CHAPTER III
REVIEW OF LITERATURE

The objective of this study was to assess the role of driving anger, vengeance, boredom proneness and sensation-seeking in propensity towards unsafe driving. The role of impulsiveness in terms of unsafe driving was also assessed. The aforementioned psychological variables were studied among various groups (viz. males, females, traffic offenders, non-offenders, two-wheeler drivers and four-wheeler drivers). The present investigation aimed to study the relationship between various variables by understanding the correlation, delineating the predictors of unsafe driving and assessing the differences that exist among various groups.

Unsafe driving is an area of growing concern amongst policy-makers and social scientists since the increasing number of vehicles on roads is endangering lives and property of other road users. The developed countries confronted this issue quite early with increase in their motorized vehicle population and the onset of systematic study of psychological aspects of driving which is believed to have begun in 1949 when Tillman and Hobbs stated that "a man drives as he lives" (p.329). The interest in driving behaviour further grew when Meyer Parry (1968), in his monograph “Aggression on the Road”, very appropriately emphasized that “the increasing stress involved in motoring nowadays makes the psychological efficiency of the driver a more important factor than the mechanical efficiency of the vehicle he drives”.

One year later, J.J. Leeming’s article “Road Accidents: Prevent or Punish?” (1969) which concluded very aptly about the psychological transformation of the driver the moment he/she gets behind the wheel. “...a person’s whole attitude changes as if the period of driving were not part of real life, but some stage between episodes of real life. Many think only in terms of ‘other cars’ not of ‘other drivers’, and thus forgetting all consideration assume a dangerously competitive or even aggressive attitude towards those other cars.”

Unsafe, aggressive driving, road-rage, dangerous driving are the terms which have often been used interchangeably (Dula & Geller, 2003; Tasca, 2001). Reason’s (1990, 1997) accident causation model advocated that an accident is directly preceded by unsafe driving actions. For the purpose of this study, the term ‘unsafe driving’ has been used and it includes risky driving, aggressive driving and negative emotional driving based on Dula Dangerous Driving Inventory (DDDI) used as a tool in this study. Since the objective of this research was to study unsafe
driving, driving anger, vengeance, boredom proneness, sensation-seeking and impulsiveness, the available literature was reviewed separately for each of the selected psychological variables.

**Unsafe driving and driving anger**

Driving anger is one of the most widely researched psychological construct in the realm of Traffic Psychology. Since early 1970s, the traffic researchers started focusing on driving anger as single most significant factor leading to dangerous or aggressive behaviour on roads.

Several researchers (Deffenbacher, Huff, Lynch, Oetting, & Salvatore, 2000; Novaco, 1979; Selzer & Vinokur, 1974; Stokols, Novaco, Stokols, & Campbell, 1978), firmly associate driving anger, stress, and aggression with traffic violations, accidents, and physical health.

Other researchers like Arnett et al. (1997), Donovan, Queisser, Salzberg, and Umlauf (1985), Mayer and Treat (1977), McMillen, Pang, Wells-Parker, Anderson (1991), Underwood et al. (1999) found that drivers who rate high on general anger, aggressiveness, risk-taking, impulsiveness, social irresponsibility and sensation-seeking, are prone to risky, illegal or unsafe driving with a higher likelihood of getting involved in a road crash. Deffenbacher et al. (1994) in his research also proposed that anger might influence a driver to engage in risky driving behaviour that in turn may increase accident liability during such an emotional episode. Anger may motivate a driver to indulge in dangerous driving such as tailgating, speeding or flashing their lights.

Driving anger has also been studied in terms of 'trait anger' i.e. as a personality disposition, as well as 'state anger' i.e. anger aroused due to context or specific state factor like driving environment (Cattell & Scheier, 1961). This was supported in another study on college students by Morris, Deffenbacher, Lynch, and Oetting (1996) who found elevated state anger contributed to reckless driving.

Some of the research focussing on high-anger drivers found that these drivers not only reported greater levels of anger in ‘rush hour’ traffic but also reported significantly more anger than low-anger drivers. Further, the analysis of expressed ‘driving anger’ revealed that high anger drivers participated in more extreme forms of aggression (Gordhamer, Martinex, Petrilli, Lynch, & Deffenbacher, 1996). Deffenbacher et al. (2000) in their study also found that individuals who rate higher on trait driving anger, experience more frequent and intense anger. They display more aggressive and risky driving behaviour and have more road crashes. Trait
driving anger was also found to be positively correlated with risky driving attitudes and behaviours such as frequent risky and aggressive behaviour, close calls, and crash-related events. Another study on similar lines by Deffenbacher et al. (2000, 2002) found from a clinical sample of high-anger drivers that these drivers reported greater loss of concentration, close calls, and moving violations. In a study by Deffenbacher et al., (2003), driving anger was found to be one of the most influential predictors of aggressive and other forms of risky driving. High-anger drivers were also found to be more likely to speed on a driving simulator than the low anger drivers.

In context to driving anger and traffic violations, a study by Underwood et al. (1999) analyzed the diaries of 100 drivers who were instructed to keep an account of the number of times they experienced anger while driving. The accounts of these diaries were examined along with a filled up questionnaires that measured mild social deviance and traffic violations. A total of 293 near-accidents and 383 occasions of anger episodes were recorded by the respondents. The study found a strong association between the number of near-accidents and the episodes of anger a person experiences while driving.

Sullman, Gras, Cunill, Planes, and Font-Mayolas (2007) documented an increase in driving anger research, demonstrating the utility of its study and its significance in today’s scenario. He observed that individuals who rate high on driving anger engage more in unsafe driving, frequently lose vehicular control, report more near-hits and loss of concentration and have more crashes in driving simulator studies.

Another study by King and Parker (2008), took cognizance of aggression - a behavioural manifestation of anger and similarly revealed drivers rating high on trait aggressiveness had more traffic violations and were more likely to get involved in a road crash.

One of the recent studies in China also revealed positive correlation between anger, stress and dangerous driving (Ge, Qu, Jiang, Du, Sun, & Zhang, 2014). In this study, anger was also found as a mediator in the relationship between stress and dangerous driving. Another study in China done on road rage (Lei, Yan, Wu, Zhong, & Qi, 2014), assessed driving behaviours of angry drivers. The results revealed that driving anger frequently led to driver distraction, lapses in vehicle control, and impulsive driving. Angry drivers were found to engage in various aggressive behaviours on roads and were also observed as changing vehicle operations quickly,
more frequently and with more force (like frequent change of gears, more acceleration and abrupt use of brakes).

Research has also shown positive relationship between driving anger and adverse driving outcomes amongst attention deficit-hyperactivity disorder drivers (Oliver, Han, Bos & Backs, 2015). The results found that the negative emotions and emotional control were significant mediators of the relationship between ADHD symptoms specifically for ADHD-Hyperactive/Impulsive symptoms and driving anger, but not for safe driving behaviour.

**Unsafe driving and vengeance**

The desire for vengeance is one of the universal human psychological endowments (Cheema, 2013), but at times its expression can be quite lethal specifically in a driving context where it may pose threat to one's own life, as well as to other road users. Vengeance is regarded as one of the manifestation of aggression (Black, 2014) and can range from mild driver aggression to violence and road rage.

One of the earliest studies on vengeance in a driving context dates back to 1980 when Hauber in his study found young drivers indulging in vengeful acts. Youngsters vehemently demonstrated a tendency to defend their extended personal territory or space on road represented by their vehicle.

Research studies of Ohbuchi and Kambara (1985), Daly and Wilson (1988), Stuckless and Goranson (1992), Deffenbacher et al. (1994), Stuckless, Ford, and Vitelli (1995) observe that drivers nurturing vengeful attitude were more likely to perceive minor infractions by other road users as intentional and deliberate, and therefore, experience psychological distress, and as such reacted with extreme levels of aggression and violence.

Driving context was also symptomatic facilitator of heightened aggression and vengeance on roads. Ohbuchi and Kambara (1985), and Quigley and Tedeschi (1996) in their studies observed that in a driving scenario potential for vengeful responses gets heightened, especially because true intent of anti-normative driving behaviour is often difficult to assess, considering the speed, anonymity, and lack of communication within traffic conditions. Actions that cannot be attributed to the situation, accident, or any other event are interpreted as intentional, increasing the likelihood of vengeful aggression.
In studies done on vengeful drivers and traffic violations, Oldenquist (1988) discovered that in the absence of a police officer or any other official deterrent, vengeful drivers often felt justified in personally taking upon themselves to punish and reprimand the perpetrator of such perceived aberration and transgression on road, through their own aggressive behaviour. This perhaps serves as an ego-defense mechanism of rationalization and justifies their own indulgence in vengeful acts. Stuckless et al. (1995) in his study on habitual offenders found such drivers are typically more prone to experiencing anger, which has been linked to vengeful aggression and impulsive dangerous driving behaviour.

Vengeance studies among young drivers have found significant correlation of hostility with unsafe driving as a personality attribute among youth. Drivers who were less than 30 years of age were found to engage in risk-taking behaviour. However, Hemenway and Solnick (1993) and Hennessy, Wiesenthal, Wickens, and Lustman (2004) concluded that though mild aggression among drivers with at least five years of experience may get subdued with age, it however, increased among those who rated high on vengeance.

