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Abstract

Social norms have been found an important factor in individuals' health and risk behaviors. Past research has typically addressed which social norms individuals *perceive* in their social environments (e.g., in their peer group). The present paper explores normative social influences beyond such perceptions by applying a multilevel approach and differentiating between *perceived norms* at the individual level and *collective norms* at the group level. Data on norms and three road traffic risk behaviors (speeding, driving after drinking, and texting while driving) were obtained from a representative survey among young German car drivers (N = 311 anchor respondents) and their peer groups (overall N = 1,244). Multilevel modeling (MLM) revealed that beyond individual normative perceptions of peers' behavior and approval, actual collective norms (peers' actual risk behavior and attitudes) affect individuals' risk behaviors. Findings are discussed with regard to theorizing normative influences on risk behavior and practical implications.

Keywords: perceived norms, collective norms, social influence, risk behavior, multilevel modeling

Much of human behavior is guided by social norms (e.g., Deutsch & Gerard, 1955). By orienting their behavior to norms and thus to the behavior and attitudes of referent others, people can ensure that they act efficiently and correctly and that their actions are socially approved of (Cialdini, Reno, & Kallgren, 1990). In behavioral theories, such as the theory of planned behavior (TPB; Ajzen, 1991) and the theory of normative social behavior (TNSB; Real & Rimal, 2007; Rimal & Real, 2005), norms are conceptualized as individuals' *perceptions* of social referents' behaviors and approval of those behaviors (see also Armitage & Conner, 2001; Rimal & Lapinski, 2015).

The present paper follows the call in social sciences to "stretch the boundaries of the study of behavior […] to capture the role of social context" (Glass & McAtee, 2006, p. 1651) and links individual-level cognitions and behaviors with group-level characteristics (see also Pan & McLeod, 1991; Sallis & Owen, 2015; Slater, Snyder, & Hayes, 2006). For this purpose, it refers to *perceived norms* located at the individual level and *collective norms* operating at the group level and integrates them into a multilevel approach to normative social influences (Lapinski & Rimal, 2005; Rimal & Lapinski, 2015). This multilevel approach contributes to the extant social norms literature by addressing the question as to whether collective norms and, thus, the actual behavior and attitudes of referent others (Lapinski & Rimal, 2005; Rimal & Lapinski, 2015), influence behaviors beyond individuals' normative perceptions (Sallis & Owen, 2015). Findings on this question will help to fully understand the role of norms in shaping human behavior and inform norms-based intervention strategies (Berkowitz, 2004).

The multilevel norms approach will be examined with regard to three risk behaviors of young car drivers, which are widely prevalent among adolescents and have fatal consequences for themselves and for other road users (e.g., WHO, 2015): speeding, driving after drinking, and texting while driving. The simultaneous application of the multilevel approach to

normative social influences on three different risk behaviors allows comparing normative influence patterns across behaviors and enhances the findings' validity and generalizability.

Differentiating Normative Social Influences

Descriptive and Injunctive Norms

To gain differentiated insights into normative social influences, the paper takes up the distinction between *descriptive norms* and *injunctive norms* established by the theory of normative conduct (Cialdini et al., 1990). Descriptive norms refer to the prevalence of a behavior within the referent group; injunctive norms pertain to the social approval of the behavior by relevant others. Thus, the two types of norms can be thought of as norms regarding what *is done* (descriptive) as compared to norms of what *ought to be done* (injunctive; Deutsch & Gerard, 1955; Kallgren, Reno, & Cialdini, 2016). Descriptive norms influence behavior because of people's motivations to do the right thing; they promote behaviors by providing an "information-processing advantage" about what may be an effective and adaptive action (Cialdini et al., 1990, p. 1015). Injunctive norms, on the other hand, are thought to influence behavior because of people's motivations for affiliation with others (Cialdini et al., 1990).

It is most often the case that descriptive and injunctive norms are congruent. However, descriptive and injunctive norms sometimes do not overlap—for example, when people perceive a particular behavior as widespread but do not link social approval with it (Lapinski & Rimal, 2005; Rimal, Lapinski, Cook, & Real, 2005; Rimal & Real, 2003). Thus, for a proper understanding of different normative influences, it is important to distinguish between descriptive and injunctive norms (see also Chung & Rimal, 2016).

The differentiation between descriptive and injunctive norms has been adapted in different theoretical approaches on normative influences, most importantly in the integrated

behavior model (IBM; Fishbein & Yzer, 2003; Montaño & Kasprzyk, 2015) as well as in the TNSB (Real & Rimal, 2007; Rimal & Real, 2005), and it is a central tenet in research on normative social influences on behavior (Borsari & Carey, 2003; Shulman et al., 2017). However, both descriptive and injunctive norms are mainly understood as individual norms, more concretely as individual perceptions of the social reality. In this paper, we aim for an improved resolution in theorizing normative influences, follow Rimal and Lapinski (2015) for this purpose, and conceptualize norms as *multilevel phenomena* by considering both descriptive and injunctive norms as perceived and collective norms (see also Lapinski & Rimal, 2005).

Perceived and Collective Norms

Perceived and collective norms differ according to the level to which they pertain. Perceived norms are located at the individual, psychological level (Rimal & Lapinski, 2015, p. 395). They represent the individuals' perceptions of the group's norms (Lapinski & Rimal, 2005, p. 129), that is, in the case of descriptive norms, the perceptions of the behavior (Grube, Morgan, & McGree, 1986) and, with regard to injunctive norms, the perceived social approval of the behavior (White, Terry, & Hogg, 1994). In contrast, collective norms operate at the level of the social group or the societal level (see also Hogg & Reid, 2006) and serve as "prevailing codes of conduct that either prescribe or proscribe behaviors that members of a group can enact" (Lapinski & Rimal, 2005, p. 129). At this level, descriptive norms refer to the actual behavior and injunctive norms to the actual attitudes of relevant others (e.g., Hogg & Reid, 2006; Rimal & Real, 2003). We note that collective norms are also discussed as "actual norms" (Berkowitz, 2004, p. 5) or "group norms" (Hogg & Reid, 2006) in social norms literature.

[Table 1 about here]

The differentiation between perceived and collective norms reflects the distinction between the individual and social perspective on norms that can be found in the literature (Yanovitzky & Rimal, 2006; see also Turner, J. C., 1991, pp. 146–147). The *individual perspective* discusses norms as perceptions of group behaviors and attitudes; they are influential to the extent that people feel as group members and compare themselves to the group (Yanovitzky & Rimal, 2006, p. 1). In contrast, the *social perspective* conceptualizes norms as the property of the group and thus as characteristics of social environments that provide more or fewer opportunities for individuals to enact the risk behavior. From this perspective, norms are primarily influential when group members are present and are able to provide rewards for compliance or sanctions for noncompliance (Yanovitzky & Rimal, 2006, p. 1).

The conceptual distinction between perceived and collective norms is important as they can operate independently of each other (Lapinski & Rimal, 2005, p. 129; Rimal & Lapinski, 2015, p. 395). Quite often, individuals overestimate the peers' permissiveness of attitudes and risk behaviors (e.g., Kenney, LaBrie, & Lac, 2013; see also Berkowitz, 2004). The "mismatch between perceptions and reality" (Rimal & Lapinski, 2015, p. 396) is subject of the social norms approach (SNA; Berkowitz, 2004; Perkins & Berkowitz, 1986) and might have different reasons. For example, individuals may falsely assume that most of their peers behave or think differently from them when in fact their attitudes or behaviors are similar (*pluralistic ignorance*; O'Gorman & Garry, 1976) or they might believe that others are like themselves when in fact they are not (*false consensus*; Ross, Greene, & House, 1977). However, more important than the reasons for the mismatch is that it is often predictive of behavior (e.g., Kenney et al., 2013; see also Berkowitz, 2004); therefore, the SNA suggests addressing this mismatch by norms-based intervention strategies.

A Multilevel Approach to Normative Social Influences on Risk Behavior

The Multilevel Approach

The present contribution is not about the (mis)match between perceived and collective norms and its behavioral influence in the tradition of the SNA (Berkowitz, 2004); instead, it presents a multilevel approach to normative social influences on risk behavior that analyzes the impact of individual and collective norms separately, not merged in terms of misperceptions. With this approach, the paper contributes to the understanding of normative social influences at different levels. Do collective norms influence risk behaviors beyond normative perceptions? Do normative influences at different levels operate in the same or in the opposite direction, and do different levels of norms interact in their relationship with risk behaviors? Findings on these questions will not only advance our theoretical understanding of normative social influence processes (Sallis & Owen, 2015; Yanovitzky & Rimal, 2006), but are also of practical relevance, as they may inform norms-based intervention strategies with regard to how normative characteristics of the social context should be considered (Berkowitz, 2004).

