysed the data using a four step directed content analysis approach.
Results: Engagement in violations was associated with affective and functional advantages such as excitement, saving time, convenience and avoidance of expenses and parent involvement. Level of approval varied across violations and was expressed directly as well as indirectly by both parents and peers. Strong beliefs in good riding skills and the ability to keep control over the moped facilitated engagement in violations. Actual and expected apprehension by the police was the main barrier, thus preventing engagement in violations.
Conclusion: Advantages associated with engagement in violations, approval from peers, parents and general society, and a strong belief in the ability to avoid negative consequences facilitate engagement in violations among young moped riders. Inclusion of the identified beliefs in preventive measures is discussed.

1. Introduction

This paper focuses on engagement in violations among 15–17 year old moped riders. Mopeds are often referred to as powered two-wheelers (PTW) along with scooters and motorcycles. Different models exist, and the legislation varies accordingly across countries. However, in general, mopeds and scooters have a step-through design, are restricted to lower speed areas and have lower maximum allowed riding speeds compared to motorcycles, which are often allowed on highways and constructed to high riding speeds (Haworth, 2012). Furthermore, compared to motorcycles or cars, a moped (as well as a scooter) is a flexible, comparably cheap and easily accessible mode of transport. In Denmark as well as in many other Western countries, the age limit for acquiring a moped licence is lower than for motorcycles and other motor vehicles (for detailed information about age limits and other moped-related requirements, see Section 2.1). In many countries, the moped therefore offers the first legal access to individual motorised transport. Not surprisingly,

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the use of mopeds is comparably high among young persons and generally decreases with age (e.g. Yannis et al., 2007).

It is well recognised that young road users constitute a high-risk group and continue to be overrepresented in road traffic crashes (see Scott-Parker et al., 2015; Cassarino and Murphy, 2018 for recent reviews). A key barrier preventing knowledge on moped crash risk is that crash statistics often do not distinguish between different types of PTW (White et al., 2013; OECD/ITF, 2015). However, from the available exceptions, it is clear that moped rider crash risk is high, particularly for young but also for older moped riders (Blackman and Haworth, 2013; Moskal et al., 2012). In Sweden, the Netherlands and Denmark, moped rider crash risk is 20–30 times higher than the risk faced by car occupants (Aare and Holst, 2003; SWOV, 2017; Christiansen and Warnecke, 2018). An Australian study found that the crash risk of moped riders was four times higher than the crash risk of motorcycle riders (Blackman and Haworth, 2013). However, they did not differentiate possible age-related differences in risk.

In general, crash risk of young road users is a result of the combined effect of age-related factors such as cognitive development (Reyna and Farley, 2006; Dahl, 2008), psychosocial maturity (Arnett, 1992; Williams, 2006), and factors related to a lack of experience in handling complex traffic situations (e.g. OECD, 2006). However, specific knowledge on crash risk and riding behaviour of young moped riders remains sparse (de Ceunynck et al., 2018), although the need for such knowledge was highlighted by Kopjar (1999) already two decades ago.

The few existing studies on young moped riders use different approaches, one of which is to focus on personality characteristics as predictors of crash involvement or risk-taking behaviour. Examples include a study by Falco et al. (2003), which identified associations between personality and risk-taking behaviour. Results identified sensation seeking and normlessness as prevailing factors in the personality of moped riders at risk of crash involvement, as well as a tendency to attribute crash causes to external factors that they were unable to control. In a study by Brandau et al. (2011), four clusters of young moped riders differing with regard to personality characteristics, driving style and injury severity were identified. Finally, Lucidi et al. (2019) identified three sub groups of moped riders and found that persons scoring high on the personality trait impulsiveness had the highest rate of self-reported severe injury and the highest level of engagement in violations such as speeding. Similar to the results by Falco et al. (2013), they found that high-risk riders were more likely to attribute crash involvement to external factors not controllable by the rider. They concluded that preventive measures should address risky driving beliefs according to the personality type of the target group. In summary, the three studies identified sub-groups of moped riders based on personality traits, risk behaviour and crash involvement. However, the studies used different measures and got different results. Additional studies are therefore relevant to better understand the links between, personality, risk-taking behaviour and crash involvement. Steg and van Brussel (2009) used a different approach in their study. In a survey, they aimed to see if engagement in aberrant behaviours predicted crash involvement among young moped riders. The term aberrant behaviour refers to the work by Reason et al. (1990) and the development of the Driver Behaviour Questionnaire (DBQ). The DBQ includes a distinction between three types of aberrant behaviour, namely violations, errors and lapses. Steg and van Brussel developed a Moped Behaviour Questionnaire on the basis of the DBQ to measure aberrant behaviours among moped riders. A second aim of their study was to see if variance in the intention to engage in speeding could be explained by the Theory of Planned Behaviour (Ajzen, 1991), more specifically by the attitude towards the behaviour, subjective norms and perceived behavioural control. Results showed that speeding was the most common aberrant behaviour and that positive attitudes and subjective norms towards speeding predicted the intention to engage in the behaviour. However, contrary to what was expected, aberrant behaviours did not predict crash involvement among the moped riders. The authors suggest that the unexpected result reflects that the comparably small sample was too small to detect differences in crash involvement. They concluded that preventive measures addressing violations, particularly speeding, are highly relevant.