Vengeance has also been studied in context to hostility level among drivers. In a self-reported study of 270 drivers 89% of the respondents indulged in aggressive violations like chasing another car, honking to express their annoyance and hostility towards another driver. (Parker, Lajunen & Stradling, 1998).

Hennessy and Wiesenthal (2001), Holbrook (1997), McCullough, Bellah, Kilpatrick, and Johnson (2001), Wiesenthal, Hennessy, and Gibson (2000), in their studies also discovered that over a period of time, a vengeful disposition can develop as perceived infractions accumulate, leading to more severe and repetitive aggression. There is a considerable evidence linking vengeance to road aggression and violence in both hypothetical and actual driving situations. Vengeful drivers were more prone to perceive minor infractions by other drivers as purposeful and deliberate. Such vengeful drivers are prone to inflict harm purposefully on others in the driving environment in direct response to a perceived injustice, observed Wiesenthal et al. (2000). Harm may include physical and psychological pain, injury, emotional harm, humiliation, or annoyance.

As put forth by Hennessy and Wiesenthal (2001, 2005), vengeance is a feeling of retaliation, in response to perceived injustice or harm by another person. In a driving context, it is the other driver or road user who is perceived to be a transgressor indulging deliberately in
unsafe driving behaviour. Studies therefore show positive relationship between Unsafe driving and vengeance.

**Unsafe driving and boredom proneness**

While there had been comprehensive studies on unsafe driving and various high-arousal mood states like anger, sensation-seeking, aggression, a very few researchers have focused on low-arousal mood state like boredom (Heslop, Harvey, Thorpe, & Mulley, 2010).

Individuals who are high on boredom are also found to be high on high need for stimulation. A bored driver is found to resort to various possible means for alternate stimulation which may highly compromise safety margins while driving Berlyne (1960), Bryant and Zillmann (1984), Dyer-Smith (1992), London et al. (1972), Mikulas and Vodanovich (1993), Molstad (1986).

Arnett (1990), Furnham and Saipe (1993), Verwey and Zaidel (2000) reiterated the significance of this psychological aspect of a driver being associated with unsafe driving behaviour. Homel, Tomsen and Thommeny (1992) also found boredom as leading driver to indulge in aggressive behaviour such as public violence and alcohol-related assaults; thus, signifying boredom as a contributing factor to aggression (such as crime, violence, and delinquency).

Many research studies assessing relationship of one’s personality to driving behaviour (Dahlen et al., 2005; Iversen & Rundmo, 2002; Schwebel et al., 2006) have revealed that personality traits such as sensation-seeking, impulsiveness, and boredom-proneness seem to be good predictors of crash-related situations, aggressive driving, risky driving, driving anger and traffic violations. Dahlen, Martin, Ragan and Kuhlman (2004a) also found boredom as a significant determinant of crash-related conditions, aggressive and risky driving among drivers.

Studying boredom among young drivers, Machin and Sankey (2008) discovered that young and less-experienced drivers get bored more easily. Young drivers were adding to their risk by flouting safety margins by over-speeding and making a variety of driving maneuvers to avoid boredom. Another study on a sample of 1550 drivers, aged between 17 to 65 years, fairly concluded that young drivers who are less conscientious and low on driving enthusiasm, are more likely to pose high threat to road safety because of driver boredom. On the contrary, those
who are more enthusiastic about driving seem less likely to suffer driver boredom due to their being more engaged in the task of driving Heslop (2014).

Boredom proneness was found as a significant determinant of unsafe driving among youngsters in a study done by Schroeter, Oxtoby, and Johnson (2014). This study discussed the possibilities of introducing futuristic automotive design elements and accessories to enhance driver’s experience and more specifically, combat the problem of boredom specifically among young drivers.

**Unsafe driving and sensation-seeking**

Sensation-seeking is another psychological variable quite researched in the realm of driving context (Jonah, 1997). In a driving context, it manifests itself in diverse forms like speeding, risky maneuvering of the vehicle, reckless driving etc. Literature reviews (Beirness, 1993; Jonah, 1997) and empirical studies (Dahlen et al., 2005) recognized three psychological constructs of particular interest as predictors of risky driving behaviour, namely sensation-seeking besides conscientiousness, and anger or aggression/hostility.

Research studies by Arnett et al. (1997) and Jessor (1987) found sensation-seeking disposition, in particular, as part of a global risk-taking behaviour pattern as an important contributor to risky driving. It was Lecoeur et al. (1997) who also discovered sensation-seeking to be significantly associated with involvement in road crashes. As per this research, if a driver engages in risky driving which elicits a 'high' or a state of euphoria, it is likely that the driver would repeat this same behaviour in order to enjoy the sensation and similar elation.

Jonah (1997) reviewed studies determining the association between sensation-seeking and risky driving. Among risky driving behaviours associated with sensation-seeking were speeding, unsafe overtaking, and a short following distance. Rimmö and Åberg (1999) in their research on 700 young adult Swedish drivers aged between 18–27 years found significant association of sensation-seeking in relation to unsafe driving practices. Sensation-seeking was also found associated with aberrant driving behaviour.

Jonah, Thiessen and Au-Yeung (2001) did a comparative analysis among drivers who were categorized as high and low sensation-seekers. The results found that drivers who scored high on sensation-seeking were more likely to overspeed, drive without wearing seat belts, drink
frequently and drive after drinking, or overspeed on wet roads. Such drivers perceived a low risk of detection for impaired driving.

Several other research studies (Beirness, 1995; Dahlen et al., 2005; Dahlen & White, 2006; Fernandes, Job, & Hatfield, 2007; Iversen & Rundmo, 2002; Roth, Hammelstein, & Brähler, 2007; Sumer, 2003; Schwebel et al., 2006; Ulleberg & Rundmo, 2002; Waylen & McKenna, 2008) also reveal that sensation-seeking is the most consistent personality trait and is positively related to risky driving practices. Both the genders and young male drivers, considered the most likely group to seek high sensation, posed a great threat to road safety.

Oltedal and Rundmo (2006) in a study done among 2,605 Norweigan drivers revealed that drivers who scored high on sensation-seeking, normlessness and driving anger, tend to over speed, indulge in unsafe and risky driving behaviour, ignore and flout traffic rules frequently, and get involved in near-accidents and crashes more than those drivers who were low on aforementioned variables. Richer and Bergeron (2012), also added that drivers who indulge in unsafe driving are more likely to be involved in intense sensations and are likely to be impulsive.

The positive association of sensation-seeking with drunken driving is also well established (Arnett, 1990; Donovan, Marlatt, & Salzberg, 1983; Donovan, Umlauf, & Salzberg, 1990; Jonah, 1997; González-Iglesias, Gómez-Fraguela, & Luengo, 2014).

In one of the recent studies, the prevalence of pro-social aggressive driving among undergraduate students was assessed. The results found that sensation-seeking was significantly associated with aggressive driving, however pro-social driving was associated with few reported traffic accidents and violations (Harris, Houston, Vazquez, Smither, Harms, Dahlke, & Sachau, 2014).

Unsafe driving and impulsiveness

Impulsiveness reflects a tendency to act on a whim; a diminished ability to delay gratification (Petry, 2001), low inhibitory control and restlessness (Barratt, 1993). In a driving context, this tendency might lead to unsafe driving due to errors and lapses while driving. Impulsiveness has been found as another reason for risk-taking behaviour among young drivers (Berdoulat, Vavassori, & Sastre, 2013; Dahlen et al. 2005; Moore & Rosenthal, 1993; Thompson, Molina, Pelham, & Gnagy, 2007; Whiteside & Lynam, 2001).
Schuman, Pelz, Ehrlich, and Selzer (1967) in his research observed that accident frequency and traffic violations are related to impulsiveness which is considered as another key component of risk-taking behaviour. There was a lack of self-perceived capability to process information while driving, and to be able to react in critical situations. This tendency was noted to be higher among risk-denying drivers (Dickman, 1993). Risk-taking behaviour has been found prominent among individuals engaged in sensation-seeking and impulsive decision-making (Donohew et al., 2000).

In a study by Loo (1978), primary personality factors including impulsiveness were studied in perception of traffic signs and were found to play a significant role in driver violations and accidents. Stanford et al. (1996) conducted a study among high-school and college students, to demonstrate relationship of impulsiveness with various risk-taking behaviours. The findings revealed that individuals who rated high on impulsiveness are involved in risk-taking behaviour at a higher rate than low impulsive subjects increasing the vulnerability of personal injury and a potential injury to others.

Araújo, Mall oy-Diniz and Rocha (2009) published a biographical review of archived online database from 1966-2006, and researchers discovered link between impulsiveness and risky driving behaviour, viz, “run for thrill”, and “traffic violations”, though review on impulsiveness and accident proneness was not conclusive.

Berdoulat, Vavassori and Sastre (2013) in their study to investigate the three predictors i.e. driving anger, impulsiveness and aggressiveness, found that these three psychological variables significantly predicted aggressive behaviour and transgressive driving.

Xu, Yaoshan, Yongjuan, and Jiang (2014) in their research to explore the effects of situational variables and impulsiveness on drivers’ intentions to violate traffic rules studied the novice, less-experienced and experienced drivers in China. The findings revealed that one's age and driving experience played a significant role.