Given the extant research on perceived norms and normative misperceptions (see Berkowitz, 2004), there is strikingly little research taking up the idea of multiple levels of normative social influences. Even though there are studies referring to the concept of collective norms in order to examine normative influences on behaviors, they differ from the present approach as they define collective norms as normative perceptions of collectives, such as schools (e.g., Paluck & Shepherd, 2012), understand the *perceived* prevalence of behaviors and ideologies at group level as collective norms (e.g., Mollborn, Domingue, & Boardman, 2014; Shulman & Levine, 2012), or do not differentiate between descriptive and injunctive norms (e.g., Coley, Lombardi, Lynch, Mahalik, & Sims, 2013).

The current paper drives forward the state of the social norms literature by developing a comprehensive and coherent multilevel approach that differentiates between descriptive and injunctive norms (Cialdini et al., 1990) at the individual as well as the group level (see also Lapinski & Rimal, 2005; Rimal & Lapinski, 2015). In this vein, we are able to examine whether normative influences at different levels operate simultaneously and interactively (Sallis & Owen, 2015; Slater et al., 2006).

The Case of Examination

This multilevel approach to normative social influences is examined in the context of road traffic safety and with regard to speeding, driving after drinking (drinking & driving), and texting while driving (texting & driving). Speeding and drinking & driving are widely prevalent and the causes of a large number of fatal crashes in virtually all countries (WHO, 2015), particularly among young drivers who seek sensation (Cestac, Paran, & Delhomme, 2011; Simons-Morton et al., 2012) and have difficulties in identifying road hazards because of their lack of driving experience (Scott-Parker, Hyde, Watson, & King, 2013). Additionally, related to the rapid growth in use of mobile phones (Vorderer, Krömer, & Schneider, 2016), the use of phones while driving has become a serious threat to road safety (WHO, 2015) as it causes cognitive, manual, visual, and auditory distraction (Caird, Johnston, Willness, Asbridge, & Steel, 2014).

Taken together, speeding, drinking & driving, and texting & driving are prevalent risk behaviors among young drivers and have fatal consequences for themselves and for other road traffic users. They qualify as cases of interest in the present context because normative peer influences have been found on young drivers' speeding (Cestac et al., 2011; Møller & Haustein, 2014; Simons-Morton et al., 2012), drinking & driving (Åberg, 1993; Beck, 1981; Kenney et al., 2013; Zhang, Wieczorek, & Welte, 2012), as well as texting & driving (Bazargan-Hejazi et al., 2017; Gauld, Lewis, & White, 2014; Nemme & White, 2010).

However, informed by the TPB (Ajzen, 1991), previous studies have mostly focused on individuals' normative perceptions and did not consider actual collective norms[1].

Hypotheses and Research Question

To examine normative influences on speeding, drinking & driving, and texting & driving within a multilevel approach, we first have to ensure that these risk behaviors are group phenomena and can be potentially explained by group characteristics. Compared to other social groups (e.g., family), peers—most often defined as friends in social norms research (Shulman et al., 2017)—turn out to be the most important reference group with regard to road traffic risk behaviors (Fleiter, Watson, Lennon, & Lewis, 2006; Zhang et al., 2012). Even though previous studies on peer influences on young drivers' risk behaviors only deal with normative perceptions (see above), they suggest that peer groups play an important role with regard to road traffic risk behaviors. Therefore, we hypothesize that road traffic risk behaviors are not only individual but also peer group phenomena and, thus, should not only vary across individuals but also across peer groups.

H1: Risk behaviors vary across peer groups.

The current multilevel approach examines normative influences at the individual and group level. At the *individual level*, perceived norms pertain to young drivers' perceptions about the prevalence (i.e., descriptive norm) and the perceived social approval (i.e., injunctive norm) of a road traffic risk behavior. For instance, young drivers may perceive that driving after drinking is common within their peer groups and harbor the impression that their peers approve of drinking & driving. These normative perceptions are influential because the drivers identify with their peer groups (Rimal & Real, 2005) and align their own behaviors in order not to be aberrant (this is the injunctive norms-based motivation of affiliation) and "to

[1] The study of Kenney et al. (2013) is an exception in this regard; it compares perceived injunctive norms regarding drinking & driving with actual approval among college students.

do the right thing" (Rimal & Lapinski, 2015, p. 397; motivation for complying with descriptive norms, see also Cialdini et al., 1990). Given the state of research on the influence of perceived norms on a wide range of risk behaviors (see Berkowitz (2004) for a review)—among others, speeding, drinking & driving, and texting & driving (e.g., Åberg, 1993; Bazargan-Hejazi et al., 2017; Cestac et al., 2011)—, we hypothesize that perceived descriptive and injunctive norms are positively correlated with risk behavior.

H2: Perceived descriptive (H2a) and injunctive norms (H2b) are positively correlated with risk behavior.

At the *collective level*, descriptive norms refer to the actual road traffic risk behavior enacted by peers and injunctive norms pertain to the peers' actual attitudes towards the risk behavior in question. Thus, collective norms typify the individuals' social environments that provide more or fewer opportunities for individuals to enact the risk behavior. For instance, young drivers with peers who regularly drink & drive and approve of it might find themselves more often in a situation in which they have to decide whether to get home by car although they have consumed alcohol. Consequently, the likelihood that individuals within pro-risk social environments engage in risk behaviors is higher, compared to individuals who are not embedded in risk-oriented peer groups. Additionally, the likelihood of enacting the risk behavior might be increased by direct social influences of the peers: The drivers might be urged to join in the drinking and also receive appreciation for complying with their peers (Yanovitzky & Rimal, 2006). Even though empirical evidence for the impact of collective descriptive and injunctive norms is missing, research indicates that norm-related characteristics of the social contexts influence human behavior, independently from normative perceptions (Coley et al., 2013; Mollborn et al., 2014). Therefore, we hypothesize that, beyond normative perceptions, collective descriptive and injunctive norms are positively correlated with risk behavior.

H3: Controlled for perceived norms, collective descriptive (H3a) and injunctive norms (H3b) are positively correlated with risk behavior.

By considering norms as multilevel phenomena and taking into account perceived as well as collective norms within a single approach, we are able to explore interactional effects, that is, effects resulting from the interplay of normative perceptions and social environments (see also Sallis & Owen, 2015; Turner, J. C., 1991, pp. 143–173). More concretely, we are interested in the question as to whether the behavioral impact of normative perceptions depends on peer groups' objective normative characteristics. Applied to our example, the normative social influence of vehicle drivers' normative perceptions might be strengthened, the more often they find themselves in situations in which they have to decide whether they want to drink & drive and in which their peers urge them to join in the drinking. Consequently, the present contribution explores interaction effects between perceived and collective norms.

RQ1: Are there interaction effects between perceived and collective (descriptive and injunctive) norms in their relationships with risk behavior?

Method

We conducted a survey among young drivers and their peer groups as part of a research project funded by the German Federal Highway Institute and operated by the Allensbach Institute of Public Opinion Research (IfD)[2].

Sampling Procedure and Participants

The sampling procedure consisted of two steps: First, a representative sample of $N = 311$ young German drivers in possession of a driver's license and aged 18 to 24 was drawn. These young drivers were selected by quota sampling based on data from the Federal

[2] Find further information about the IfD here: http://www.ifd-allensbach.de/service/english/summary.html

Office for Motor Traffic regarding driving license owners aged 18 to 24 and from the German Federal Statistical Office on the demographic structure of the German population[3]. Second, every young driver nominated the three most important friends within his or her circle of friends. Thus, ego-centered networks representing the relations between the drivers (egos) and their three most important friends (alteri) were established. After the young drivers and their alteri had agreed to participate in the study, they were interviewed independently from each other at their homes. All interviews were realized as computer-assisted personal interviews by interviewers of the IfD between April and June 2016.

This sampling strategy leads to a sample of $K = 311$ independent peer groups and $N = 1{,}244$ (311 x 4) individuals. The average age is $M = 22.36$ years ($SD = 5.75$); gender is distributed almost evenly (49 % females).

Measures

Road traffic risk behaviors. All three road traffic risk behaviors under study were measured through self-reports, with questions asking about the frequency with which participants drove significantly faster than allowed (speeding), drove a car after having drunk alcohol (drinking & driving), and held a cell phone or smartphone while driving (texting & driving). It should be noted that texting & driving was defined and operationalized in slightly broader terms as compared to the current research that operationalizes texting as "typing and reading text messages while driving" (Caird et al., 2014). Responses were recorded on a five-point Likert scale ranging from 0 = *never* to 4 = *very often.*

Perceived norms. Perceived descriptive and injunctive norms were operationalized as "pro-risk norms"; the higher the value, the higher the perceived risk affinity of one's friends (see Table 2). The term "friend" was not restricted to those three peers who were nominated

[3] These data are based on the "Mikrozensus", a mandatory survey conducted among 1% of the German population.

as peer group members in the sampling procedure. Consequently, the perceived norms might encompass perceptions related to a broader circle of friends. Perceived descriptive norms (PDN) were measured as the young drivers' perceptions of the frequencies of their friends' risk behaviors (see also Real & Rimal, 2007; Rimal & Real, 2005). The respondents rated on five-point scales how often they estimate their friends to enact the three risk behaviors (speeding, drinking & driving, and texting & driving). Perceived injunctive norms (PIN) were measured by one item for each risk behavior representing the young drivers' perceptions about social approval (e.g., "Many of my friends think it's okay to drive faster than it is allowed.") on a four-point Likert scale ranging from 0 = *does not apply at all* to 3 = *applies completely* (see also Rimal & Real, 2005).