Different from the studies mentioned above, a Danish study (Møller and Haustein, 2016) identified crash-contributing factors by means of an in-depth analysis of police-registered moped crashes occurring in the year of 2007. Human behaviour, particularly engagement violations such as speeding, was the most frequent contributing factor. The authors recommended improving young moped rider safety by reducing engagement in violations. de Ceunynck et al. (2018) also identified human factors as the key contributing factor. Interestingly, they identified alcohol as a more frequent crash factor than excessive speed, most likely because their study was not limited to young moped riders only.

The Theory of Planned Behaviour (TPB) is widely used to predict and understand engagement in different health-related behaviours under volitional control (see Armitage and Conner, 2001; McEachan et al., 2011 for meta-analytic reviews). According to the TPB (Ajzen, 1991), behavioural intention is the key construct in predicting behaviour. The stronger the intention to perform a behaviour is, the more likely the person is to engage in the behaviour. The theory hypothesises that the three constructs - attitude, subjective norm and perceived behavioural control, - determine behavioural intention. Attitude regards the person's evaluation of the behaviour, subjective norm regards the person's evaluation of social pressure to engage in the behaviour, and perceived behavioural control regards the perceived ease or difficulty associated with engagement in the behaviour. The more favourable the attitude, subjective norm and perceived behavioural control towards the behaviour, the stronger the intention to engage in the behaviour. However, behavioural control also influences behaviour directly, due to influence from actual ability to engage in a behaviour. According to the theory, each of the three factors (attitude, subjective norm and perceived behavioural control) is a function of underlying beliefs relevant for the target behaviour. The underlying beliefs provide the basis for understanding and not only predicting a person's behaviour. The underlying beliefs associated with attitude are called behavioural beliefs, and they regard an evaluation of the behaviour in terms of advantages and disadvantages. The underlying beliefs associated with subjective norm are called normative beliefs, and they regard an evaluation of the behaviour in terms of approval or disapproval among people important to the individual (e.g. peers and parents). The underlying beliefs associated with perceived behavioural control are called control beliefs, and they regard facilitators and barriers behind engagement in the target behaviour. Fig. 1 provides an overview of the Theory of Planned Behaviour and the key constructs.

Violations are behaviours under volitional control, and exploring engagement in traffic violations by means of TPB is therefore highly relevant. Most previous studies focus on predicting engagement in violations among drivers. Examples include prediction of drunk driving (e.g. Moan and Rise, 2011; Potard et al., 2018), illegal phone use while driving (e.g. Waddell and Weiner, 2014; Bazargan-Hejazi et al., 2017), and speeding (e.g. Forward, 2009; Møller and Haustein, 2014). Other studies have used TPB to predict violations among e-bike users (e.g. Yang et al., 2018), conventional bike users (e.g. Huemer, 2018), pedestrians (e.g. Zhou et al., 2016), and motorcyclists (e.g. Elliot et al., 2003; Satiennam et al., 2018). We only identified one study applying TPB to violations among young moped riders. The study was done by Steg and van Brussel in 2009. We described the study in more detail in a previous section.

Predicting behaviour is useful to identify risk groups among road users and thus to identify different target groups for road safety interventions. However, in order to target the content of the intervention, understanding the underlying beliefs and motivations is crucial. Only a limited number of studies addressing the underlying beliefs associated with engagement in road traffic violations exist. Examples include studies on underlying beliefs associated with the use of mobile devices while driving (e.g. White et al., 2010; Gauld et al., 2014; Gauld et al., 2016), speeding (e.g. Forward, 2006; Lewis et al., 2013), and engagement in different risk-taking behaviours such as speeding, phone use and drunk driving (e.g. Rowe et al., 2016). To the best of our knowledge, no previous study has addressed beliefs underlying engagement in violations among young moped riders.

As is clear from the above, there is limited knowledge on young moped rider behaviour. Previous studies identified engagement in violations as a key issue in young moped rider safety, although results regarding the association between violations and crash involvement are contradictory and need further investigation. To address this knowledge gap, the purpose of the present study is to increase knowledge on engagement in violations among young moped riders with a particular focus on the underlying beliefs motivating the behaviour. We apply the focus group approach as it allows an explorative elicitation of the underlying beliefs in accordance with the aim of the study. The results will identify relevant beliefs and motivations to address in interventions aiming to reduce engagement in violations and support safety for young moped riders.

2. Method

2.1. Defining a moped

The present study focuses on light-mopeds, which in Denmark refers to a powered two-wheeler with a cylinder volume of less than 50 cc. The maximum allowed speed is 30 km/h inside as well as outside built-up areas and regardless of the speed limit of other road users. The rider must use the cycle path at all times, if available. Passengers are not allowed, and helmet use is mandatory. The minimum age for riding a light-moped is 15. For persons aged 15 or 16, a light-moped licence is required. For persons aged 17 or older, at light-moped licence is only required if the person does not have a driver's licence.