The Inter-correlations amongst different variables was also reviewed. As relationship between driving anger, vengeance, boredom proneness, sensation-seeking and impulsiveness with regard to one another were studied by limited researchers especially in a driving context, few studies on correlation among them could be reviewed with hardly any research to cite between vengeance with sensation-seeking or impulsiveness.
Driving anger and vengeance

Various researchers have studied correlation amongst different psychological variables and their impact on unsafe driving. In this context, Wiesenthal et al. (2000) also observed significant positive correlation between vengeance and elevated driver aggression.

In a study done in a naturalistic setting found that hostile bumper stickers on vehicles conveying vengeance (e.g. “Don’t Get Mad, Get Even”) were found to elicit anger and aggressive behaviour from other drivers (Turner, Layton, & Simons, 1975). Further, anger in a driving context was found to significantly impact one's emotional arousal influencing one's perception and performance. Skewed perception in a driving scenario have often been found leading to "attribution error" whereby other road users, unintentional error on roads are misinterpreted as deliberate, leading to vengeance (Ellison-Potter, Bell, & Deffenbacher, 2001). Adding to this, several researchers have reported that drivers with vengeful attitude are likely to experience anger, irrational thoughts, and psychological distress and are more likely to perceive and interpret minor infractions as purposeful and react in an aggressive and violent manner on roads (Daly & Wilson, 1988; Deffenbacher et al., 1994; Ohbuchi & Kambara, 1985; Stuckless, Ford, & Vitelli, 1995; Stuckless & Goranson, 1992).

Habitual offenders were also found as experiencing anger while driving which was significantly associated with vengeful aggression (Stuckless, Ford, & Vitelli, 1995). Asserting link between anger and vengeance, Oldenquist (1988), observed that in any social setting, if one member disobeys a rule, other members become angry demanding swift punishment for the perceived offender. Thus, vengeance is resorted in order to maintain the overall normative value of the group. Similarly, in a driving context, if one road user fails to obey and follow traffic rules, anger is more likely to be followed with vengeance in order to punish the offending driver for the perceived injustice committed.

The instances of road rage and drivers indulging in violence proved significant correlation between driving anger and vengeance (Hennessy & Wiesenthal, 2001), and even later studies proved this tendency (Deffenbacher et al., 2001; Deffenbacher et al., 2002; Deffenbacher et al., 2003; Lajunen & Parker, 2001).

Hennessy and Wiesenthal (2002) observed that drivers holding a vengeful attitude were also more likely to experience anger and irrational thoughts; and aggressive drivers with elevated
levels of vengeance indulged in violence. Consequently, aggression and vengeance were two variables considered as predictors for the violent driving behaviour.

Driving related anger and aggression have much in common (Neighbors, Vietor, & Knee, 2002) with traits of anger and aggressive behaviour while driving found to be significantly associated with one another (Arnett, Offer, & Fine, 1997; Deffenbacher, Huff, Lynch, Oetting, & Salvatore, 2000; Deffenbacher, Richards, Filetti, & Lynch, 2005; Lajunen & Parker, 2001) and relationship between experiencing anger and expression of aggression as quite strong (Jovanović, Lipovac, Stanojević, & Stanojević, 2011). This is probably the reason why driving vengeance questionnaire is also used as one of the aggressive driving measure (Van Rooy, Rotton, & Burns, 2006). Aggressive behaviour while driving therefore is found to form an antecedent of vengeful thoughts, feelings and actions in a driving scenario, hence, affirming a strong link between driving anger and vengeance.

When provoked in a driving scenario it was observed that drivers were more likely to report anger arousal and hostile thoughts invariably resulting in vengeance (Dahlen, White, & Robison, 2004). A study on Polish drivers confirmed significant relationship of vengeance to driving anger and aggression on roads, yet found older generation having lower levels of vengeance than their younger counterparts (Przepiorka, Blachnio & Wiesenthal, 2014).

In one of the study on driving aggression amongst offenders and non-offenders, trait levels of anger and aggression, were found to be predictors of driving violence (Smith, Waterman, & Ward, 2006). Anger and resentful mood were also found to be positively correlated with violence risk (Apter, Plutchik, & Praag, 1993).

Elshout, Nelissen and Beest (2014), however, considered vengeance and anger as significantly correlated but also quite distinct from one another. They believed that earlier studies failed to differentiate the driver's reaction i.e. whether these were anger motivated or vengeance driven. Autobiographical recalls were examined to study the difference between vengeful and anger driven responses. The findings revealed that vengeful responses elicited more intense negative self-conscious emotions unlike those driven by anger which were motivated more by intra-personal or self-centric goals.
Driving anger and boredom proneness

Morrant (1984), Lantz (1988), McHolland (1988) in their studies found that boredom is a manifestation of inner anger. The role of boredom proneness in anger and aggression was also studied as an extension of the work of Rupp and Vodanovich (1997). The results revealed that individuals, who were high on boredom, reported more aggression, trait anger, dysfunctional anger expression, deficits in anger control than those who were low on boredom propensity. It was also observed that participants who tend to get bored easily displayed deficits in one’s ability to prevent the outward expression of anger and one’s use of internal controls to manage one’s anger. The results on correlation analysis revealed positive correlation between trait anger and boredom proneness. Further they also confirmed that boredom experienced due to a lack of external stimulation predicted anger expression, anger control, and aggression. However, it was further suggested that the positive correlation of anger and aggression with boredom proneness could be due to the increased impulsiveness and/or sensation-seeking among individuals prone to boredom (Dahlen et al., 2004a).

Driving anger and boredom proneness were studied where boredom was assessed as lack of internal or external stimulation and it was found that driving anger was positively correlated with boredom due to lack of external stimulation (i.e. situational boredom) while it was not correlated with boredom due to lack of internal stimulation (i.e. dispositional boredom) (Dahlen et al., 2005).

Studies on relationship of general anger with regard to boredom proneness were also reviewed as there were limited studies between anger and boredom in a driving context.

Several researchers have confirmed significant positive correlation between boredom proneness and negative affect such as anger, anxiety, hopelessness and life dissatisfaction (Ahmed, 1990; Farmer & Sundberg, 1986; Rupp & Vodanovich, 1997; Sommers & Vodanovich, 2000; Vodanovich et al., 1991; Watt & Davis, 1991). Strong relationships of external stimulation factor of boredom proneness (BP-ext) and anger was also established by another study (Bruursema, Kessler, & Spector, 2011).

Therefore, the review presents a mixed picture whereby boredom experienced due to lack of external stimulation seems to be a useful construct for determining positive correlation with anger while another aspect of boredom i.e. boredom experienced due to lack of internal
stimulation is negatively correlated while the total boredom score as not significantly correlated with anger.

**Driving anger and sensation-seeking**

Sensation-seeking and driving anger have often been studied together in context of risky, dangerous and aggressive driving. Personality factors which have often been found to be significantly associated with risky driving are locus of control, driver anger, sensation seeking and normlessness (Burns & Wilde, 1995; Deffenbacher, Oetting, & Lynch, 1994; Montag & Comrey, 1987). Sensation-seekers who are found to score high on driving anger also tend to report more traffic rule violations (Iversen & Rundmo, 2002). While, sensation-seeking and driving anger together have been successful in their positive correlation with unsafe driving though in relation to one another they have often failed to show significant correlation. Although, sensation-seeking when assessed with trait anger or anger alone (not specifically in a driving context) has revealed positive correlation most of the times (Dahlen, 2004a; Schwebel et al., 2006). Following are certain studies which shed light on relationship of sensation-seeking with driving anger.

In a study by Dahlen et al. (2004a), on relationship of sensation-seeking with anger and aggression, it was found to be positively correlated with some measures of anger i.e. trait anger, anger expression in and out but not all the scales of anger, this study though did not take into account driving anger. In another study by Dahlen et al. (2005) on prediction of unsafe driving by different correlates, sensation-seeking and driving anger were found to be significant predictors of unsafe driving but was not significantly correlated with one another. Further, it was also observed that sensation-seeking added significantly to the prediction of risky and aggressive driving, independent of driving anger.

A study on driving anger, sensation-seeking, and the Big Five personality factors in predicting unsafe driving behaviours were assessed, and the results supported a positive correlation of all these variables with unsafe driving, but correlation between driving anger and sensation-seeking were found to be non-significant (Dahlen & White, 2006).

In another study by Lonczak, Neighbors, & Donovan, (2007), driving anger and sensation-seeking were found to be positively correlated among both male and female drivers. It was further observed that individuals with particular personality characteristics of high
sensation-seeking, stress and negative affect, higher drinking frequency and tobacco use, were more likely to be angry while driving with more likelihood of experiencing negative consequences of their driving.

**Driving anger and impulsiveness**

Impulsiveness studied in context with driving anger and aggression have found mixed results where relationship among them is not very clear. Researchers have often found a weaker relationship than was expected (Dahlen et al., 2005). Studies on driving anger and impulsiveness have revealed varied results in contrast to the relationship between general anger and impulsiveness where more concrete results of positive relationship was found.

In studies by Deffenbacher et al. (2000) and Deffenbacher et al. (2003), the findings revealed that driving anger was positively related to trait anger, impulsiveness, and trait anxiety. It was also found that individuals who score high on driving anger indulge more in aggressive and risky driving and some crash-related outcomes than those who score low on driving anger.

Studies on impulsiveness and anger per se have found a strong link between negative affective states and internally directed impulsive behaviours (such as self-harm). It has also been observed that people who engage in internally directed impulsive behaviours are more likely to express anger frequently, and without any specific provocation (Milligan & Waller, 2001).