Collective norms. Collective descriptive and injunctive norms were created by aggregating peers' data on self-reported risk behaviors and attitudes to peer group scores (see Table. 2; see also Rimal & Lapinski, 2015)[4]. Following the idea that collective descriptive norms indicate the prevalence of the behavior within the peer group (e.g., Lapinski & Rimal, 2005), we computed a sum score for each risk behavior by counting the "risk peers" within a group who reported to show the risk behavior *often* or *very often* (see also Coley et al., 2013; Rimal, Limaye, Roberts, Brown, & Mkandawire, 2013). This score can thus vary between zero and four risk peers (ego and his/her three alteri) in the present data. Referring to the concept of social exposure (Mead, Rimal, Ferrence, & Cohen, 2014), Rimal and Lapinski (2015) suggest that such a score serves "as a good indicator of the collective norm" (p. 396): If many peers within the peer group show the risk behavior, it would be appropriate to suppose that the peer group has a supportive collective norm on this issue. In line with the definition of collective injunctive norms (CIN) as peers' actual attitudes (e.g., Hogg & Reid, 2006; Rimal & Real, 2003), they were computed by aggregating the peers' attitudes towards

[4] At least, there had to be two valid responses within the group for calculating collective norms.

the risk behaviors to group means. The higher the value, the stronger the positive attitudes towards the behavior within the peer group and the greater the collective approval of the behavior (see also Rimal & Lapinski, 2015). Attitudes were assessed for each risk behavior by four or five items (e.g., "It's ok to drive a car after you drank a glass of beer or wine.") asking about the respondents' agreement on a four-point Likert scale ranging from 0 = *does not apply at all* to 3 = *applies completely*. Whereas the reliability of the attitude scale for texting & driving is quite good (Cronbach's α = .76), the internal consistency of the attitude scale for speeding (Cronbach's α = .68) and drinking & driving (Cronbach's α = .65) is suboptimal, however, still acceptable (George & Mallery, 2002).

[*Table 2 about here*]

Control variables. Standard demographic information, such as age, gender (0 = *female*; 1 = *male*) and socioeconomic status (SES), were collected as control variables. SES was computed by combining information regarding the monthly household income and the level of education into a six-point scale ranging from 1 = *lowest SES* to 6 = *highest SES* (M = 4.33; SD = 1.28)[5].

Statistical Analysis

The dataset is hierarchically structured as the data pertains to the individual and group level. Multilevel modeling (MLM) is able to adequately address such data and allows identifying the extent to which risk behaviors vary across peer groups (*H1*), testing the associations of perceived descriptive (*H2a*) and injunctive norms (*H2b*) as well as collective descriptive (*H3a*) and injunctive norms (*H3b*) with risk behaviors, and answering the

[5] More concretely, the lowest level of education (maximum secondary education) and a monthly household income below 1,250 Euro resulted in a score of 1; increasing levels of educational and financial status yielded stepwise to higher scores; the maximum score is 6, representing the highest educational level (entrance qualification for a technical college) and a monthly household income above 3,000 Euro.

questions on cross-level interactions between perceived and collective norms (*RQ1*; see also Enders & Tofighi, 2007; Hayes, 2006).

In MLM, individual-level predictors can be centered at the grand mean or they can be deviated around the mean of the group to which the individual belongs (group-mean centering; Enders & Tofighi, 2007)[6]. To adequately address our research aims, we used both forms of centering in separate multilevel procedures as the centering strategy is vital to the interpretation of intercept and slope parameters (Enders & Tofighi, 2007)[7]: To examine the associations between perceived and collective norms with risk behaviors, we centered the individual perceived norms at the grand mean as we were interested in differences between an individual's normative perceptions to be in a more risk-oriented peer group compared to other individuals outside the peer group, and not in differences in normative perceptions within peer groups (Aguinis, Gottfredson, & Culpepper, 2012; Enders & Tofighi, 2007).

However, grand-mean centering is not adequate to examine cross-level interactions because grand-mean centered variables encompass within-group (i.e., differences within groups) and between-group variance (i.e., differences between groups). Thus, grand-mean centering leads to cross-level interaction effects that are a "mixed bag" (Aguinis et al., 2012, p. 1511) of two separate effects: first, a true cross-level interaction involving the peer group-level moderator (i.e., collective norms) and the within-group variance of the individual-level variable (i.e., perceived norms) and second, an interaction between the former and the between-group variance of the individual-level predictor (i.e., differences of perceived norms across peer groups; see also Enders & Tofighi, 2007, p. 132–133). Because group-mean centered variables only possess within-group variance, group-mean centering minimizes the

[6] As our scales are arbitrary metrics lacking clearly interpretable and meaningful zero points, centering is used to establish interpretable zero points (Blanton & Jaccard, 2006).

[7] Group-level variables were centered at the grand mean (Enders & Tofighi, 2007).

possibility of finding spurious cross-level interaction effects (Aguinis et al., 2012; Enders & Tofighi, 2007).

First, MLM with grand-mean centered individual variables was performed to test our hypotheses by following the modeling strategy proposed by Hox (2010). We started by estimating the empty baseline model (not including any variables) which is technically speaking a one-way analysis of variance (ANOVA) with random-effects to test hypothesis *H1* whether risk behaviors vary across peer groups and to estimate the degree of nonindependence in risk behaviors by the ICC (intraclass correlation)[8]. To test the hypotheses on the associations between perceived norms (*H2a, H2b)* and collective norms (*H3a*, *H3b)* with the risk behaviors, we integrated perceived norms at the individual and collective norms at the group level. Fixed-effects models were used to calculate Snijders and Bosker's (1999) pseudo R^2s for both levels, and random-effects models were performed to examine whether the slopes of the perceived norms vary across peer groups. In order to enhance clarity in reporting, only the final models for the three risk behaviors are displayed in Table 3. Second, we ran the same analyses (including the same variables) once again, but used group-mean instead of grand-mean centered variables to answer *RQ1* on cross-level interaction effects. As the single purpose of this analysis is the estimation of accurate interaction effects, Table 4 only reports these effects.

Analyses were run with HLM 7.0 (Raudenbush, Bryk, Cheong, Congdon, & Du Toit, 2011). Peer groups with missing values on the predictor variables were excluded from analysis, resulting in a final sample of $k = 283$ peer groups. At the individual level, respondents with missing values were deleted listwise.

[8] ICC = group level variance / (group level variance + individual level variance).

Results

All three road traffic behaviors proved to be prevalent among young drivers. However, speeding and texting & driving were more frequently enacted than drinking & driving (see also Table 2): 19 percent of the young drivers reported to *often* or *very often* drive significantly faster than allowed (speeding) and 24 percent indicated to hold a cell phone while driving (texting & driving); on the contrary, only 10 percent of the respondents admitted to drinking & driving regularly.

The first hypothesis *H1* states that differences across young drivers in performing these risk behaviors can be explained by peer group characteristics. The ICC, calculated on the basis of the baseline model, indicate that differences across peer groups significantly ($\chi^2(289) = 738.18$, $p < .001$) account for 31 % of the variability in speeding[9]. Comparably, 38 % of variance of drinking & driving ($\chi^2(289) = 865.83$, $p < .001$)[10] and 36 % of the texting & driving variance ($\chi^2(289) = 851.33$, $p < .001$)[11] is attributable to between-group variance. In short, results confirm hypothesis *H1* and provide evidence for a multilevel data structure that requires MLM to address normative social influences on road traffic risk behaviors.

Table 3 displays the results of MLM on normative social influences on the three risk behaviors. Briefly looking at the control variables, we can confirm that gender is a relevant factor regarding road traffic risk behaviors (e.g., Cordellieri et al., 2016). Male drivers speed, drink & drive, and text & drive more frequently than female drivers. Within the group of young drivers, age has only small positive effects on speeding and drinking & driving (i.e., the older the drivers, the higher their risk affinity).

[*Table 3 about here*]

[9] $ICC_{speeding} = .282/(.282 + .624) = .311$.
[10] $ICC_{drinking} = .423/(.701 + .423) = .376$.
[11] $ICC_{texting} = .498/(.498+ .878) = .362$.

In line with the second hypothesis, the findings show that perceived descriptive (*H2a*) and injunctive norms (*H2b*) are positively correlated with road traffic risk behaviors. The more individuals perceive that their peers enact the behavior frequently and approve of it, the more frequently they drive at higher risk. Pseudo R^2s for the individual level that are adjusted for the effects of demographic control variables[12] indicate that perceived descriptive and injunctive norms are able to explain 28 percent (speeding), 33 percent (drinking & driving), and 41 percent (texting & driving) of the variance at the individual level.