2.2. Study population and sampling

We conducted four focus groups with 35 adolescents aged 15–17 years old. Three participants were 15 years old, 16 participants were 16 years old, and 16 participants were 17 years old. All participants received a voucher worth 200 DKK (25 EUR). We recruited the participants via social media and educational institutions. In addition, we used a modified version of snowball sampling (Goodman, 1961) in which we encouraged recruited people to invite relevant acquaintances to contact the research team and sign up for participation too. Recruitment took place in four suburban cities. Inclusion criteria were being 15–17 years old, having a licence to a light-moped, and riding a light-moped on a regular basis. According to Morgan (1997), the rule of thumb recommends 6–10 participants in a focus group. In addition, an over-recruitment of 20% to cover for no-shows is recommended. When recruiting, we therefore
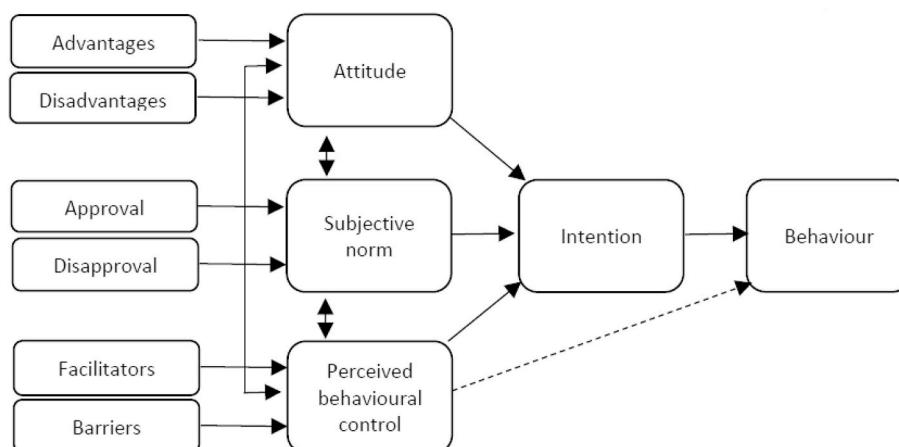

Fig. 1. Overview of the Theory of Planned Behaviour (TPB) adapted from Ajzen (1991).

aimed for 6–12 persons per group. However, in two cities recruitment turned out to more difficult compared to the others, despite similar efforts. In one city with six recruited participants, only five showed up. In another city, one additional young male showed up. We decided to include the additional young male in the focus group even through the total number of participants was then 13. Table 1 provides an overview of participant characteristics and number of participants per group.

2.3. Data collection

We conducted the four focus groups during August–September 2018 and followed the guidelines described by Morgan (1997) and Krueger and Casey (2000). The sessions were audiotaped and lasted approximately 1 h. The sessions took place in a meeting room with no interruptions in the city in which the participants were recruited. During the session, all participants were seated around a table with the audio recorder placed in the middle of the table. The size of the table was adjusted according to the number of the participants. The focus groups were moderated by a senior researcher (first author), assisted by two research assistants (second and third author). The chosen moderator was experienced in conducting focus groups in a research context and had prior knowledge on the topic, both of which are important for facilitating a focus group. The task of the research assistants was to observe that everything went well and that the discussion stayed on focus.

At the beginning of a session, the moderator reminded the participants that participation was voluntary and that they could leave the session at any time if they wished to do so. The moderator further informed the participants that the research team would maintain data confidentiality in accordance with GDPR requirements. The participants then signed a consent and information form. Then, the moderator introduced the topic in a general way, emphasising that the overall purpose was to learn more about moped riding among young persons and the thoughts and beliefs behind behavioural choices. The moderator emphasised the importance of sharing thoughts and experiences rather than trying to reach an agreement and the importance of speaking one person at a time without interrupting each other. As icebreaker and to support active participation by all participants, the moderator then invited the young moped riders to briefly state if they owned a light-moped as well as one aspect they did/did not appreciate about riding a light-moped.

To support the explorative purpose of the study we applied a less structured approach with the moderator controlling the discussion as little as possible. However, the moderator did ensure that the discussion stayed on the topic and that side-conversation was avoided. Side conversations were rare but interrupted by the moderator inviting the person who was interrupted to repeat what the person was saying and inviting the others to repeat their statements without interruption. In addition, the moderator occasionally invited specific participants to share their thoughts, if the participant had not participated actively for some time. However, in general no efforts were made to ensure that all participants contributed with similar number of statements. The need for moderator involvement increased with the size of the groups, but a free flow in the discussion was possible in all the groups. The moderator used a semi-structured guide to ensure that the discussions stayed on the topic and covered relevant aspects (see Appendix 1). A semi-structured guide allows the participants to express their individual perspectives on the subject through narratives based on their own lives and experiences (Jovchelovitch and Bauer, 2000). The guide included specific topics of interest as well as open-ended probes to be used if relevant in order to ensure elicitation of behavioural beliefs (advantages/disadvantages), normative beliefs (approval/disapproval of behaviour), and control beliefs (barriers/facilitators) inspired by the procedure for belief elicitation studies (Ajzen, 2013). Due to the semi-structured nature of the guide, the order and extent to which each topic was explored varied.

2.4. Data analysis

Verbatim transcripts were prepared, excluding paralinguistic characteristics and information that could identify the participants. For the data analyses, we applied a directed content analysis as described by Hsieh and Shannon (2005). The data was coded by the two research assistants in the software Atlas.ti. Version 8. Atlas.ti is a software used to support qualitative data analysis. It supports the analysis by providing tools to code the data and keep track of the coding performed by the researcher (for further information, see https://atlasti.com/). The coding involved four main steps, which will be described in the following (see also Fig. 2 for an overview of the coding process).

Table 1
Overview of participant characteristics and number of participants per focus group.