Dahlen et al. (2004a) in his study on the role of boredom proneness in anger and aggression also assessed the impact of impulsiveness and sensation-seeking. The results revealed that impulsiveness predicted anger (on the Aggression Questionnaire), outward anger expression, and its control. The aspect of driving anger was not explored in this study but apparent role of boredom proneness in anger and aggression as a function of increased impulsiveness was found.

Dahlen et al. (2005) also confirmed positive correlation between impulsiveness and driving anger in their study on potential contribution of sensation-seeking, impulsiveness, and boredom proneness to driving anger in predicting aggressive and risky driving. While in another study on driving aggression, impulsiveness was found to be moderately correlated with anger and aggression (Smith et al., 2006).

Positive relationship between driving anger and sensation-seeking have also been supported by several studies done on health risk behaviour viz. on eating disorders (Engel et al., 2007; Staicu, & Cuțov, 2010).
**Vengeance and boredom proneness**

There has been dearth of literature on correlation between vengeance and boredom, more specifically in driving context. Hence, other studies which were found to be closely associated with the construct of vengeance were explored in context to boredom. The article "On Vengeance: The Desire to Get Even", Socarides (1996), opined that vengeance and boredom are in contradiction to one another. He based his explanation of these two constructs on the psychoanalytical theory. He asserted that in vengeance, the conscious super-ego guilt is absent especially for those instinctual aims such as aggression. This is in contrast to states of boredom (Greenson, 1953) in which instinctual aims and objects are repressed because of guilt. This viewpoint reflects that vengeance and boredom proneness are contradictory as far as their root causes are concerned.

Since vengeance is also associated with 'hostility' which refers to the unresolved anger augmented with a desire to hurt, punish or gain vengeance, one such study in relation to boredom was found. The results revealed that boredom proneness was not significantly correlated with the hostility measure. It was further suggested that boredom is a less aggressive construct and hence not related to hostility (Knust & Stewart, 2002). Therefore, this reflects the non-significant relation of vengeance with boredom proneness.

**Vengeance and Sensation-seeking**

Vengeance and sensation-seeking are the two tendencies identified among risk-prone individuals and have often been studied in tandem with regard to unsafe driving, though they have hardly been studied in relation to one another. As such, vengeance was not directly studied though research on related concepts of vengeance such as hostility and violence were reviewed.

Donovan and Marlatt (1982), identified some of the items from Parry's measure (1968) and certain sub-scales of Buss-Durkee hostility measure (Buss & Durkee, 1957) and formed an aggressive sub-type assessing the risk enhancing traits among individuals. In context to this, certain clusters of young drivers were identified which made them risk averse such as high sensation-seekers, ones who were more hostile or lacked impulse control (Deery & Fildes, 1999). Another study on 152 undergraduate students endorsed that aggressive driving was related to personality variables of hostility and sensation-seeking (Harris & Houston, 2010).
Vengeance and impulsiveness

Studies on relationship between vengeance and impulsiveness in a driving context is quite limited with one of the study findings no significant relationship hence, in one such study, impulsiveness was not found as a predictor of driving violence, though it was associated closely with measures of anger and aggression. The measure to gauge impulsiveness used in this study was also behavioral impulsiveness rather than impulsive aggression per se, the latter, otherwise, would shown some association with vengeance (Smith et al., 2006).

In certain studies on criminal behaviour, vengeance as assessed through violence and impulsiveness have found to coexist as personality factors (Felson & Osgood, 2008; Wilson, 1981), but the same might or might not hold true for the general population.

Fox and Levin (1998) observed that vengeance is cited as one of the most common motivational factor behind a crime and it was further supported by another study where impulsiveness, insensitivity, risk-taking were all the traits strongly associated with evolutionary assumptions of violence (Van Geem, 2009). DeGue, DiLillo, & Scalora (2010) in their study on perpetrators of violence demonstrated an impulsive disregard to societal norms and mores without bothering much about potential consequences of their acts. Moreover, vengeance and resentment were two critical factors differentiating offenders who indulged in lesser or greater acts of violence.

Boredom proneness and sensation-seeking

Boredom proneness is a construct representing an aversion to monotonous and invariant situations, with people experiencing restlessness on being exposed to monotonous situations (Zuckerman, 1979). Zuckerman, Eysenck, and Eysenck (1978) constructed a tool to measure sensation-seeking and termed it as the 'Sensation-seeking scale' Form-V (SSS-V) which was an upgradation to the earlier version of scale i.e. SSS-IV (Zuckerman, 1971). Even after so many years, the SSS-V scale is still valid, reliable and is used widely (Zuckerman, 2007). Boredom proneness is one of the components of sensation-seeking along with its three other sub-scales, referred to as four different modes of sensation-seeking (Knust & Stewart, 2002). Hence, as boredom proneness is one of the key factor of sensation-seeking, the positive correlation between them is quite evident.
Positive relationship between boredom proneness and sensation-seeking has also been validated by several studies (Berlyne, 1960; Bryant & Zillman, 1984; Dyer-Smith, 1992; Heslop et al., 2010; Kass & Vodanovich, 1990a; London et al., 1972; Molstad, 1986; Mikulas & Vodanovich, 1993; Roberti, 2004; Zuckerman, 1971; Zuckerman, Bone, Neary, Mangelsdorff, & Brustman, 1972; Zuckerman et al., 1978).

However, in a contradictory study by Dahlen et al. (2004a), where different measure to assess boredom proneness was used (i.e. Arnett inventory of sensation-seeking), the total score of boredom proneness was not found as significantly correlated with sensation-seeking. In this study, boredom was assessed through its two components as well i.e. boredom aroused due to lack of internal or external stimulation and the results found sensation-seeking to be positively correlated with boredom proneness external stimulation while it was negatively correlated with boredom proneness internal stimulation. The same results of sensation-seeking with regard to the sub-scales of boredom proneness were also found by another study by Dahlen et al. (2005).

Signifying a close relationship between sensation-seeking and boredom proneness, Zuckerman in his recent book on sensation-seeking (Zuckerman, 2014) propounded that when an individual is mentally fatigued or bored, a novel event or activity is pleasurable (i.e. indulging in sensation-seeking activity) as it reduces one's state of boredom (p. 39).

Boredom proneness and impulsiveness

Ascertaining the relationship between boredom proneness and impulsiveness, Depue and Collins (1999) observe, "impulsivity comprises a heterogeneous cluster of lower-order traits that includes terms such as impulsivity, sensation-seeking, risk-taking, novelty seeking, boldness, adventuresomeness, boredom susceptibility, unreliability, and unorderliness" (p. 495). Thus signifying a close positive relationship between these two variables.

Watt and Vodanovich (1992) in their study on relationship between boredom proneness and impulsiveness found a significant positive correlation of 0.56 between these two variables. They also asserted that although boredom signifies amotivating, lacking autonomous orientation and impulsiveness reflecting restlessness and distractability, these constructs are conceptually related. A study by Leong and Schneller (1993) examined the relationships between cognitive and personality variables related to boredom proneness. For this, a sample of undergraduate students in US were studied and the results identified certain ‘risk-factors’ related to boredom.
proneness, i.e. individuals who are highly dogmatic, less sociable, exhibit low levels of persistence, and experience problems with inhibitory control of impulses, are more prone to boredom.

Dahlen et al. (2004a) studied boredom proneness and impulsiveness, and found positive correlation with the total boredom proneness score and with its sub-scale of external boredom proneness, while it was not correlated with the other sub-scale i.e. internal boredom proneness. Individuals who are likely to experience boredom due to a lack of external stimulation were found to be more impulsive with an increased need for novelty and stimulation. This was also further supported by another study by Dahlen et al. (2005) where external boredom proneness was significantly correlated with impulsiveness while internal boredom proneness was not.

Boden (2009) in his study on boredom and impulsive behaviour found positive correlation between the two, with experience of boredom being linked to a wide range of impulsive and destructive behaviours like criminal activity, violence, compulsive gambling and sexual activity. It was also observed that individuals who engage in these maladaptive behaviours often share personality trait of boredom.

In a review on fifty years of Barratt Impulsiveness scale, impulsiveness was assessed with other related self-report measures. Boredom proneness evaluation found positive correlation with all the first and second order factors of impulsiveness except one i.e. second order factor of cognitive complexity (Stanford, Mathias, Dougherty, Lake, Anderson, & Patton, 2009).

Sensation-seeking and impulsiveness

Several researchers are of the viewpoint that sensation-seeking and impulsiveness are related personality traits (Buss and Plomin, 1975; Eysenck & Eysenck, 1977; Zuckerman, 1983; Zuckerman, Kuhlman, Joireman, Teta & Kraft, 1993) with Zuckerman claiming these two constructs as the biological foundations of a basic dimension of personality. Zuckerman et al. (1993) in his study probed the structural model of personality combined impulsiveness and sensation seeking into a single dimension of a personality scale. He concluded (1994) that "while [impulsivity is] not an equivalent or supra-ordinate of sensation-seeking, [it] is a highly related trait, particularly in its non-planning and risk-taking aspects" (p.96).

Zuckerman (1996) in his research on modification of sensation-seeking form V did some item revisions and included ‘Impulsive Sensation-seeking’ as one of the measures, signifying the
role of impulsiveness in sensation-seeking and assessing both these factors in juxtaposition. The sub-scale therefore, measured impulsiveness through lack of planning and a tendency to act impulsively, without prior reflection while sensation-seeking determining the general need for sensations and restlessness and preference for unexpected situations, change and novelty.