The third hypothesis state that, controlled for perceived norms, collective descriptive and injunctive norms are positively associated with risk behavior. Collective norms are able to explain about three-fourths of the variance at the group level, as shown by the pseudo R^2s for the group level. In line with the hypotheses, the coefficients reveal that the greater the frequency of risk behaviors (speeding, drinking & driving, and texting & driving) in one's social environment (*H3a*) and the more they are accepted by the group (*H3b*), the more frequently the individuals display the risk behaviors on the road.

With regard to *RQ1* on cross-level effects, Table 4 presents two interaction effects between collective and perceived norms, both regarding texting & driving. For the other risk behaviors investigated, no such cross-level effects were observed.

[*Table 4 about here*]

Figure 1 illustrates the positive interaction effect between the perceived and collective descriptive norms on texting & driving. The more peers within the peer group text while driving, the stronger the impact of the perceived descriptive norm on individuals' texting behavior. Comparably, the influence of perceived injunctive norms on texting & driving is strengthened as a function of its acceptance within the peer group (i.e., collective injunctive

[12] Pseudo R^2 for the individual level (including demographics and normative variables) - Pseudo R^2 for demographic variables = Pseudo R^2 for perceived norms controlled for demographics

norms; see Figure 2). The greater the approval of texting & driving within the peer group, the stronger the behavioral impact of the perceived acceptance.

[*Figure 1 and Figure 2 about here*]

Taken together, the findings show that road traffic risk behaviors are group phenomena (*H1*) and that next to perceived descriptive (*H2a*) and injunctive norms (*H2b*), collective descriptive (*H3a*) and injunctive norms (*H3b*) are positively associated with risk behaviors. These results were found for every risk behavior under study (i.e., speeding, drinking & driving, and texting & driving). Additionally, in the case of texting & driving, cross-level effects were also revealed (*RQ1*), indicating that the association between perceived pro-risk norms and behavior is amplified in risk-oriented peer groups.

Discussion

The paper seeks to contribute to the extant social norms research by extending the understanding of normative social influences beyond the exploration of individual normative perceptions. For this purpose, we took into account the normative characteristics of individuals' peer groups. We referred to the idea of norms as multilevel phenomena (Rimal et al., 2005; Rimal & Lapinski, 2015) and analyzed data on perceived and collective norms regarding three road traffic risk behaviors (i.e., speeding, drinking & driving, and texting & driving).

Normative Social Influences at Multiple Levels

Gender effects. Before discussing our results on normative social influences on risk behaviors, we want to briefly note the strong and consistent gender effects across all road traffic risk behaviors. This result is in line with previous studies (e.g., Harré, Field, & Kirkwood, 1996; Rhodes & Pivik, 2011; Turner, C. & McClure, 2003) and reveals that young male drivers are more likely to engage in road traffic risk behaviors.

Risk behaviors as group phenomena. Overall, the findings lend credence to the multilevel approach. First of all, in line with hypothesis *H1*, speeding, drinking & driving, and texting & driving turned out to be group phenomena. About one third of the variance in drivers' road traffic risk behaviors is rooted in their peer groups (as indicated by the intraclass correlation), which demonstrate the need for considering peer groups' (normative) characteristics in order to gain a comprehensive understanding of young drivers' road traffic risk behaviors.

Influence of perceived norms. In accordance with previous research on normative influences on road traffic risk behaviors (e.g., Åberg, 1993; Bazargan-Hejazi et al., 2017; Cestac et al., 2011) and the corresponding second hypothesis, perceived descriptive (*H2a*) and injunctive norms (*H2b*) are substantially correlated with risk behaviors; they are able to explain about thirty to forty percent of the variance lying at the individual level. The more individuals perceive that their peers enact a certain risk behavior and approve of it, the more frequently they behave in this way. However, the more interesting finding regarding the study's aim is that peer groups' normative characteristics are relevant behavioral determinants beyond individuals' normative perceptions.

Influence of collective norms. The findings on the third hypothesis reveal that collective norms, that is, the peer groups' behavior (i.e., collective descriptive norms, *H3a*) and attitudes (i.e., collective injunctive norms, *H3b*), explain about three-fourths of the group level variance, indicating that important group level characteristics have been addressed in the present study. Pro-risk social environments enhance the likelihood of individuals' risk taking: The more the peer groups can be typified as "risk groups" in terms of risk behaviors and risk attitudes, the more frequently individuals enact the risk behavior.

In general, these patterns of normative social influences are found across all three risk behaviors. However, in the case of speeding, less variance in behavior can be explained by

differences across peer groups and by norms, suggesting that speeding is not as much a social group phenomenon and less susceptible to collective norms compared to drinking & driving and texting & driving. In accordance with the attribute-centered approach (ACA; Rimal, Lapinski, Turner, & Smith, 2011), this difference might be due to variations regarding the behaviors' "privacy". Rimal et al. (2011) expect behaviors performed in private settings to be under less normative social influence, in comparison to risk behaviors enacted in public settings as the prevalence of the behavior will be hard to ascertain and compliance with the norms will not be known to others. Drinking is a widespread behavior among young adolescents which is often enacted socially, together with peers (e.g., Schulenberg & Maggs, 2002; Townshend & Duka, 2005) and texting is a behavior that inherently includes social interactions with peers (e.g., Vorderer et al., 2016). In contrast, speeding is a less public behavior in so far as the peers may be less often present in speeding situations compared to drinking and texting situations and, thus, direct social influence processes and social sanctions for violating peer group norms have less often to be expected, which is probably why norms are less influential on this type of risk behavior.

Cross-level interactions of normative influences. In reference to *RQ1*, we found two cross-level effects, both in the case of texting & driving. They indicate that peer groups' normative characteristics also serve as moderators by enforcing the association between individuals' normative perceptions and the risk behavior. More concretely, the results reveal that if one's peers both text while driving and approve of it, the behavioral impact of the drivers' corresponding normative perceptions will be strengthened. As this result was only found for texting & driving, we again refer to the ACA (Rimal et al., 2011) to reflect on distinct behavioral attributes. Compared to speeding and drinking & driving, texting is an interdependent behavior (Mackie, Moneti, Shakya, & Denny, 2015, pp. 13–16); it inherently implies interactions. The cross-level interactions reflect the interactional dependence between

individuals and their peers: Extensive texting behavior within the peer group, which also covers texting & driving (Vorderer et al., 2016), calls for reactions on the part of individuals. By acting on the normative perceptions that texting & driving is prevalent and accepted within the peer group and on related perceptions that immediate reactions are expected, individuals may be trying to ensure smooth interactions within their peer groups.

To sum up, the present study shows that both aspects of norms—individual perceptions and normative social group characteristics—are relevant components of normative social influences on (risk) behaviors. Generally, these findings on normative social influences apply across all three risk behaviors, thus lending validity and generalizability to the underlying theoretical mechanisms.

Implications

Theoretical implications. The study supports the idea established by Rimal and Lapinski (2015) to conceptualize norms as multilevel phenomena (see also Lapinski & Rimal, 2005). Our findings demonstrate that, in order to understand normative social influences comprehensively, there is a need to differentiate perceived norms at the individual level and collective norms at the group level. This differentiation is also subject of the SNA (Berkowitz, 2004) whose arguments are primarily based on the gap between individual "perceived" and "actual" group norms, with the idea that overestimations of the permissiveness of peers' attitudes and risk behavior increase individuals' risk behavior (Berkowitz, 2004, p. 5). However, in contrast to the SNA, the current approach conceptualizes norms more strictly as a multilevel phenomenon; it considers the normative levels separately and in parallel and not merged in terms of "misperceptions" (Berkowitz, 2004, p. 5) which helps to gauge the (lack of) concurrence in both levels of norms and to disentangle normative social influences at different levels.

[*Table 5 about here*]

Table 5 illustrates the insights gained through the multilevel approach by considering different configurations of individuals' normative perceptions and actual collective norms. It suggests that the most risk-vulnerable individuals are not the ones who dramatically overestimate the peers' risk affinity (Type 2) but who harbor more or less correct impressions. This is the case when individuals are members of risk-oriented peer groups and correctly perceive that their peers enact and support road traffic risk behaviors (Type 4). The likelihood that those individuals engage in risk behaviors is amplified by two sources of influence: their normative perceptions and direct social influences within their peer groups. Moreover, our findings suggest that even those individuals who rather underestimate the peers' risk affinity (Type 3) are under risk. Though their risk behavior might not be subject to pro-risk normative perceptions, they are embedded in a risk-oriented peer group who exerts direct social influences. The less risk-vulnerable drivers are those who do not perceive pro-risk norms and who are actually not member of a peer group engaging in and supporting risk behavior (Type 1).