Characteristic	Group 1 (N = 13)	Group 2 (N = 7)	Group 3 (N = 10)	Group 4 (N = 5)	Total (N = 35)
Age					
15	2	0	1	0	3
16	7	3	5	1	16
17	4	4	4	4	16
Gender					
Male	11	7	10	2	30
Female	2	0	0	3	5
Moped-riding frequency					
Daily	10	7	6	5	28
13 days per week	2	0	4	0	6
1–3 days per month	0	0	0	0	0
< 1 day per month	**1**	**0**	**0**	**0**	**1**

Before the coding began, the coding was prepared to ensure inter-rater reliability (O'Connor and Joffe, 2020). As part of the preparation, the research assistants reviewed and coded the transcripts independently. If in doubt, they briefly met and discussed the issue. Inspired by Thomas and Harder (2008), the codings were then compared, and overlaps and differences were discussed to reach a common agreement. The senior researcher also participated in these discussions. This process was not quantified, but only few minor differences were identified. Based on this preparation process, the actual coding was performed independently by the two research assistants.

As the first initial step, all transcripts were reviewed to identify the violations mentioned by the young moped ridders. At the second step, we initiated the directed content analysis, which, according to Hsieh and Shannon (2005) is a structured approach in which the researchers based on existing theory, identify key concepts as initial coding categories. Specifically, we identified the three underlying belief categories (behavioural beliefs, normative beliefs and control beliefs) as the initial coding categories based on TPB. In addition, we reviewed the parts of the transcripts coded for each violation separately, and we coded the text according to the three belief categories, taking one violation at a time. At the third step, we determined the operational definitions for each belief category. Specifically, we identified the following operational definitions: advantages, disadvantages, approval, disapproval, facilitators and barriers in accordance with TPB. In addition, for each violation, we reviewed the text coded for each of the three belief categories and coded the text according to the operational definitions. At the fourth and final step, we selected the quotes to be included in the manuscript to illustrate the results of the analysis. Thus, through this process, all parts of the transcripts were reviewed several times.

3. Results

In this section, we first provide an overview of the type of violations identified during the analysis as well as the number of quotes coded for each type of violation and underlying beliefs. Second, we present the results regarding underlying beliefs associated with behavioural beliefs, normative beliefs and control beliefs separately.

3.1. Type of violations

During the focus groups, the participants mentioned engagement in eight different moped riding related violations (Table 2).

Engagement in violations appeared to be quite common, although with large differences between participants and across violations. The method applied does not allow exact quantification or comparison of the frequency of different violations. However, based on the descriptions and comments provided during the focus groups, speeding, facilitated by an engine tuned up to allow a maximum speed higher than 30 km/h, stood out as occurring comparably frequent, whereas impaired riding stood out as occurring comparably rare. Regarding speeding one of the participants explains:

"I live in a rural area, and for school I have to go into the city. When I reach the city sign, I make a turn down onto the smaller roads leading towards school, so I can [continue to] drive fast". (Woman).

Speeding occurs on a daily basis as part of the usual driving style regardless of riding with friends or alone on the way to/from daily
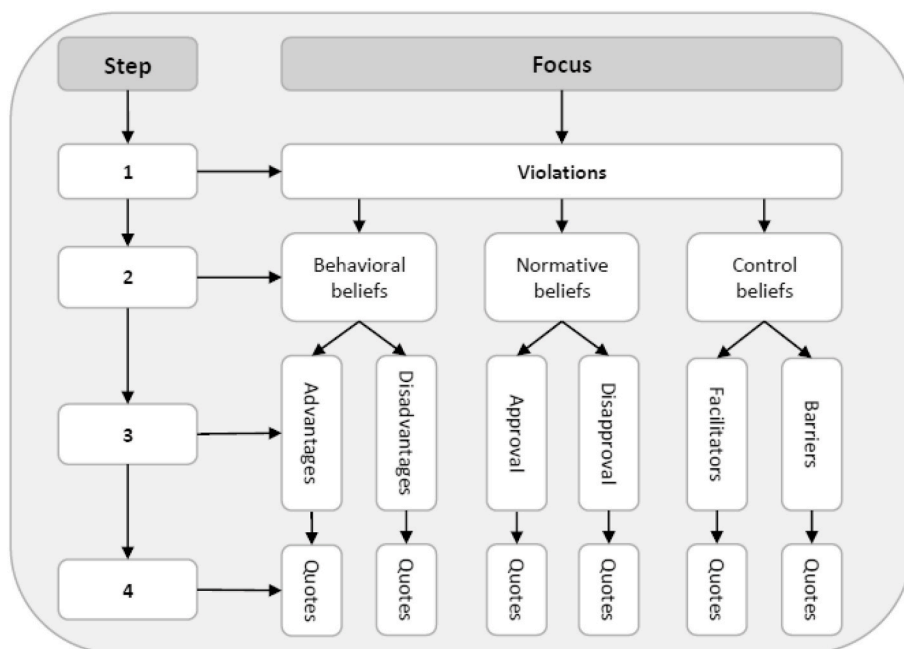

Fig. 2. Overview of the analysis and coding process.

Table 2
Overview of the number of quotes coded for each violation and underlying belief. N = 247.