Jonah (1997) in his review and synthesis of literature on sensation-seeking and risky driving also observed that Zuckerman (1994) held sensation-seeking as a part of broader trait referred as “impulsive sensation seeking”. There were thus several attempts by other researchers who combined certain measures of impulsiveness and sensation-seeking together in order to develop a measure of risk-taking. In one such attempt, Johnson and White (1989) combined the scores on the Disinhibition and Experience-seeking sub-scales of SSS with subscales of the Jackson (1984) Personality Research Form (play, impulsivity, harm avoidance and cognitive structure) to form a risk taking/impulsive orientation measure. In another study, Wilson and Jonah (1988) observed that the thrill and adventure seeking sub-scale of sensation-seeking combined with an impulsiveness measure was a major predictor of risky driving (i.e. non-use of seat belts, speeding, aggressive driving, impaired driving). Thus, both sensation-seeking and impulsiveness measures have been used in a combined form to assess variety of health risk behaviour including risky driving.

Donohew, Zimmerman, Cupp, Novak, Colon, & Abell (2000) in their study on sensation-seeking, impulsiveness and their implications on risk-taking suggested that sensation-seeking and impulsive decision-making are complementary components of a decision-making process that may or may not be "rational". They further observed significant role of both these variables in terms of varied health risk behaviors including risky sexual behavior and alcohol use.

Individuals who score high on sensation-seeking scales are also more likely to be more impulsive, commit traffic violations, and are less likely to use their safety belts while driving Wilson (1990). Dahlen et al. (2004a) also confirmed positive correlation between sensation-seeking and impulsiveness in a study on college students, where these two variables were found to be responsible for risky-driving and crash-related situations. In another study by Dahlen et al. (2005) where multiple psychological variables were assessed in terms of unsafe driving found sensation-seeking and impulsiveness to be positively but weakly correlated with one another ($r = 0.25$).
Steinberg, Albert, Cauffman, Banich, Graham, & Woolard (2008) in their study on age differences in sensation-seeking and impulsiveness found that both these constructs develop along different timetables with different neural underpinnings. The development of sensation-seeking is more linked to pubertal maturation following a curvilinear pattern between 10 to 15 years of age, declining or remaining stable thereafter. On the other hand, impulsiveness can be viewed as following a linear pattern declining from 10 years of age onwards. Although these variables seems to have different developmental taxonomies yet they are closely related, since heightened risk-taking during middle adolescence is determined by a higher inclination to seek excitement coupled with relatively immature capacities for self-control.

**Unsafe driving**

Studies on unsafe driving with regard to differences among gender, between traffic offenders and non-offenders, and type of vehicle were reviewed. Since there is no one particular definition of unsafe driving, all the risky acts on roads ranging from aggressive driving, risky driving, dangerous driving, and leading to collisions and road crashes falls under the purview of unsafe driving and was thus included in the review of literature.

**Gender differences**

Majority of studies on unsafe driving have found male drivers indulging more in various forms of unsafe driving as compared to their female counterparts. Various reasons attributed to this are over-confidence in driving skills, low risk perception, portrayal of masculinity, etc.

Several researchers like Storie (1977) who observed driving styles of both the gender found that males are more likely to be involved in road accidents and traffic violations such as speeding, drinking and risk-taking than the females. Many other researchers (Aberg & Rimmo, 1998; Blockley & Hartley, 1995; Evans 1991; Lawton, Parker, Stradling, & Manstead, 1997; Reason et al., 1990) have revealed that men commit dangerous traffic violations and behave aggressively on the roads more frequently than women. Dahlen et al. (2005) pointed out that men reported more lifetime moving violations and gender was a definite predictor.

However there had been mixed results in several other studies on gender differences. Hauber (1980) in his observational study found no significant differences between men and women in terms of aggressive behaviour on roads which was measured through horn-honking.
Doob and Gross (1968) in their observational study used horn-honking as an indirect measure for aggression and found that males honked their horns three times more quickly than females when drivers in front did not move on a green traffic signal. Novaco (1989) in his research ruled out the existence of any gender differences as they found that ‘self-endangering’ and provocative behaviours are characteristic of both male and female drivers.

In so far as unsafe driving amongst young drivers is concerned, youth has been at risk because of inexperience of diverse road situations and conditions. Maycock et al., (1991) found that women were at lower risk of having an accident than males in all age groups, and the difference was greatest for young and inexperienced drivers. Researchers like Guppy (1993), Jonah et al. (1997); Stradling et al. (2000) revealed that younger drivers, particularly males are more likely to take risks and drive in a dangerous manner. Elander et al. (1993) observed that it seems that deviant driving styles among drivers were associated with being male and being young. Peck (1993) found that males behave in a riskier manner than females and these risk-taking types of behaviour tend to decrease with age. Bingham and Shope (2004) observed that rate of high risk driving among the teen male driver/male passenger condition was about double that of general population.

Are male drivers more prone to aggression and resort to unsafe driving? DePasquale, Geller, Clarke, and Littleton (2001) discovered a significant correlation between self-reported aggression scores and gender, which revealed that males were more prone to aggressive driving than females. Hennessy and Wiesenthal (2001) reported that females tend to use milder forms of aggressive behaviour (example horn honking and sworeing) but as frequently as males. Males, on the other hand, were found getting engaged frequently in using violent forms of aggression such as verbal and physical confrontations than females. Hennessy and Wiesenthal (2002) conducted a research on 192 drivers and concluded that male and female drivers reported similar levels of mild driver aggression, supporting the notion that context is important in arousing aggression among females.

The masculinity factor was considered in unsafe driving behaviour amongst men. Krahe (2002) observed that macho personality in men (as measured by Hyper-Masculinity Inventory) has been found to be positively correlated with higher driving aggression, whereas feminity in females is associated with lower driving aggression (Krahe, 2005). Deffenbacher et al. (2003) in their study ruled out the gender effect and laid more emphasis on the context. They cautioned
against gender stereotypes saying that ‘gender’ has less utility than dispositional anger when predicting aggression as young adults.

Gender differences in risky driving have been studied extensively. Dula and Ballard (2006) studied 119 college students and observed that males significantly reported more risky driving than females but both showed similar levels of dangerous driving and negative emotions. Males scored higher than females on risky driving, aggression-hostility, drug use and gambling risk (Zuckerman & Kuhlman, 2000). Begg and Langley (2001) in their research observed that risky driving was predominantly a male activity. Patil, Shope, Raghunathan, and Bingham (2006) found that for men and women, greater risk-taking propensity, physical/verbal hostility, aggression, and tolerance of deviance were significant predictors of a competitive attitude towards driving, risk-taking driving, high-risk driving, driving aggression, and drinking and driving.

Vanlaar, Simpson and Robertson (2008) did a study to understand the genesis of concern of unsafe driving behaviour. Data was collected through telephonic surveys in Canada and it was found that perceived risk and perceived level of concern for others was a major factor determining unsafe driving.

**Group Differences**

Studies on group differences (i.e. traffic offenders, non-offenders and two-wheeler, four-wheeler drivers) on unsafe driving were also reviewed and as expected, traffic offenders were found to score high on unsafe driving than the non-offenders.

In a study by Donovan and Marlatt (1982) among traffic offenders, the sub-types of driving, i.e. attitudinal, personality, and hostility measures were delineated. Traffic offenders were found as having high levels of risk-enhancing traits and levels of driving-related aggression, competitive speed, sensation-seeking, and irritability, verbal and indirect hostility.

Farrow (1987) conducted a study among adolescent offenders and non-offenders with their propensity to get involved in unsafe driving. The offenders were more likely to drink before driving, associate alcohol with social events and dating, drive fast to combat stress, and were less likely to inform parents if caught driving while intoxicated.

Smith, Waterman, and Ward (2006) studied driving aggression, anger, impulsiveness and its perception among convicted offenders and non-offenders. It was found that acts of driving...
aggression were perceived as less severe among offenders than non-offenders. Assault was rated more severely by non-offenders, and aggressive behaviour was found to be a significant predictor for offenders. It was observed that offenders differed on their perceptions of aggressive behaviour, with more likely to commit acts perceived as violent by non-offenders.

Wundersitz and Bums (2006) did a comparative analysis between traffic offenders and non-offenders in terms of personality characteristics and attitudes of Australian young drivers. It was observed that higher levels of driving-related aggression were reported among young traffic offenders who reported driving to reduce tension than the non-offenders. The traffic offenders had less safety-oriented attitudes towards road safety than the non-offenders.

In a follow-up study by Summala, Rajalin and Radun (2014), traffic offenders were compared with the non-offenders in terms of their risky driving in 1987 and were again contacted after twenty-four years. The data of recorded offences and accidents involved were retrieved from national driver records and accident statistics. The findings revealed that the traffic offenders still differed from the control sample as they did a century ago. The results show that individual differences in driver behaviour persist for decades, perhaps for life. However, interestingly the effect of offence on driver behaviour seemed to be moderated by occupation which explained the lower mortality among the offenders during this 24-year follow-up.

The prevalence of unsafe driving among two-wheeler and four-wheeler drivers could be gauged only from the road crash statistics as, due to paucity of literature, not much inference could be drawn as far as their driving behaviour was concerned.