Moreover, the study's findings indicate that behavioral theories, such as the TPB (Ajzen, 1991) and TNSB (Real & Rimal, 2007; Rimal & Real, 2005), that focus on the individual level and conceptualize norms exclusively as *perceptions*, exclude a significant part of social reality. "Ecological models" (Sallis & Owen, 2015) that emphasize the social contexts of behavior, while incorporating social and psychological influences, might provide some ideas how to incorporate psychological constructs within a more comprehensive framework. More specifically, in order to develop a coherent "cross-level theory" (Slater et al., 2006, p. 376) of normative social influences (see also Rimal & Lapinski, 2015), further theoretical reflections on the interplay between collective norms, perceived norms, and (risk) behaviors are necessary. In this regard, the consideration of peer communication and observation might be helpful in mainly two domains (see also AUTHORS; Lapinski & Rimal,

2005; Pan & McLeod, 1991; Rimal & Lapinski, 2015; Yanovitzky & Rimal, 2006). First, peer communication and observation can provide insights into the relationship between collective and perceived norms as normative perceptions are built upon and negotiated through communication (Carcioppolo & Jensen, 2012) and learned by observing relevant others (Bandura, 1986; Mead et al., 2014). For example, a study by AUTHORS shows that peer communication plays a crucial role in the formation of normative perceptions which, in turn, affect risk behavior. Second, peer communication and observation might facilitate a more comprehensive understanding of mechanisms and processes through which collective norms influence individuals' behaviors, as group interactions and influences can only be thought of in terms of communication and observation (see also Paluck & Shepherd, 2012). Thus, theorizing on norms from a communication perspective (AUTHORS) by elaborating on the role of peer communication and observation on and in-between different levels of normative social influences might help to develop a coherent multilevel theory on normative social influences (Slater et al., 2006, p. 376; see also Rimal & Lapinski, 2015; Yanovitzky & Rimal, 2006).

Practical implications. The study provides further evidence that interventions should address normative social perceptions and environments through a social norms approach as these message strategies might affect individual behaviors effectively (Berkowitz, 2004). Furthermore, it contributes to the SNA (Berkowitz, 2004) by suggesting that social norms interventions should take account of separate levels of normative social influences (Sallis & Owen, 2015).

More concretely, our findings indicate that not individuals who overestimate their peers' risk affinity should be the most prioritized targets in social norms campaigns but the ones who correctly harbor the impression that they are in a risk group (Table 5; Type 4). Those individuals' risk behavior is amplified by pro-risk normative perceptions and direct

social influences of their risk-oriented peers. Thus, intervention strategies addressing these drivers should target individual normative perceptions and peer groups' normative characteristics in parallel and create synergies between both levels (Berkowitz, 2004). Normative perceptions might be addressed as mediators as they can be changed by communication and those changes, in turn, can lead to risk-reduced behavior (see also AUTHORS). Given that collective descriptive norms—the peers' behaviors—are less amenable to change, social norms campaigns should target collective injunctive norms in the first instance, that is, the peers' attitudes towards risk behaviors. Peer communication can help to bridge individual-level perceptions and group-level characteristics and should be induced to facilitate changes in attitudes as well as normative perceptions. Moreover, our findings suggest that intervention strategies should also address drivers who underestimate the permissiveness of peers' attitudes and the prevalence of risk behaviors among peers (Table 5; Type 3), for example, by enforcing the individuals' attitudes to protect them from social influences of their risk-oriented peers. Strategies targeting individuals who overestimate their peers' risk affinity (Table 5; Type 2) should focus on correcting corresponding misperceptions (Berkowitz, 2004).

Generally, all three risk behaviors under study—speeding, drinking & driving, and texting & driving—turned out to be social group phenomena that might effectively be addressed by norms-based intervention strategies. However, the study's findings also point to little differences across the behaviors. Therefore, preventive efforts and risk communication strategies need to be adjusted to the (risk) behaviors' particularities, as to whether the underlying relationships between collective and individual norms are strong or weak.

Limitations and Future Research

Methodological limitations. The present study contributes to the extant research on normative social influences by demonstrating the impact of perceived and collective norms on

three risk behaviors (i.e., speeding, drinking & driving, texting & driving). However, the study has methodological limitations. The first and most crucial limitation is that, theoretically, causal assumptions between norms and risk behaviors are stated but, empirically, the analysis is based on cross-sectional data. Therefore, our cross-sectional results only provide limited evidence for our theoretical assumptions. Follow-up longitudinal research is needed to demonstrate the findings of multilevel normative social influences in the sense of causal effects.

Second, our analysis of risk behaviors is based on single-item measures. The validity of single items has been questioned because items might go along with measurement errors (Nunnally & Bernstein, 1994, p. 67) and may be unable to fully represent a complex theoretical concept (McIver & Carmines, 1981, p. 15). However, we assume that the items used in this study are able to represent the corresponding concepts adequately as asking respondents for the perceived prevalence of the behavior among their peers and their peers' approval is the most adequate direct measurement for descriptive and injunctive norms (see also Real & Rimal, 2007; Rimal & Real, 2005). Additionally, the replication of our results on normative social influences across three different risk behaviors increases the results' validity.

The third limitation refers to the measurement of behaviors by self-reports. Especially with regard to risk behaviors, the use of self-assessments might be biased due to social desirability concerns in face-to-face interviews (Brener, Billy, & Grady, 2003). This limitation affects also the measurements of collective descriptive norms as they represent aggregates of peers' behaviors; in this regard, the limitation is even more important as collective norms have been referred to as "actual norms" (Berkowitz, 2004, p. 5). Given their measurements, collective norms cannot be equated with actual norms technically speaking and only represent self-reports of the social reality; but, and this is the crucial point, they characterize social environments more accurately than individuals' normative perceptions. To

assess the validity of the drivers' self-reports, we referred to accident statistics of the German police. According to the self-reports of our sample's drivers, one in five of the young drivers drives significantly faster than allowed and one in ten drives under the influence of alcohol, which roughly corresponds to the police statistics according to which 18 percent of drivers aged 18 to 24 involved in an accident drove too fast and 3 percent drove under the influence of alcohol (Destatis, 2017). Future research addressing the relationship between norms and (risk) behaviors should combine observational data on behaviors and survey data on normative perceptions and attitudes (Baumeister, Vohs, & Funder, 2007).

A further limitation is the slightly different conceptualization of the reference group between perceived and collective norms. The collective norms were obtained from the three most important friends, whereas the normative perceptions refer to the whole, potentially larger group of friends. However, as the three most important friends are at the center of the ego's networks, we suppose that a great part of ego's perception regarding the prevalence and approval of the behavior within the group is shaped by these three friends.

Areas for future research. Next to these limitations, there are limits due to the study's scope. First, we focused on normative influences of peer groups, as peers are the most important referents for young people. Future studies should thus compare normative social influences of different reference groups, such as friends, people of the same age, and parents (see also Holtzman & Rubinson, 1995; Mollborn et al., 2014; Powell & Segrin, 2004). Moreover, it might also be valuable to extend the idea of collective norms and to integrate further levels of normative influences by examining "nested" groups. For example, in the case of risk behaviors in school contexts, such as harassment behavior (e.g., Paluck & Shepherd, 2012) and bullying (e.g., Festl, Scharkow, & Quandt, 2014), the integrative study of normative influences of close school friends, school classes, and schools in which individuals are nested might provide interesting insights. The integration of further, more abstract levels

is also interesting from an applied perspective. Norms-based intervention strategies rather focus on larger social entities, such as schools, because it is easier to target them strategically compared to small circles of friends (Berkowitz, 2004). The present approach shows how different social contexts can be integrated into a single multilevel approach (see Sallis & Owen, 2015).

Second, in accordance to the ACA (Rimal et al., 2011) and its proposition that the influence of social norms on behaviors depends on underlying properties of behaviors, we studied normative social influences on three different risk behaviors (speeding, drinking & driving, texting & driving). Small differences across the behaviors were observed, indicating that differences exist in the behaviors' susceptibility to normative influences and that these differences are interpretable in reference to behavioral attributes. Some important attributes are as to whether they are "public or private" (Rimal et al., 2011) or "independent or interdependent" (Mackie et al., 2015). Future research should focus on the question how multilevel normative social influences vary as a function of behavioral attributes and systematically test the influence of behavioral attributes.

Third, given that our study confirmed once again that gender is a consistent and important predictor across different road traffic risk behaviors, future research might combine the multilevel approach to normative social influences with a gender perspective and examine gender differences in normative influences on risk behaviors in order to develop gender-specific normative intervention approaches (see also AUTHORS).

Fourth, future studies might integrate the role of peer communication and peer observation in the relationship between collective and perceived norms and try to gain insights into the processes and mechanisms between collective norms and (risk) behaviors (e.g., Paluck & Shepherd, 2012; Shulman & Levine, 2012). Corresponding findings could help develop peer-based intervention programs by taking into account peer communication as

an important pathway to reduce risk behaviors (van den Putte, Yzer, Southwell, Bruijn, & Willemsen, 2011).

Conclusion

The present paper followed the call in communication sciences to "think and model at multiple levels" (Slater et al., 2006, see also Sallis & Owen, 2015) and examined influences of perceived norms at the individual level and collective norms at the group level on three road traffic risk behaviors (i.e., speeding, drinking & driving, and texting & driving). The conceptualization of norms as multilevel phenomena (Rimal et al., 2005; Rimal & Lapinski, 2015) turned out to be valuable for linking individual-level cognitions and behaviors with macro-level social contexts (see also Rimal & Lapinki, 2015); in this vein, it also provides a useful approach for developing comprehensive norms-based intervention strategies that can create synergies between different levels of risk communication (Berkowitz, 2004). Further research should take up the idea of norms as multilevel phenomena and consider the role of peer communication and observation in this regard (see also AUTHORS). This might help to develop a coherent "cross-level theory" (Slater et al., 2006, p. 376) of normative social influences (see also Rimal & Lapinski, 2015).