Violation	Behavioural beliefs (n = 85)		Normative beliefs (n = 70)		Control beliefs (n = 92)		Total
	Advantages	Disadvantages	Approval	Disapproval	Facilitators	Barriers	
Speeding	21	4	32	9	15	19	100
Impaired riding	5	8	2	8	17	7	47
Passenger on moped	9	0	7	1	5	1	23
Not wearing helmet	8	3	2	2	2	5	22
Red light running	1	10	2	2	2	2	19
Riding defective moped	6	0	1	1	5	3	16
Ride on road [a]	4	0	0	0	7	0	11
Trick riding	6	0	0	1	1	1	9
Total	**60**	**25**	**46**	**24**	**54**	**38**	**247**

[a] Bike path available.

errans or the like. Similarly, riding on poorly maintained mopeds (e.g. brakes or lights not working) appeared to be quite common among the participants.

3.2. Behavioural beliefs

Regarding behavioural beliefs, we identified a number of underlying beliefs regarding advantages and disadvantages connected to their engagement in violations (see Table 3 for an overview). For the advantages, we additionally identified two underlying dimensions: "*achieve*" and "*avoid*". The "*achieve*" dimension regards advantages directly associated with the actual engagement in a violation, whereas the "*avoid*" dimension regards indirect advantages in the sense that engagement in the violation serves to avoid something unpleasant.

For five of the eight violations, engagement in the behaviour was associated with direct advantages. This also includes speeding, which, as explained by some of the participants, was associated with a joyful ride:

"*The faster it goes, the more fun it is*". (Man)

and reduced travel time:

"*If you stick to the speed limit, then it is an extremely slow transportation mode*". (Man)

The specific advantages associated with riding on the road (despite a bike path being available), riding with passengers and not wearing a helmet are different, but for all of them engagement in the behaviour serves to make the moped ride a more pleasant experience for the moped rider, as can be illustrated by the following quotes:

"*Even if there is a bike path available, you know, one that is often frequented by bicycles or people who are out for a run or whatever, I prefer to ride on the road. Instead of having to pay attention to oncoming bicycles*". (Man)
"*I have a friend, who loves to sit on the back of the moped. We talk. and it's just really nice*". (Woman)

For three of the eight violations, the advantage associated with engagement in the behaviour was only indirectly associated to the behaviour itself. For instance, riding a poorly maintained moped does not provide direct advantages in itself but provides the indirect advantage of avoiding spending time and money fixing broken lights etc. Similarly, alcohol impaired riding was not believed to provide directs advantages in itself. It did, however, provide the indirect advantage of not having to walk home or ask parents to pick

Table 3
Overview of the underlying behavioural beliefs and number of coded quotes for each type of violation.

Violation	Behavioural beliefs			Total
	Advantage and associated dimension		Disadvantage	
Speeding	Achieve	Joyful ride (14)[b], save time (4), adrenaline kick (3)	Apprehension by the police (3)	25
No helmet	Achieve	Convenience (5), maintain hairstyle (3)	Apprehension by the police (1), personal injury (2)	11
Passenger	Achieve	Help friends (5), nice (4)	–	9
Trick riding	Achieve	Excitement (6)	–	6
Ride on road [a]	Achieve	Improve flow (2), feel safer (2)	–	4
Impaired riding	Avoid	Walking home (3), parental involvement (2)	Apprehension by the police (2), personal injury (6)	13
Red light running	Avoid	Waiting time (1)	Apprehension by the police (1), personal injury (9)	11
Defective moped	**Avoid**	**Expenses (4) inconvenience (2)**	**-**	**6**

[a] Bike path available.
[b] Number of quotes in brackets.

them up late at night. One of the participants explains it like this:

> *"I mean, no it isn't okay to drink and ride, but we do it because we can't be bothered walking home, it's just sheer laziness"*. (Man)

With regard to the disadvantages associated with engagement in violations, the participants associated very few with the behaviour. The participants mentioned apprehension by the police in connection to all violations except doing tricks on the moped, and thus it appeared as the main disadvantage of engagement in violations. More specifically, getting a fine would be inconvenient and unpleasant, as their parents would not pay. However, the main disadvantage was the risk of losing the moped licence as well as the possibility to get a driver's licence postponed by six months because of the apprehension. The participants also mentioned personal injury as a disadvantage, but only in connection to doing tricks, riding without a helmet and impaired riding. The following quotes exemplify how the participants expressed it:

> *"I don't want to risk falling off and hitting my head or receiving a fine for not wearing my helmet"*. (Man)
> *"Just think about it, because I mean that's essentially what you're doing, when you are drunk driving, you're risking other people's lives and your own"*. (Man)

3.3. Normative beliefs

For the normative beliefs, we identified approval/disapproval among their peers, parents and general society. In addition, the analysis revealed the relevance of distinguishing between direct and indirect approval/disapproval. Direct approval/disapproval is characterised by parents, peers etc. explicitly stating that they approve/disapprove of the behaviour, whereas the indirect approval/disapproval is communicated more indirectly, for instance by ignoring that the behaviour is taking place despite being aware of it. Table 4 provides an overview of the number of quotes coded for each dimension.

Generally, the participants believed that peers were more likely to approve of engagement in violations than parents were. However, the analysis revealed differences across violations and participants. Speeding was widely approved by friends, moped riders in general and even some parents. According to the participants, some parents expressed their approval directly, as explained by one of the participants:

> *"My dad said that I should tune my moped. I mean my dad is riding an illegal moped himself"*. (Man)

Thus, the parent actively encourages the young moped rider to engage in the violating behaviour. However, parents also support speeding indirectly by not trying to prevent it although they are aware of the violation. One of the participants explained:

> *"My parents don't care. They have always said, 'you know the consequences'"*. (Man)

Riding a poorly maintained moped was widely accepted among friends and parents, but it was not directly encouraged. Friends approved riding without a helmet and carrying passengers, but only under certain circumstances, e.g. nice weather, short rides or a friend in need of help. One of the participants explains:

> *"I rode my moped without my helmet this summer. My friends and I just rode to wherever we needed to go without a helmet, because it was so warm"*. (Man)

Similarly, friends indirectly approved of impaired riding under certain conditions, by not trying to prevent it.