Uthkarsh, Suryanarayana, Gautham, Shivraj, Murthy and Pruthvish (2012) conducted a study on injury cases admitted to a tertiary level hospital in south India over six months and observed 73.6% of road traffic accident cases involved two-wheeler users. Riding without helmets was the major cause of injury as 63.5% of two-wheeler users did not use helmets while driving or when riding on the pillion. However, among four-wheeled vehicles, 57% did not use seat belts while driving and road traffic injuries were found to be the most common of all other injuries reported.

Yıldırım-Yenier, Vingilis, Wiesenthal, Mann and Seeley (2015) studied car drivers and racing enthusiasts to investigate the high-risk behaviours of street racing and stunt driving and found positive attitude toward high-risk driving, and their personality variables such as thrill-seeking made them indulge in racing and stunts.
Driving anger

Studies on driving anger with regard to differences among gender, between traffic offenders and non-offenders, and two-wheeler and four-wheeler drivers, were reviewed. Among gender differences, the review gives a mixed picture where both male and female drivers were found equally prone to experience anger while driving. Where some of the research studies support driving anger being higher among males, others assert that females are higher while there are still other researchers who have not found significant difference among men and women on driving anger.

Several studies have reported males to be higher on driving anger than females. Guppy (1993), Joint (1995), Deffenbacher et al. (2000) discovered that males tended to report higher levels of anger as compared to females which can be associated with aggressive and risky driving. Another study on gender differences among male and female offenders revealed male offenders to be higher than female offender on anger (OBrien, Tay & Watson, 2004).

Whereas, there are some studies which have revealed females to be higher on driving anger than their male counterparts. Assessment of driving anger among Spanish drivers by Sullman et al. (2007) revealed females to be higher on overall anger in support with a study done by Lajunen and Parker (2001) as well. The female drivers reported high anger on overall anger as well as on some sub-scales or components of driving anger such as discourtesy, traffic obstructions and illegal driving.

A study by Deffenbacher et al. (1994) found gender differences in the factors provoking anger among drivers. Female drivers were found to be more angered by illegal driving of other drivers and by traffic obstructions whereas male drivers were more angered by nearby police presence and by others' slow driving. In a study by González-Iglesias, Gómez-Fraguela and Luengo-Martín (2012) on a sample of five hundred and forty one drivers to explore the contribution of anger related variables in terms of explaining traffic rule violations in both male and female drivers. The findings revealed that males reported greater number of fines and accidents, were more prone of violating traffic regulations, and were found to be angrier at police presence than the females. However, women were found to be angrier at traffic obstructions but on the whole exhibited more adaptive attitude in terms of anger expression while driving.

There were some other studies too who did not report significant difference among males and females on driving anger. Wickens, Mann, Stoduto, Butters, Ialomiteanu and Smart (2012)
in their research on driving anger and aggression did not observe much gender differences. They asserted that on the whole the results on gender differences have not been very definitive. One such study found no gender differences in the likelihood of reporting anger nor in the likelihood of driving more than 10 mph over the speed limit while in an angry mood (Arnett et al., 1997). Male and female drivers have not been found to differ in terms of overall level of anger (Deffenbacher et al., 1994, 2003, 2004; Lajunen et al., 1998; Lonczak, Neighbors, & Donovan, 2007; Vinayak & Assi, 2011). However, some researchers suggest gender differences with regard to certain anger provoking behaviour (Deffenbacher et al., 1994) although these gender differences have also not been found as consistent (Björklund, 2008; Deffenbacher et al., 2000; Lonczak et al., 2007).

**Group differences**

Group differences in terms of differences on driving anger between traffic offenders and non-offenders and among two- and four-wheeler drivers was also reviewed.

Raval, Raval, and Becker (2012) in their exploratory study on Indian adolescent male offenders serving their punishment in pre-sentencing institute were interviewed. Their beliefs concerning causes, behavioural responses to, one’s own anger, and family patterns of anger expression were explored. The results revealed that offenders agreed to the social inappropriateness of anger considering it bad to express anger while they also acknowledged their indulgence in aggressive behaviour as a common response to anger.

A study on comparison between two-wheeler and four-wheeler driver in terms of driving anger could not be drawn due to dearth of literature though study among four-wheeler drivers revealed that a four-wheeled vehicle provides personal space and room for anonymity which has been found to be associated with increased anger and aggression (Potter et al., 1995; Ellison-Potter et al., 2001).

Another study among commercial drivers of different type of public transport vehicles in Indore (India) found that the driving anger did not vary significantly among the different vehicles assessed (Dixit et al., 2011).

Smith et al. (2006) studied the reactions of drivers with regard to the other road user being anonymous, and found that the drivers reacted with more anger towards other driver who was anonymous. It was also observed that as a four-wheeled vehicle provides the added
advantage of anonymity than a two-wheeled vehicle, the drivers driving a four-wheeler are expected to be higher on anger, and are also more likely to be recipient of anger from other drivers.

Vengeance

Studies on vengeance with regard to gender differences, between traffic offenders and non-offenders, and type of vehicle driven were referred. Vengeance in a driving context has been studied through various forms of aggression ranging from mild driver aggression to driver violence. In terms of gender differences, the review gives a mixed picture as both male and female drivers have been found to indulge in various forms of vengeful acts.

Gender differences

Eagly and Steffen (1986) in their meta-analytic review on gender and aggressive behaviour found that females were lower on vengeance than males due to the self-protecting mechanism. Females were found to anticipate future actions and consequences better than males therefore avoided any action that might elicit angry reaction from the other driver.

However, in other studies Hennessy and Wiesenthal (1999, 2001, 2002), McGarva and Steiner (2000) found that both male and female drivers are likely to demonstrate mild aggression equally. Male drivers were found to be more prone of exhibiting vengeance while driving and to respond with extreme aggression and violence to perceived infractions from other drivers. On similar lines, a study by Deffenbacher, Petrilli, Lynch, Oetting and Swaim (2003) observed that males tend to report more frequent thoughts of revenge and physical aggression than females.

Yagil (2001) studied the role of attributions which effect aggressive reactions to another person’s provocative behaviour. For this, 150 male drivers were observed in an on-road scenario when exposed to different frustrating driving situations caused by another driver who could be either male or a female. It was found that hostile attributions were directed more towards the males than females.

In a study by Forbes, Jobe, White, Bloesch and Adams-Curtis (2005), college going males and females were studied in terms of perceptions of violence following a betrayal by a romantic partner. The results found that regardless of the type of betrayal or the gender of the
betrayed person, men were found to be higher on seeking their justification for hitting or getting even than the women.

Hennessy and Wiesenthal (2005) in their study on drivers from Toronto, Canada, with at least five years of driving experience found that driver violence was predicted by the three-way interaction of vengeance, violations and gender. The findings revealed that the violence increased in male drivers with a vengeful attitude, especially in combination with higher levels of violations.

In a study by Sawada and Hayama (2012) on dispositional vengeance and anger among Japanese undergraduates found no gender effect on vengeance reflecting no significant difference between males and females on vengeful thoughts and feelings.

**Group differences**

Group differences in terms of traffic offenders and non-offenders and two-wheeler, four-wheeler drivers were reviewed. Study specifically among traffic offenders could not be traced. Therefore as vengeance is regarded to be one of the characteristic feature among general offenders (Murray, Thomson, Cooke, & Charles, 2013; Zevitz, & Farkas, 2004), the causal factor of this in one of the study enlisted was probed. Among two-wheeler and four-wheeler drivers, the concept of vengeance was traced to the feeling of vulnerability felt by the two-wheeler drivers as discussed below.

In one of the studies, Sanyal, Chatterjee, Dasgupta and Chatterjee (2012) explored the causal factor behind vengeance among offenders as compared to their non-offender counterparts and found that the offending drivers have significantly impaired controllability awareness. The impaired controllability awareness reflects that either these drivers are unaware of or are unable to distinguish between those aspects of situations which are controllable and those which are not. They are also more likely to appraise environmental demands as threatening, rather than challenging which also justifies the fact as to why they retaliate in extreme form of aggression in response to perceived injustice on roads.

Smith, Waterman, & Ward (2006) in their study on driving aggression among offenders and non-offenders found perceptual bias among offenders as one of the major reason behind aggressive acts on roads. The offenders viewed intensity of violence as less serious, had low tolerance for relatively mundane traffic events and lacked inhibition which made them more
vulnerable towards aggression, violence and vengeance on roads as compared to their non-offender counterparts.

Banet and Bellet (2008) studied the risk awareness analysis among car drivers and motorcyclists and observed that motorcycles, considered themselves vulnerable as compared to car drivers. The motorcyclists also feared being spotted by the car drivers as it may cause car crash. Since this study does not assess vengeance among these two group of drivers, though it just shows vulnerability among motorcyclists, who if threatened might retaliate with vengeance.

**Boredom Proneness**

Studies on boredom proneness with regard to differences among gender, between traffic offenders and non-offenders, and two-wheeler and four-wheeler drivers were reviewed. Majority of studies have found males to be higher on boredom proneness than their female counterparts. The reason for the same could be the higher need of arousal, sensation-seeking and novelty-seeking among men. The following studies present an overview on research conducted on gender differences and boredom proneness.