References

Åberg, L. (1993). Drinking and driving: Intentions, attitudes, and social norms of Swedish male drivers. *Accident Analysis & Prevention*, *25*, 289–296. https://doi.org/10.1016/0001-4575(93)90023-P

Aguinis, H., Gottfredson, R. K., & Culpepper, S. A. (2012). Best-practice recommendations for estimating cross-level interaction effects using multilevel modeling. *Journal of Management*, *39*, 1490–1528. https://doi.org/10.1177/0149206313478188

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology*, *40*, 471–499.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. *Prentice-Hall series in social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Baumeister, R. F., Vohs, K. D., & Funder, D. C. (2007). Psychology as the science of self-reports and finger movements: Whatever happened to actual behavior? *Perspectives on Psychological Science: a Journal of the Association for Psychological Science*, *2*, 396–403. https://doi.org/10.1111/j.1745-6916.2007.00051.x

Bazargan-Hejazi, S., Teruya, S., Pan, D., Lin, J., Gordon, D., Krochalk, P. C., & Bazargan, M. (2017). The theory of planned behavior (TPB) and texting while driving behavior in college students. *Traffic Injury Prevention*, *18*, 56–62. https://doi.org/10.1080/15389588.2016.1172703

Beck, K. H. (1981). Driving while under the influence of alcohol: Relationship to attitudes and beliefs in a college population. *The American Journal of Drug and Alcohol Abuse*, *8*, 377–388. https://doi.org/10.3109/00952998109009561

Berkowitz, A. D. (2004). *The social norms approach: Theory, research, and annotated bibliography*. Retrieved from http://www.alanberkowitz.com/articles/social_norms.pdf

Blanton, H., & Jaccard, J. (2006). Arbitrary metrics in psychology. *The American Psychologist*, *61*, 27–41. https://doi.org/10.1037/0003-066X.61.1.27

Borsari, B., & Carey, K. B. (2003). Descriptive and injunctive norms in college drinking: A meta-analytic integration. *Journal of Studies on Alcohol*, *64*, 331–341.

Brener, N. D., Billy, J. O. G., & Grady, W. R. (2003). Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: Evidence from the scientific literature. *Journal of Adolescent Health*, *33*, 436–457. https://doi.org/10.1016/S1054-139X(03)00052-1

Caird, J. K., Johnston, K. A., Willness, C. R., Asbridge, M., & Steel, P. (2014). A meta-analysis of the effects of texting on driving. *Accident Analysis & Prevention*, *71*, 311–318. https://doi.org/10.1016/j.aap.2014.06.005

Carcioppolo, N., & Jensen, J. D. (2012). Perceived historical drinking norms and current drinking behavior: Using the theory of normative social behavior as a framework for assessment. *Health Communication*, *27*, 766–775. https://doi.org/10.1080/10410236.2011.640973

Cestac, J., Paran, F., & Delhomme, P. (2011). Young drivers' sensation seeking, subjective norms, and perceived behavioral control and their roles in predicting speeding intention: How risk-taking motivations evolve with gender and driving experience. *Safety Science*, *49*, 424–432. https://doi.org/10.1016/j.ssci.2010.10.007

Chung, A., & Rimal, R. N. (2016). Social norms: A review. *Review of Communication Research*, 1–28.

Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, *58*, 1015–1026.

Coley, R. L., Lombardi, C. M., Lynch, A. D., Mahalik, J. R., & Sims, J. (2013). Sexual partner accumulation from adolescence through early adulthood: the role of family, peer, and school social norms. *The Journal of Adolescent Health*, *53*, 91-97. https://doi.org/10.1016/j.jadohealth.2013.01.005

Cordellieri, P., Baralla, F., Ferlazzo, F., Sgalla, R., Piccardi, L., & Giannini, A. M. (2016). Gender effects in young road users on road safety attitudes, behaviors and risk perception. *Frontiers in Psychology*, *7*, 1412. https://doi.org/10.3389/fpsyg.2016.01412

Destatis. (2017). Verkehrsunfälle. Unfälle von 18- bis 24-Jährigen im Straßenverkehr 2016. [Road traffic accidents. Accidents of persons aged 18 to 24 in road traffic 2016]. Retrieved from https://www.destatis.de/DE/Publikationen/Thematisch/TransportVerkehr/Verkehrsunfaelle/Unfaelle18bis24jaehrigen5462406167004.pdf?__blob=publicationFile

Deutsch, M., & Gerard, H. B. (1955). A study of normative and informational social influences upon individual judgment. *Journal of Abnormal and Social Psychology*, *51*, 629–636.

Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods*, *12*, 121–138. https://doi.org/10.1037/1082-989X.12.2.121

Festl, R., Scharkow, M., & Quandt, T. (2014). The individual or the group: A multilevel analysis of cyberbullying in school classes. *Human Communication Research*, *41*, 535–556. https://doi.org/10.1111/hcre.12056

Fishbein, M., & Yzer, M. C. (2003). Using theory to design effective health behavior interventions. *Communication Theory*, *13*, 164–183. https://doi.org/10.1111/j.1468-2885.2003.tb00287.x

Fleiter, J. J., Watson, B. C., Lennon, A. J., & Lewis, I. M. (2006, October). *Significant others, who are they? Examining normative influences on speeding.* Paper presented at the Australasian Road Safety Research Policing Education Conference, Gold Coast. Retrieved from https://eprints.qut.edu.au/5450/1/5450.pdf

Gauld, C. S., Lewis, I., & White, K. M. (2014). Concealing their communication: Exploring psychosocial predictors of young drivers' intentions and engagement in concealed texting. *Accident Analysis & Prevention*, *62*, 285–293. https://doi.org/10.1016/j.aap.2013.10.016

George, D., & Mallery, P. (2002). *SPSS for Windows Step by Step: A Simple Guide and Reference, 11.0* (4th ed.). Needham Heights, MA: Pearson Higher Education.

Glass, T. A., & McAtee, M. J. (2006). Behavioral science at the crossroads in public health: Extending horizons, envisioning the future. *Social Science & Medicine*, *62*, 1650–1671. https://doi.org/10.1016/j.socscimed.2005.08.044

Grube, J. W., Morgan, M., & McGree, S. T. (1986). Attitudes and normative beliefs as predictors of smoking intentions and behaviours: A test of three models. *British Journal of Social Psychology*, *25*, 81–93. https://doi.org/10.1111/j.2044-8309.1986.tb00707.x

Harré, N., Field, J., & Kirkwood, B. (1996). Gender differences and areas of common concern in the driving behaviors and attitudes of adolescents. *Journal of Safety Research*, *27*, 163–173. https://doi.org/10.1016/0022-4375(96)00013-8

Hayes, A. F. (2006). A primer on multilevel modeling. *Human Communication Research*, *32*, 385–410. https://doi.org/10.1111/j.1468-2958.2006.00281.x

Hogg, M. A., & Reid, S. A. (2006). Social identity, self-categorization, and the communication of group norms. *Communication Theory*, *16*, 7–30. https://doi.org/10.1111/j.1468-2885.2006.00003.x

Holtzman, D., & Rubinson, R. (1995). Parent and peer communication effects on AIDS-related behavior among U.S. high school students. *Family Planning Perspectives*, *27*, 235–240. https://doi.org/10.2307/2136175

Hox, J. J. (2010). *Multilevel analysis: Techniques and applications* (2nd ed.). *Quantitative Methodology Series*. New York: Routledge.

Kallgren, C. A., Reno, R. R., & Cialdini, R. B. (2016). A focus theory of normative conduct: When norms do and do not affect behavior. *Personality and Social Psychology Bulletin*, *26*, 1002–1012. https://doi.org/10.1177/01461672002610009

Kenney, S. R., LaBrie, J. W., & Lac, A. (2013). Injunctive peer misperceptions and the mediation of self-approval on risk for driving after drinking among college students. *Journal of Health Communication*, *18*, 459–477. https://doi.org/10.1080/10810730.2012.727963

Lapinski, M. K., & Rimal, R. N. (2005). An explication of social norms. *Communication Theory*, *15*, 127–147. https://doi.org/10.1111/j.1468-2885.2005.tb00329.x

Mackie, G., Moneti, F., Shakya, H., & Denny, E. (2015). *What are social norms? How are they measured?* Retrieved from https://www.unicef.org/protection/files/4_09_30_Whole_What_are_Social_Norms.pdf

McIver, J. P., & Carmines, E. G. (1981). *Unidimensional scaling*. *Sage University Papers Series. Quantitative Applications in the Social Sciences: no. 07-024*. Beverly Hills, CA.: Sage Publications.