With regard to disapproval, the participants obviously knew that society and the police disapproved of the violating behaviours. Except for speeding, violations were generally believed to be disapproved both by parents and friends. However, as illustrated in the previous section, by not actively discouraging engagement in the violations, their disapproval seemed more like an indirect approval. For societal approval/disapproval, we found similar results. According to the participants, the general society indirectly approved of

Table 4
Overview of the number of quotes coded under each dimension.

Violation	Approval		Disapproval		
	Direct	Indirect	Direct	Indirect	Total
Speeding	15	17	8	1	41
Impaired riding	2	0	10	0	12
Passenger	6	1	1	0	8
No helmet	1	1	2	0	4
Red light running	1	1	1	0	3
Defective moped	0	1	0	1	2
Trick riding	0	0	1	0	1
Ride on road	0	0	0	0	0
Total	**25**	**21**	**23**	**2**	**71**

engagement in violations among moped riders by expecting such behaviour. The quotes below exemplify this:

"I think a lot of us boys are thought of as chavs, when we drive around [on our mopeds]". (Man)
"It's almost a tradition, especially when you're a boy. The first thing you do when you get a moped is to go out riding illegally with the boys".
(Man)

Thus, according to some participants, violations are generally expected and thereby indirectly approved.

3.4. Control beliefs

We identified different facilitators and barriers associated with engagement in moped-related violations. Both barriers and facilitators were similar across different violations. Table 5 provides an overview.

The beliefs that moped riding is easy and that the young moped riders themselves are skilled moped riders and therefore capable of engaging in the violations while keeping control over the vehicle were key facilitators associated with all violations. The following quotes exemplify how the participants express it:

"I mean in the beginning I was like, okay I need to ride my moped properly, and then I got used to it and now I ride as I want". (Man)

"You know, those bicycle barriers, where mopeds shouldn't really drive through. Well, you can ride through them with a passenger on the back of the moped. It is in no way difficult. It's completely normal". (Man).

Similar beliefs facilitated riding poorly maintained mopeds. They believed that their riding skills allowed them to adjust their behaviour so that it was not a problem if, for instance, the front brake was not functional.

As for speeding, the participants knew that the mopeds are designed for riding speeds higher than 30 km/h. This supported their belief that they had sufficient riding skills to speed, and speeding was further justified by the belief riding at higher speeds was better for the moped:

"There are a lot of the [type of] *mopeds we ride around on, which are originally constructed to hit a much higher speed. But in Denmark, there are all these requirements, so yeah it's a complete wear and tear of the machinery".* (Man).

Overall, they did not really believe that riding above the legal limit increased risk of crash or personal injury. They did mention that moped riders are vulnerable to injury in case of a crash, that other motor vehicles easily overlook moped riders, and that moped riders are vulnerable to uneven surfaces, etc. However, those engaging in the violations did not associate this with a need to slow down, make sure they were visible or in other ways take precautions to protect themselves from crash involvement.

A strong belief in their ability to avoid the police by choosing specific routes and the excitement associated with trying to escape also facilitated engagement in violations. The following quotes exemplify this:

"If one knows where the police is patrolling in town, one might just think about what road to take". (Man)
"It is the thrill, because if you have a fast moped that makes a lot of noise, the police will chase you and you'll just shake them off". (Man)

The key barrier for all violations was apprehension by the police. However, rather than making sure that the mopeds were well maintained, not tuned, complying with the speed limits, etc., some chose alternative modes of transportation for trips where they knew the police would often be present. The following quote exemplifies this:

"I usually take the bus to school, because there is often police near the school". (Man)

However, a few stated that they had decided to stop engaging in moped related violations, as they would lose the moped licence and have the drivers' licence postponed if apprehended again:

Table 5
Overview of the beliefs underlying perceived behavioural control.

Perceived behavioural control	Underlying belief	Total
Facilitators	Ability to compensate when impaired and to control level of impairment	14
	Excellent riding skills	11
	The moped is designed for riding speeds higher than 30 km/h and riding with passengers	9
	Use of residential roads	8
	Ability to dodge the police	5
	Compensating by other equipment (e.g. wearing headlights if front lights are broken)	5
Barriers	Perceived risk of apprehension by the police	9
	Parental involvement and presence	8
	Personal injury	8
	Police presence	7
	Poor weather conditions	**1**

"I ride legally now, I actually do. I've been caught by the police once, so if I get caught again I lose everything". (Man)

Parents were also a barrier for engagement in violations, however only if present at the time the young moped rider started the ride:

"If my parents are home, I always wear my helmet". (Man)

or in other ways becoming aware of engagement in violations:

"I was once doing a wheelie, down near the harbour whilst my mum saw it, and after that it was straight home". (Man)

In addition, lack of ability to maintain control thereby increasing crash risk was an additional barrier associated with impaired riding and red light running. One of the participants explains:
"Your perception, when drinking alcohol, is completely blurred and you don't know what you're doing. You do not see anything in front of you. You're just focusing on your balance and riding straight without swerving". (Woman).