**Gender differences**

Majority of studies on boredom proneness and gender differences have found males to be higher than females. This is also one of the reason for the high need of arousal among male drivers who experience boredom and consequently indulge in distracted driving (for example use of mobile phones while driving) (Hancock, Lesch, & Simmons, 2003; Holubowycz, & McLean, 1995; Stavrinos et al., 2013)

In a study by Sundberg, Latkin, Farmer and Saoud (1991) the comparisons of college students on boredom proneness in Australia, Hong Kong, Lebanon and the United States was conducted. The results revealed that males scored higher than females within all cultural groups but significantly so in the United States and Australia.

Forabosco and Ruch (1994), Amirfakhrnai, Taghinejad and Sadeghifar (2013) in their research also found men to be higher on boredom proneness than women. Vodanovich, Wallace, and Kass (2005) suggested that there is a lack of literature on gender and driver boredom but some studies have pointed out that males are more likely to suffer from boredom proneness, having high desire for seeking variety and their perceived inability to amuse themselves than
their female counterparts. Another study on similar line by McIntosh (2006) on undergraduates demonstrated statistically significant mean difference on boredom proneness as men scored significantly higher than the women.

On the other hand however, Dahlen et al. (2005) and Heslop et al. (2010) found that women get more bored, have higher reported cognitive failure, and have a great tendency to seek stimulation, control and social interaction in contrast to men, who are more enthusiastic for driving.

In line with majority of studies where men are found to be higher on boredom proneness than women, another study supported the same whereby a meta-analysis was conducted and the researchers found gender differences on boredom susceptibility ranging from small to medium but being relatively stable across time. The stable gender differences were attributed to males being higher on the tendency of avoiding repetitive activities than females (Cross, Cyrenne, & Brown, 2013).

Group differences

Boredom has been found as one of the major factors for indulgence of anti-social activities among offenders. Limited literature is available on boredom in a driving context with not much attention given to low arousal state (Heslop et al., 2010). However, studies among general offenders were reviewed which have established the role of boredom in anti-social activities.

Boredom has been found as a significant contributory factor to behaviour like violence, delinquency and crime (Brown & Davis, 1991). The prevalence of boredom among offenders had been found in several studies as compared to the non-offenders (Farrow, 1987; Richer & Bergeron, 2009; Snow & Wells-Parker, 1986).

Boredom was also found as one of the major causal factor for indulgence in anti-social activities such as gambling, excessive internet usage (Quayle, Vaughan, & Taylor, 2006; Williams & Hinton, 2006). In order to feel good and ward off boredom, offenders were frequently found to indulge in drugs (Howard & Zibert, 1990). Farnworth (1998) in his research among offenders found that the underlying reasons for their boredom was lack of engagement in productive occupations, such as education or work, and the predominance of time spent in passive leisure.
Newberry and Duncan (2001) explored the relationship of boredom and negative selves with juvenile delinquency. The results found that juveniles reported more tendencies to experience boredom and more negative perspective of life as compared to the control sample of adolescents.

A study among two-wheeler drivers in India (Michael et al., 2014) also demonstrated the role of boredom behind speeding and indulgence in unsafe driving. Boredom was also observed as one of the anticipated emotional states providing relief from monotony and a significant motive for speeding.

**Sensation-seeking**

Sensation-seeking tendency is one of the highly researched personality traits in context to risk-taking (Breivik, 1996; Parke, Griffiths, & Irwing, 2004; Zuckerman, 1971; Zuckerman & Kuhlman, 2000) specifically among young population. In this following section, an overview of studies on sensation-seeking with regard to differences among gender, between traffic offenders and non-offenders, and type of vehicle were reviewed.

**Gender differences**

Majority of studies have found males to be higher than females on sensation-seeking, validated by studies done worldwide with these differences remaining stable across time (Cross, Cyrenne, & Brown, 2013), following studies provides an overview on the studies on sensation-seeking and gender differences:

Men have been found to be higher on sensation-seeking than women (Amirfakhraei et al., 2013; Arnett, 1994; Franken, 1988; Forabosco & Ruch, 1994; Horvath & Zuckerman, 1993; Jackson & Wilson, 1993; Ulleberg & Rundmo, 2002; Zuckerman, 1979). While there are certain studies that do not support meaningful differences between men and women on sensation-seeking (Hansen & Breivik, 2001; Pufal-Struzik, 1999).

Daitzman, Zuckerman, Sammelwitz, and Ganjam (1978) conducted an early investigation into the relationship between sensation-seeking and risk-taking and levels of male testosterone and found positive correlation among them. Dabbs and Morris (1990), Bogaert and Fisher (1995), Gerra et al. (1999) also confirmed Daitzman’s findings that a positive correlation exists.
between sensation-seeking and testosterone levels, justifying the role of men in engagement of such behaviours.

A cross-cultural study was conducted by Zuckerman et al. (1978), comparing the factor structure of sensation-seeking scale among English and American sample. The results found that English and American males did not differ on the sensation-seeking, but American females scored higher than the English females. Males in both countries scored higher than females on the total sensation-seeking scores and on the Thrill and Adventure-Seeking and Disinhibition sub-scales. Distinct gender differences with strong decline with age were noticeable. Overall, males showed higher sensation-seeking scores than females.

In context to traffic violations and its relationship with sensation-seeking, a study was conducted by Horvath and Zuckerman (1993). The relationship between sensation-seeking and impulsiveness was assessed in purview of appraisal of risk and risky behaviour in several areas including crime, financial, social violations, sports, and risk of AIDS from sexual activity. The results found perceived peer behaviour and sensation-seeking to be strong predictors of risky behaviour, particularly in the areas of crime and social violations.

Beck, Thombs, Mahoney, and Fingar (1995) in their study on social context and sensation-seeking found the latter playing a significant role in alcohol impaired driving. This study also revealed that high intensity drinkers of both gender were more likely to drink in a context of social facilitation and score higher on the sensation-seeking sub-scale of disinhibition.

Zuckerman (1996) discovered that men engage in sensation-seeking activities far more frequently than women and that these tendencies are spread across a wide range of behaviours, including driving.

Research done by Rosenblitt, Soler, Johnson and Quadagno (2001), to explore the link between sensation-seeking and hormones among males and females was assessed. The relationship between sensation-seeking behaviours and two hormones, testosterone and cortisol, among male and female college students was explored. The results supported significant inverse relationship between cortisol and sensation-seeking in men, but not in women, even after adjustment for testosterone levels and age. The study further found support to the association between risky behaviour and a hormone other than testosterone. This study also examined the association between cortisol and sensation-seeking in women, and identified a possible effect of gender on the association between hormones and sensation-seeking behaviours.
Sensation-seeking among males and females was also assessed in context to nicotine, alcohol, and marijuana use (Martin, Kelly, Rayens, Brogli, Brenzel, Smith, & Omar, 2002). The findings of this study revealed sensation-seeking to be higher among males and females who reported nicotine and alcohol use while sensation-seeking was higher among males who indulged in marijuana usage.

A study to assess the relationship of impulsive sensation-seeking and gender in context to gambling activities was conducted. The results found main effect of gender on impulsive sensation-seeking with males being higher than the females (McDaniel & Zuckerman, 2003). Similar gender difference was also supported by a study among American college students (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993).

In one of the recent research on gender differences on sensation-seeking, a meta-analysis was conducted. The findings revealed that gender differences with regard to sensation-seeking have not declined over the past 35 years and the mean effect size for the sex difference in total SSS-V scores was moderate and stable across the time span of the study (1978–2012). It was further concluded that males and females still differ in their propensity of reporting sensation-seeking characteristics though it might vary with regard to certain sensation-seeking activities (Cross, Cyrenne, & Brown, 2013).

One of the studies (Smorti & Guarnieri, 2014) examined the relationships between supportive parental bond, sensation-seeking, and risky driving. The results supported parental influence as a mediating factor of risky driving among females while it had a negligible impact as a mediator on sensation-seeking tendency among males and consequent unsafe driving. Thus, good parenting and upbringing can play as a buffer for children against unsafe driving and sensation-seeking.

**Group differences**

Studies on group differences among traffic offenders and non-offenders and two- and four-wheeler drivers were also reviewed. Sensation-seeking was found as a potent factor differentiating traffic offenders from non-offenders, while no difference could be gauged in terms of drivers of two- or four-wheeler drivers.
Donovon and Marlatt (1982) conducted cluster analysis to identify group of drivers arrested for driving while intoxicated. The results revealed the most deviant cluster having the highest sensation-seeking scores.

A comparative study between first and multiple offenders of alcohol impaired drivers on measures of personality traits, drinking behaviour and problems, and driving behaviour and history (Donovan, Marlatt, & Salzberg, 1983), revealed multiple offenders to be significantly higher on hostility, sensation-seeking, psychopathic deviance, mania, and depression than first time offenders. Multiple offenders had significantly more non-traffic arrests, accidents, and traffic tickets than first time offenders and were also found to be significantly lower on emotional adjustment and assertiveness.

Donovon et al. (1985) did a comparative study between offenders who have been caught for driving while intoxicated with high risk drivers and participants from normal population. The results revealed traffic offenders and high-risk drivers to be higher on sensation-seeking than the control sample although there was not much difference on sensation-seeking among these two groups of drivers.

Little and Robinson (1989) did a research on convicted impaired drivers with their driving while intoxicated (DWI) recidivism being monitored for eight months. The findings revealed that high sensation-seekers were more likely to repeat the offence.