Mead, E. L., Rimal, R. N., Ferrence, R., & Cohen, J. E. (2014). Understanding the sources of normative influence on behavior: The example of tobacco. *Social Science & Medicine*, *115*, 139–143. https://doi.org/10.1016/j.socscimed.2014.05.030

Mollborn, S., Domingue, B. W., & Boardman, J. D. (2014). Understanding multiple levels of norms about teen pregnancy and their relationships to teens' sexual behaviors. *Advances in Life Course Research*, *20*, 1–15. https://doi.org/10.1016/j.alcr.2013.12.004

Møller, M., & Haustein, S. (2014). Peer influence on speeding behaviour among male drivers aged 18 and 28. *Accident Analysis & Prevention*, *64*, 92–99. https://doi.org/10.1016/j.aap.2013.11.009

Montaño, D. E., & Kasprzyk, D. (2015). Theory of reasoned action, theory of planned behavior, and the integrated behavioral model. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 95–124). San Francisco, CA: Jossey-Bass.

Nemme, H. E., & White, K. M. (2010). Texting while driving: Psychosocial influences on young people's texting intentions and behaviour. *Accident Analysis & Prevention*, *42*, 1257–1265. https://doi.org/10.1016/j.aap.2010.01.019

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). *McGraw-Hill Series in Psychology*. New York: McGraw-Hill.

O'Gorman, H. J., & Garry, S. L. (1976). Pluralistic ignorance: A replication and extension. *Public Opinion Quarterly*, *40*, 449–458. https://doi.org/10.1086/268331

Paluck, E. L., & Shepherd, H. (2012). The salience of social referents: A field experiment on collective norms and harassment behavior in a school social network. *Journal of Personality and Social Psychology*, *103*, 899–915. https://doi.org/10.1037/a0030015

Pan, Z., & McLeod, J. M. (1991). Multilevel analysis in mass communication research. *Communication Research*, *18*, 104–173.

Perkins, H. W., & Berkowitz, A. D. (1986). Perceiving the community norms of alcohol use among students: Some research implications for campus alcohol education programming. *Substance Use & Misuse*, *21*, 961–976. https://doi.org/10.3109/10826088609077249

Powell, H. L., & Segrin, C. (2004). The effect of family and peer communication on college students' communication with dating partners about HIV and AIDS. *Health Communication*, *16*, 427–449. https://doi.org/10.1207/s15327027hc1604_3

Raudenbush, S. W., Bryk, A. S., Cheong, Y. F., Congdon, R. T., & Du Toit, M. (2011). *HLM 7: Hierarchical linear and nonlinear modeling*. Skokie, IL: Scientific Software International, Inc.

Real, K., & Rimal, R. N. (2007). Friends talk to friends about drinking: Exploring the role of peer communication in the theory of normative social behavior. *Health Communication*, *22*, 169–180.

Rhodes, N., & Pivik, K. (2011). Age and gender differences in risky driving: The roles of positive affect and risk perception. *Accident Analysis & Prevention*, *43*, 923–931. https://doi.org/10.1016/j.aap.2010.11.015

Rimal, R. N., & Lapinski, M. K. (2015). A re-explication of social norms, ten years later. *Communication Theory*, *25*, 393–409. https://doi.org/10.1111/comt.12080

Rimal, R. N., Lapinski, M. K., Cook, R. J., & Real, K. (2005). Moving toward a theory of normative influences: How perceived benefits and similarity moderate the impact of descriptive norms on behaviors. *Journal of Health Communication*, *10*, 433–450. https://doi.org/10.1080/10810730591009880

Rimal, R. N., Lapinski, M. K., Turner, M. M., & Smith, K. C. (2011). The attribute-centered approach for understanding health behaviors: Initial ideas and future research directions. *Studies in Communication Sciences*, *11*, 15–34.

Rimal, R. N., Limaye, R. J., Roberts, P., Brown, J., & Mkandawire, G. (2013). The role of interpersonal communication in reducing structural disparities and psychosocial deficiencies: Experience from the Malawi BRIDGE project. *Journal of Communication*, *63*, 51–71. https://doi.org/10.1111/jcom.12000

Rimal, R. N., & Real, K. (2003). Understanding the influence of perceived norms on behaviors. *Communication Theory*, *13*, 184–203. https://doi.org/10.1111/j.1468-2885.2003.tb00288.x

Rimal, R. N., & Real, K. (2005). How behaviors are influenced by perceived norms: A test of the theory of normative social behavior. *Communication Research*, *32*, 389–414. https://doi.org/10.1177/0093650205275385

Ross, L., Greene, D., & House, P. (1977). The “false consensus effect”: An egocentric bias in social perception and attribution processes. *Journal of Experimental Social Psychology*, *13*, 279–301. https://doi.org/10.1016/0022-1031(77)90049-X

Sallis, J. F., & Owen, N. (2015). Ecological models of health behavior. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior: Theory, research, and practice* (5th ed., pp. 43–64). San Francisco, CA: Jossey-Bass.

Schulenberg, J. E., & Maggs, J. L. (2002). A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. *Journal of Studies on Alcohol, Supplement*, 54–70. https://doi.org/10.15288/jsas.2002.s14.54

Scott-Parker, B., Hyde, M. K., Watson, B., & King, M. J. (2013). Speeding by young novice drivers: What can personal characteristics and psychosocial theory add to our

understanding? *Accident Analysis & Prevention*, *50*, 242–250. https://doi.org/10.1016/j.aap.2012.04.010

Shulman, H. C., & Levine, T. R. (2012). Exploring social norms as a group-level phenomenon: Do political participation norms exist and influence political participation on college campuses? *Journal of Communication*, *62*, 532–552. https://doi.org/10.1111/j.1460-2466.2012.01642.x

Shulman, H. C., Rhodes, N., Davidson, E., Ralston, R., Borghetti, L., & Morr, L. (2017). The state of the field of social norms research. *International Journal of Communication*, *11*, 1192–1213.

Simons-Morton, B. G., Ouimet, M. C., Chen, R., Klauer, S. G., Lee, S. E., Wang, J., & Dingus, T. A. (2012). Peer influence predicts speeding prevalence among teenage drivers. *Journal of Safety Research*, *43*, 397–403. https://doi.org/10.1016/j.jsr.2012.10.002

Slater, M. D., Snyder, L., & Hayes, A. F. (2006). Thinking and modeling at multiple levels: The potential contribution of multilevel modeling to communication theory and research. *Human Communication Research*, *32*, 375–384. https://doi.org/10.1111/j.1468-2958.2006.00292.x

Snijders, T. A. B., & Bosker, R. J. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. London: Sage Publications.

Townshend, J. M., & Duka, T. (2005). Binge drinking, cognitive performance and mood in a population of young social drinkers. *Alcoholism: Clinical & Experimental Research*, *29*, 317–325. https://doi.org/10.1097/01.ALC.0000156453.05028.F5

Turner, C., & McClure, R. (2003). Age and gender differences in risk-taking behaviour as an explanation for high incidence of motor vehicle crashes as a driver in young males. *Injury Control and Safety Promotion*, *10*, 123–130. https://doi.org/10.1076/icsp.10.3.123.14560

Turner, J. C. (1991). *Social influence*. *Mapping Social Psychology Series*. Pacific Grove, CA: Brooks/Cole Publishing Company.

Van den Putte, B., Yzer, M., Southwell, B. G., Bruijn, G.-J. de, & Willemsen, M. C. (2011). Interpersonal communication as an indirect pathway for the effect of antismoking media content on smoking cessation. *Journal of Health Communication*, *16*, 470–485. https://doi.org/10.1080/10810730.2010.546487

Vorderer, P., Krömer, N., & Schneider, F. M. (2016). Permanently online – permanently connected: Explorations into university students' use of social media and mobile smart devices. *Computers in Human Behavior*, *63*, 694–703. https://doi.org/10.1016/j.chb.2016.05.085

White, K. M., Terry, D. J., & Hogg, M. A. (1994). Safer sex behavior: The role of attitudes, norms, and control factors. *Journal of Applied Social Psychology*, *24*, 2164–2192. https://doi.org/10.1111/j.1559-1816.1994.tb02378.x

WHO. (2015). *Global status report in road safety 2015*. Retrieved from http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/

Yanovitzky, I., & Rimal, R. N. (2006). Communication and normative influence: An introduction to the special issue. *Communication Theory*, *16*, 1–6. https://doi.org/10.1111/j.1468-2885.2006.00002.x

Zhang, L., Wieczorek, W. F., & Welte, J. W. (2012). The influence of parental and peer drinking behaviors on underage drinking and driving by young men. *Journal of Drug Education*, *42*, 347–359. https://doi.org/10.2190/DE.42.3.f

Table 1

Descriptive and Injunctive Norms as Perceived and Collective Norms

	Descriptive norms	**Injunctive norms**
Perceived norms (Individual level)	Individual's belief about the peer group's behavior	Individual's belief about the peer group's approval of the behavior
Collective norms (Group level)	The peer group's behavior	The peer group's attitude towards the behavior

Note. Taxonomy based on Rimal and Lapinski (2015) and Lapinski and Rimal (2005).