Previous crash experiences related to a particular violation was a barrier for repeated engagement in that particular violation. Thus, one of the participants mentions that he is more careful when speeding, after a speeding-related crash:

"I do think about, you know after I slipped in the gravel, if I had just reduced my speed at the turn". (Man)

Similarly, crash involvements among friends in some cases make them less likely to engage in similar violations. One of the participants tells:
"One of my friends once rode home drunk and then sent me this video on Snapchat of it, where he was riding the moped with no hands. At the end of the video, there is audio of him crashing into the bicycle barriers before flying over them and falling on the ground. Since then it's just not been very tempting [to drink and ride]". (Man).

However, this was only the case for some of the participants. The general impression was that crash involvement and near-crash episodes had limited effect on their riding behaviour.

4. Discussion

This study identified beliefs underlying engagement in violations among young moped riders. We collected data via focus groups with 35 moped riders aged between 15 and 17. Results indicate that moped riding related violations occur quite frequently, particularly speeding facilitated by a tuned moped. Riding a poorly maintained moped with non-functional brakes or lights was also quite common. Regarding the underlying beliefs, more advantages than disadvantages were associated with the behaviour, and some violations, particularly speeding, were widely believed to be approved by peers and in some cases parents too. A strong belief in the ability to maintain control, avoid the police and injuries, was the main facilitating belief behind engagement in violations.

Different from the previous studies addressing the underlying beliefs associated with violations (e.g. Forward, 2006; White et al., 2010; Lewis et al., 2013; Gauld et al., 2014; Gauld et al., 2016; Rowe et al., 2016), this study added a distinction between two types of advantages with different underlying motivations, namely achievement and avoidance. The distinction indicates if the associated advantage follows directly from engagement in the behaviour (achievement) or not (avoidance) and, consequently, if preventive measures should address the target behaviour directly or indirectly by changing the circumstances preceding the behaviour. In the case of speeding, the behaviour was associated with immediate advantages, such as excitement and reduced travel time, in line with the results from Lewis et al. (2013). Thus, the moped riders deliberately chose to speed to have fun and save time. As the time saved by increasing speed is often overestimated (e.g. Svenson, 2008) efforts to correct the underlying belief of saving time could be a relevant way to reduce the associated advantages. Regarding poorly maintained mopeds and impaired riding, the results indicate the need for a different approach. These violations are associated with indirect advantages such as avoiding the costs of fixing the moped, avoiding long walks in the middle of the night, and avoiding parental involvement in their late-night behaviour. As the behaviours themselves do not provide any direct advantage using a systems approach addressing the safety critical environment may be a more relevant preventive strategy, as suggested by Scott-Parker et al. (2015). This could, for example, be done by providing safe transport possibilities at odd hours and systematic moped maintenance support, perhaps in connection to the moped licence procedure.

In line with Scott-Parker et al. (2012), the participants easily associated several advantages with engagement in the violations. Examples include excitement, convenience, shorter travel time, avoiding costs and avoiding parental involvement. The specific advantages are generally in line with previous results for other modes, and the results thus indicate similarities in the beliefs underlying engagement in violations across modes. Similar to results by Rowe et al. (2016) speeding was believed to reduce travel time and provide fast arrival. And similar to Gauld et al. (2016) who found that reducing boredom was a key factor behind the use of technology while driving, this study identified a joyful ride and avoiding being bored during the trip among the advantages associated with violations such as speeding and riding with passengers.

In line with previous results on drivers (Sagberg and Ingebrigtsen, 2018; Sagberg and Sundfør, 2019), we identified sanctions related to driver's licence restrictions as a key barrier regarding engagement in violations, particularly among those participants who were close to losing their licence. However, as revealed by the control beliefs, the current level of enforcement is not sufficient to prevent engagement in the violations, as most participants believed they could avoid apprehension by choosing different routes and avoiding certain destinations. Perceived crash risk and risk of personal injury were also barriers limiting engagement in violations. In

line with results by Pérez-Marín et al. (2019), our results indicate that one's own or friends' involvement in moped-related crashes in some cases reduced the likelihood of engagement in similar behaviours in the future. However, results also confirmed the belief revealed by Balckman and Haworth (2010) that moped riding is easy, leading to a strong belief in one's own capacity to maintain control and handle most violations safely. Thus, the association between crash involvement and behavioural change was unclear and needs further investigation.

Numerous studies have identified the importance of subjective norms in relation to engagement in different types of risk-taking behaviours including engagement in violations, particularly for young road users (e.g. Cestac et al., 2011; Forward, 2009; Møller and Haustein, 2014). Our results support this and clarify how beliefs regarding direct and indirect approval motivate engagement in violations. In addition, our results highlight the importance of young moped riders' beliefs regarding parental attitudes and behaviour, to ensure safe road user behaviour. In general, the participants perceived parents as a potential barrier for engagement in violations. However, while some parents tried to prevent engagement in violations, others directly encouraged engagement in violations or indirectly supported the violating behaviour by ignoring the occurrence. The potential negative safety impact from such parental attitude and behaviour is obvious, but it increases as young persons are more susceptible to negative peer influence if parental norms and behaviours are not in favour of road safety (Taubman-Ben-Ari and Katz-Ben-Ami, 2012). This study does not allow conclusions regarding the prevalence of such negative parental influence. Nevertheless, measures to increase parents' engagement in safe moped riding behaviour among youth seem highly relevant (Gaskell, 2000).