McMillen et al. (1991), McMillen, Adams, Wells-Parker, Pang, & Anderson, (1992) reported greater sensation-seeking scores for students who were caught for impaired driving behaviour than those who were not. Multiple traffic offenders were found to be relatively higher on sensation-seeking than the first time offender.

Wieczorek (1995) focusing on the psycho-social correlates of driving while impaired offenders who either had no crashes with those who were involved in several crashes. The results found no difference between these two groups on sensation-seeking.

Horswill and Helman (2003) in their study on behavioural comparison in terms of accident risk between motorcyclists and non-motorcyclist car drivers did not found difference on sensation-seeking although there was noticeable difference on hazard perception skills among these two groups of drivers.

Broughton, Fuller, Stradling, Gormley, Kinnear, O’dolan and Hannigan (2009) in their comparative study between car drivers and powered two-wheeled riders found a small sub-group
of older motorcyclists who were found to speed and were high on sensation-seeking (Horswill & Helman, 2003). This study however did not study the difference on sensation-seeking among these two different type of vehicle drivers.

A study on a sample of Ecuador drivers revealed sensation-seeking, risk-taking, violation of norms and interpersonal violations as strongest predictor for traffic violations (Serrano, Garces, & Rodriguez, 2013).

**Impulsiveness**

Impulsiveness is a non-unitary construct (Reynolds et al., 2006; Stoltenberg, Batien, & Birgenheir, 2008), which is likely to be composed of multiple varieties that may be independent. Several researchers from different areas such as personality (Carver, 2005), developmental psychopathology (Nigg, 2000) and behavioral pharmacology (Evenden, 1999) have described theories of impulsiveness which includes two, eight and ten varieties of impulsiveness, respectively. Impulsiveness in several studies on gender present a varied picture where in some cases males have been found to be higher than females whereas others support non-significant difference.

**Gender differences on impulsiveness**

Several researchers agree that there are no consistent differences among males and females on impulsiveness (Feingold, 1994; Patton, Stanford, & Barratt, 1995; Reynolds, Ortengren, Richards & de Wit, 2006) and the results are mixed depending on specific impulsive tasks administered (Weafer, & de Wit, 2014). Some studies assert that gender may moderate the association between impulsiveness and some health-risk behaviors but not in others, for example, one study found that increased alcohol use in both men and women was associated with high impulsiveness, but only among women was high impulsiveness associated with increased nicotine use (Waldeck & Miller, 1997). One more study observed that impulsiveness was associated with smoking in women, but not in men (Grano et al., 2007). Other studies also gauged impulsiveness through several tasks such as inhibitory control where women and girls were found to exhibit poor response inhibition as compared to men on stop signal tasks, which measure the time required to inhibit a response (Colzato, Hertsig, van den Wildenberg, & Hommel, 2010; Morgan, J. E., Gray, N. S., & Snowden, 2011). However, on other impulsive
task measures, men demonstrated poorer inhibition on go/no-go tasks, which measure the number of inhibitory failures (Hasson & Fine, 2012; Liu, Xiao, & Shi, 2013; Saunders, Farag, Vincent, Collins, Sorocco, & Lovallo, 2008). Taken together, gender differences on impulsiveness do appear to exist, but the direction of the differences varies across specific domains of impulsive behavior. Hence, diverse results give an unclear portrayal in terms of gender differences on impulsiveness.

Feingold (1994) aimed to investigate the gender differences in personality. For this, he conducted four meta-analyses in personality in the literature (1958-1992) and normative data for well-known personality inventories (1940-1992). The findings revealed that males were more assertive and had higher self-esteem while females were found to be high on extraversion, anxiety, trust, and especially, tender-mindedness (e.g., nurturance). The study revealed no significant gender differences on impulsiveness, social anxiety, activity, ideas (e.g., reflectiveness), locus of control, and orderliness. Gender differences in personality traits were found to be relatively constant across different nations, ages, years of data collection and educational levels. No gender difference was also supported in another study where impulsiveness and decision-making (Farnell, 2011) and impulsiveness in terms of risk-appraisal and risky behaviour was probed (Horvath & Zuckerman, 1993).

A study was designed to understand the relationship between personality and risk-taking in six areas i.e. smoking, drinking, drugs, sex, driving, and gambling. The results found that generalized risk-taking (across all six areas) was related to scales of impulsive sensation-seeking, aggression, and sociability, but not to scales for neuroticism or activity. Males scored significantly higher on the Impulsive sensation-seeking measure whereas women scored significantly higher than men on neuroticism and sociability (Zuckerman & Kuhlman, 2000).

Campbell and Muncer (2009) in their study found that where impulsive actions carry potential risks, men have been found to exceed women while not much significant difference with regard to other impulsive actions were found. On similar lines, they further add that there are well-established sex differences with males being higher than females in terms of fear, risk-aversion and harm-avoidance. As found in another study where impulsiveness with regard to alcohol problems were probed, higher levels of motor impulsiveness was the major reason for alcohol problems being higher in men than women, mediating the relationship between gender and risk for alcohol problems. Also in this study males outnumbered females in terms of
significant difference on impulsiveness as measured by BIS-11 (Impulsiveness scale), also used in the present study (Stoltenberg, Batien, & Birgenheir, 2008).

Cross, Copping, & Campbell, (2011) in their study assessed gender differences on behavioral impulsiveness where it was gauged in terms of inhibitory control and delay discounting measures. The sample of this study was young adults who were categorized into adults who were at-risk and the ones who were not at risk of being an alcoholic. The findings revealed that due to behavioral trait of impulsiveness females are more vulnerable to drug and alcohol abuse than males. On the measure of inhibitory control, the at-risk women committed significantly more inhibitory errors than at-risk men, indicating poorer behavioral control in contrast to the delay-discounting measure where no gender differences were found between at-risk men and women, or between the male and female non-risk drinkers.

Group differences

Williams, Henderson and Mills (1974) in their epidemiological study on measures of mental health and personality among serious traffic offenders found evidence of impulsiveness and non-psychotic psychiatric disorder, lower social conscience among the traffic offenders. Therefore, impulsiveness was found as one of the characteristic feature among traffic offenders in a driving context.

Donovan et al. (1985) and Wilson (1992) observed that studies among high-risk and drunk drivers focused primarily on personality measures other than impulsiveness reflecting on the paucity of literature on impulsiveness among traffic offenders.

Impulsiveness was also found to be a prominent determiner of indulging in traffic violations as Wislon (1990) found that the non-users of safety belts were higher sensation seekers, more impulsive, received more traffic violations than moderate and consistent users of safety belts.

A study by Cheng et al. (2012) was conducted where motorcyclist traffic offenders and non-offenders were compared on riskier driving decisions and risk-taking behaviour on self-report measure and task performance of impulsiveness. The study found that the self-reported impulsiveness was independent of unlawful status while poorer response inhibition with great willingness to take risks was exhibited by the traffic offenders. The task performance on the
other hand found that the traffic offenders differed from their non-offender counterparts in terms of response inhibition, risk-taking behaviour, and risky driving decisions.

Xu et al. (2014) in their study on the impact of situational factors and impulsiveness on intentions of drivers to violate traffic rules found that cognitive impulsiveness predicted the intention to violate traffic rules but only among novice drivers and not the experienced drivers. The age therefore plays a significant role in determining one's driving behaviour.

Due to dearth of studies in context to impulsiveness and the differences with regard to type of vehicle, no study could be cited however studies done among motorcyclists (Cheng et al., 2012; Haque, Chin & Lim, 2010) and among car drivers (Donovan et al., 1985; Lajunen, Parker & Stradling, 1998a; Wilson, 1992; Zuckerman 1979) reflect the prevalence of impulsive tendency among the drivers riding both these type of vehicles.

Gaps in the literature

Literature on driving behaviour is almost a 20th century phenomena and with emerging automotive and engineering technologies, their usage is impacting the human behaviour patterns. Majority of studies have been done in developed nations of USA, UK, Europe and though traffic psychologists have been trying to cope with the technological changes and their impact on human behaviour, there are discernible gaps.

Firstly, there is a lack of uniformity in defining the concept of unsafe driving (Dula & Ballard, 2003; Tasca, 2000) where the term has been used interchangeably with road rage, aggressive driving, risky driving and dangerous driving. Secondly, traffic psychology lacks a robust single theoretical framework. A researcher therefore has to rely on certain models for explanation for example, the perceptual, attentional, cognitive, social, motivational and emotional determinants of mobility and traffic behaviour (Ahmed, 2013). This limitation also poses a problem of lack of clarity for the psychological concepts in the realm of driving environment. Thirdly, research in Traffic psychology is still in its inception in India and very few researchers have attempted to unravel the psychological perspectives in a driving context (Carrasco, Rothhammer, Moraga, Henriquez, Chakraborty, Aboitiz, & Rothhammer, 2006; Chakrabarty, Gupta & Bhatnagar, 2013). Therefore one has to rely much on the literature available in the developed nations. Also, though the psychological variables studied in the present research have been studied in the West, there have been few attempts to study multiple psychological variables altogether in relation to one
another. Similarly only limited studies on traffic offenders with regard to the psychological variables are available hence, studies among general offenders were cited. There were even fewer studies on comparison among two-wheeler and four-wheeler drivers.

Given the gaps in literature, additional empirical research is needed to help clarify the constructs of unsafe driving, the impact of multiple psychological variables on it and the underlying processes in Indian context.