Table 2

Description of the Sample

	Speeding		**Drinking & Driving**		**Texting & Driving**	
	***M* (*SD*)**	***n***	***M* (*SD*)**	***n***	***M* (*SD*)**	***n***
Individual level (IL)						
Behavior[1]	1.67 (.97)	1037	.95 (1.08)	976	1.67 (1.17)	1045
PDN[1]	1.93 (.87)	1195	1.45 (1.1)	1203	1.86 (1.11)	1202
PIN[2]	1.26 (.82)	1237	1.36 (.95)	1242	1.34 (.86)	1235
Group level (GL)						
CDN[3]	.60 (.91)	297	.31 (.69)	293	.83 (1.06)	298
CIN[4]	.91 (.41)	308	.62 (.36)	308	.93 (.48)	307

Note. Scales: [1]0 = *never* to 4 = *very often*; [2]0 = *does not apply at all* to 3 = *applies completely*; [3]sum of risk peers in groups (peers who show the risk behavior *often*/*very often*); [4]group mean of attitudes, 0 = *does not apply at all* to 3 = *applies completely*; PDN = perceived descriptive norm; PIN = perceived injunctive norm; CDN = collective descriptive norm; CIN = collective injunctive norm; IL = individual level; GL = group level.

Table 3

Perceived and Collective Normative Influences on Risk Behaviors

	Speeding	**Drinking & Driving**	**Texting & Driving**
	***b* (*SE*)**	***b* (*SE*)**	***b* (*SE*)**
Individual level (IL)			
Intercept	1.642 (.021)***	.906 (.023)***	1.649 (.024)***
Male	.208 (.052)***	.446 (.053)***	.208 (.056)***
Age	.008 (.004)*	.012 (.004)*	-.004 (.004)
SES	-.033 (.018)	-.020 (.022)	-.036 (.021)
PDN	.322 (.039)***	.288 (.036)***	.402 (.037)***
PIN	.137 (.033)***	.150 (.039)***	.097 (.042)*
Group level (GL)			
CDN	.368 (.025)***	.469 (.045)***	.343 (.028)***
CIN	.144 (.065)*	.231 (.091)**	.227 (.071)**
Variance components			
Variance IL	.479	.478	.618
Variance GL	.000	.009*	.000
Var. Slope PDN	.058**	.046**	.041*
Var. Slope PIN	.004	.068**	.026
Additional information			
Pseudo R^2 (IL)[1]	.319	.422	.423
Pseudo R^2 (GL)[1]	.708	.773	.768

Note. *p < .05, **p < .01, ***p < .001; N_{Speeding} (individuals/groups): 907/283, N_{Drinking} (individuals/groups): 862/283, N_{Texting} (individuals/groups): 917/283; listwise deletion of cases; robust standard errors were used for testing statistical significance; all predictors have been centered at the grand mean; [1]Pseudo R^2 suggested by Snijders and Bosker (1999); PDN =

perceived descriptive norm; PIN = perceived injunctive norm; CDN = collective descriptive norm; CIN = collective injunctive norm; IL = individual level; GL = group level.

Table 4

Cross-Level Effects between Perceived and Collective Normative Influences on Risk Behaviors

	Speeding	**Drinking & Driving**	**Texting & Driving**
	***b* (*SE*)**	***b* (*SE*)**	***b* (*SE*)**
CDN*PDN	.066 (.053)	.033 (.105)	.153 (.061)*
CDN*PIN	-.012 (.048)	.117 (.12)	-.1 (.056)
CIN*PDN	-.223 (.17)	-.109 (.198)	-.261 (.141)
CIN*PIN	.007 (.146)	.05 (.173)	.394 (.145)**

Note. *p < .05, **p < .01, ***p < .001; N_{Speeding} (individuals/groups): 907/283, N_{Drinking} (individuals/groups): 862/283, N_{Texting} (individuals/groups): 917/283; listwise deletion of cases; robust standard errors were used for testing statistical significance; individual-level predictors have been centered at the group-mean, group-level predictors have been centered at the grand mean; PDN = perceived descriptive norm; PIN = perceived injunctive norm; CDN = collective descriptive norm; CIN = collective injunctive norm.

Table 5

Vulnerability to Risk as a Function of Perceived and Collective Norms

	Perceived Pro-Risk Norms	
Collective Pro-Risk Norms	**Low**	**High**
Low	Type 1 • Individuals' perception: correct • Vulnerability to risk: relatively low	Type 2 • Individuals' perception: overestimation of the peers' risk affinity • Vulnerability to risk: relatively moderate, driven by pro-risk normative perceptions
High	Type 3 • Individuals' perception: underestimation of the peers' risk affinity • Vulnerability to risk: relatively moderate, driven by risk-oriented peer groups	Type 4 • Individuals' perception: correct • Vulnerability to risk: relatively high, driven by pro-risk normative perceptions and risk-oriented peer groups

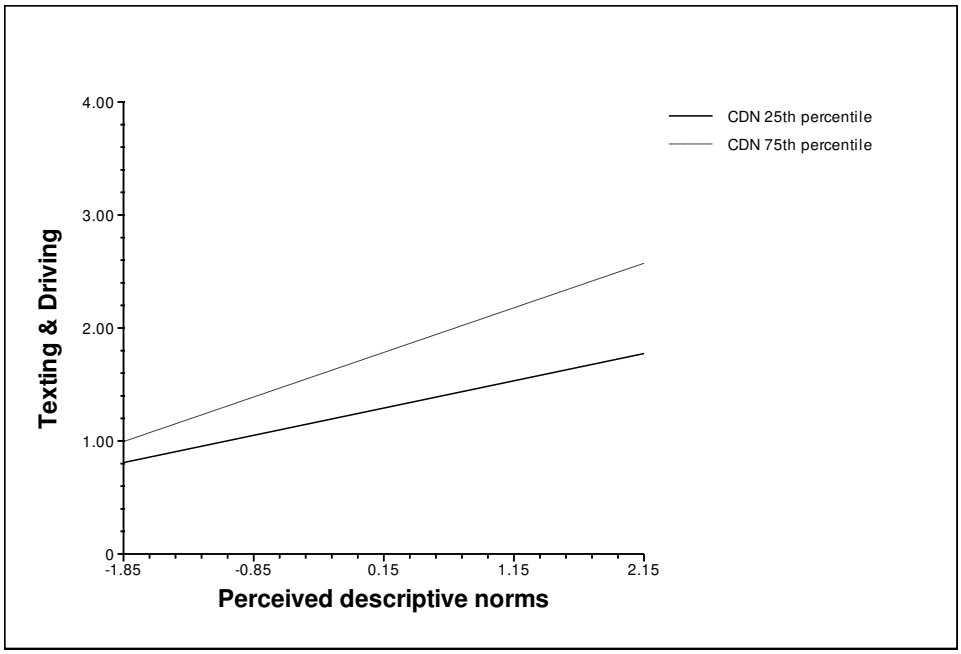

Figure 1. Cross-level effect between the perceived descriptive norm and collective descriptive norm on texting & driving.

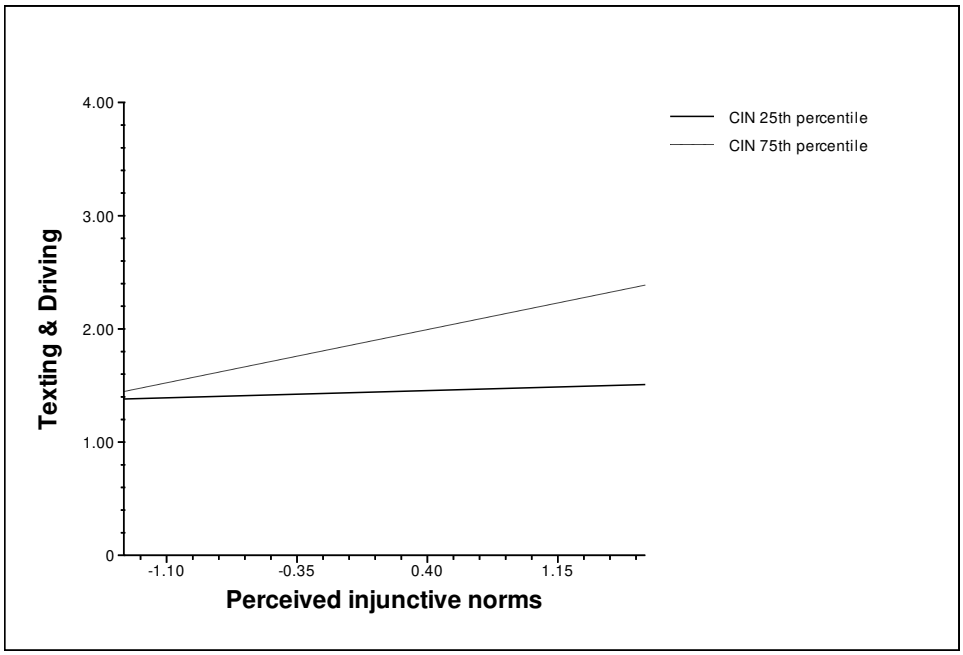

Figure 2. Cross-level effect between the perceived injunctive norm and collective injunctive norm on texting & driving.