Although the results only address societal norms to a limited extent, the result that the participants believed that societal norms and expectations indirectly support their engagement in violations is important. Such beliefs may lead to an unfortunate self-perpetuating process reinforcing risk-taking behaviour among young moped riders as it may encourage such behavioural choices based on conformity with group norms and expectations towards risk-taking and violating behaviours (e.g. Chorlton et al., 2012; Scott-Parker et al., 2009; Sele-Shayovits, 2008). Similar results exist regarding motorcyclists (see Elliot, 2010) and drivers (e.g. Møller, 2004). Further studies on the relationship between risk-taking behaviour and societal norms and expectations are needed.

In accordance with the explorative purpose of the present study, we collected data using a qualitative approach. The study includes a Danish sample, and even though results are in line with previous results, generalisation to other countries is restricted, due to possible cross-cultural differences in e.g. risk perception and behaviour (e.g. Nordfjærn et al., 2011; Sinclair, 2013), legal and regulatory differences as well as usage and ownership (see Haworth (2012) for a review). The number of participants in the study is small but sufficient for the study purpose (Guest et al., 2017). A large-scale study is, however, relevant to quantify the prevalence of the identified beliefs and assess the association between underlying beliefs and actual behaviour as well as possible differences across subgroups of moped users.

Influence from social desirability should be mentioned as a possible limitation in relation to the results of the present study. Although some studies indicate that self-reports are generally reliable and the influence of social desirability is limited (e.g. Lajunen and Summala, 2003), other studies indicate that the context influences the information provided, and that different information is provided in private contexts compared to public contexts (e.g. Wight, 1994). Our results showed that violations were believed to be widely approved by peers and that societal norms and expectations supported engagement in violations among moped riders. Social desirability bias may have suppressed the expression of beliefs regarding disadvantages, disapproval and barriers. Future studies applying a more structured approach or an approach allowing each participant more privacy are relevant to address this issue.

Finally, we would like to mention that the study only included young people who own and ride a moped. In order to explore societal norms regarding moped riding in general or moped-related violations in particular, additional focus groups including young non-riders would be relevant.

5. Conclusion

With the purpose to improve understanding of engagement in violations among young moped riders, this paper set out to identify behavioural beliefs, normative beliefs and control beliefs associated with the behaviour. A number of beliefs supporting engagement in violations were identified, and in general the number of beliefs supporting the behaviour was larger than the number of beliefs not supporting the behaviour. The identified beliefs are relevant in order to inform the design of targeted preventive measures. Specifically, the results revealed, that in relation to some violations (speeding, not wearing helmet, riding with a passenger, doing tricks on the moped and riding on the road on locations where a bike path is available), the preventive measures should prevent the behaviour itself, and increase understanding about the disadvantages associated with the behaviours. For other violations (impaired riding, red light running, riding on a defective moped) developing preventive measures, focusing on the situations preceding engagement in the behaviours, may be preferable. In addition the results indicated that direct and explicit disapproval of moped-related violations from parents, is an important element in preventing the violations. Finally, the results revealed that believing that one is able to control and compensate for influence from potential barriers such as the police discourages compliance with the traffic rules and increases engagement in violations. In conclusion, the results indicate a number of beliefs underlying engagement in violations among young moped riders, which can inform and qualify the development of targeted preventive measures.

CRediT authorship contribution statement

Mette Møller: Conceptualization, Methodology, Investigation, Writing - original draft, Supervision, Project administration, Funding acquisition. **Sandra Krogh Andersen:** Methodology, Formal analysis, Investigation, Writing - review & editing. **Nanna Bonde:** Methodology, Formal analysis, Investigation, Writing - review & editing. **Marjan Hagenzieker:** Writing - review & editing.

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Appendix IFocus group guide

✓ General introduction including legal issues and the purpose - to learn more about moped riding, and the associated thoughts and beliefs behind behavioural choices.
✓ Icebreaker: Do you own a moped? Please provide an example of one good and one bad thing about riding a light-moped.

Main theme	Possible topics to explore	Behavioural beliefs	Normative beliefs	Control beliefs
	Trip purpose Frequency Distances			
Moped use - We would like to know more about riding a moped as part of your daily life. What can you tell us about that?	Available alternatives		What do your parents think about "X" behaviour?	
- What else can you tell?	Valued qualities of transport modes	- What do you see as the advantages/ disadvantages of "X" behaviour?	- What do your peers think about "X" behaviour?	- Tell about situations circumstances that supports/ prevents you from choosing the moped as mode of transport.
- Can you provide more details about that?	Moped riding among peers Riding speed Engagement in violations	- Can you tell more about that?	- Can you tell more about that?	- Can you provide more details?
Riding behaviour	Involvement in critical situations/ crashes		What do your parents think about "X" behaviour?	
- We would like a more detailed understanding about your behaviours and ridingstyle when you ride the moped. What can you tell us about that?	Interest in mopeds/ moped riding		- What do your peers think about "X" behaviour?	
- What else can you tell?	Characteristics of moped users/non-moped users	- What do you see as the advantages/ disadvantages of "X" behaviour?	- Do "X" approve "X" behaviour	- Tell about situations circumstances that supports/ prevents you from engaging in "X" behaviour.
- Can you provide more details?	Riding behaviour among peers	- Can you tell more about that?	- Can you tell more about that?	- Can you provide more details?

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