Chapter 11
Risky Behaviors in Life: A Focus on Young People

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Abstract This chapter describes risky behaviors in daily life, especially focusing on young people. Driving while intoxicated, speeding, and illegal drug use are examples of risky behaviors, which often compromise health, quality of life, or life itself. People perform some risky behaviors consciously while they do others unconsciously. This chapter first depicts some typical theories of risky behaviors, including Heinrich's domino model, problem behavior theory, social development model, life history theory, and lifetime utility theory. Next, it illustrates young people's risky driving by reviewing risk homeostasis theory, applications of theory of planned behavior, influences of social networks and other persons, avoidance driving, mood during driving and driving purpose, driving and nightlife, and self-driving cars. Literature review suggests that there are some common factors (not only psychological factors, but also life choices and various habits formed in daily life) affecting different types of risky behaviors, suggesting that risky behaviors tend to covary and effects of one risky behavior may spill over to influence other risky behaviors. These imply that measures to prevent a risky behavior should jointly target multiple risky behaviors based on an integrated approach over a long period.

Keywords Young people · Problem behavior · Social development model · Life history theory · Risky driving behavior · Avoidance driving · Self-driving cars · Influences of family and peers

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11.1 Risky Behaviors in Daily Life

Risky behaviors are behaviors that compromise health, quality of life, or life itself (Jessor 1991). In daily life, people experience and/or perform various risky behaviors, e.g., driving while intoxicated, speeding, angry driving, illegal drug use, smoking, unsafe use of the Internet, bungee jumping, going on a jungle safari, skiing, and skating. One can even observe antisocial behavior on public transport, e.g., shouting, swearing, pushing, barging people out of the way (carelessly or aggressively), and playing loud music (Moore 2011), among the many examples that are too numerous to mention. Some risky behaviors are performed consciously, e.g., speeding, while others are done unconsciously, e.g., sitting for too long while working hard every day (which is nevertheless harmful to one's health from a long-term perspective), unhealthy diets, and unsafe use of the Internet. Some risky behaviors are not harmful to the person of interest, but may be harmful to others, e.g., throwing a glass bottle out of a car. Some risky behaviors are associated with lifestyles, e.g., smoking, working long hours, and alcohol abuse, while others are antisocial, e.g., speeding, angry driving, and illegal drug use.

Risky behaviors often result in adverse outcomes such as incarceration, loss of job, long-term illness, injury, and even death (e.g., Lane and Cherek 2000; Mason et al. 2013). The World Bank has warned that "risky behaviors—smoking, using illicit drugs, alcohol abuse, unhealthy diets, and unsafe sex—are increasing globally and pose a growing threat to the health of individuals, particularly in developing countries."[1] The Internet has dramatically improved people's lives. The Internet of Things (IoT) currently comprises 25 billion connected devices around the world and this number will grow to 50 billion worldwide by 2020, according to the World Bank.[2] These technological developments have provided people with more open, free, secure, and empowering access to goods and services; however, at the same time, issues such as privacy, safety, child protection, terrorism, and public safety have become global concerns. Importantly, use of the Internet and health are not unrelated. Indeed, Internet addiction has been recognized as an emerging behavioral problem among adolescents (American Psychiatric Association 2013; Lenihan 2007; Young 2010). Furthermore, according to the World Health Organization (WHO), the total number of road traffic deaths across the world has reached 1.25 million per year, and the highest road traffic fatality rates are observed in low-income countries[3] and tens of millions of people are injured or disabled every year.[4]

[1] http://www.worldbank.org/en/news/press-release/2013/11/20/risky-behaviors-growing-threats-global-health (accessed January 31, 2016).

[2] http://blogs.worldbank.org/category/tags/internet-security (accessed January 31, 2016).

[3] http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/ (accessed January 31, 2016).

[4] http://www.who.int/violence_injury_prevention/road_traffic/en/ (accessed January 31, 2016).

Risky behaviors have been broadly analyzed in relation to young people. The definition of young people is culturally and historically specific, varying through time and between different societies (Cieslik and Simpson 2013: p. 45). Similar terms include younger generation, young adults, youth, adolescents, and teenagers. In general, youth refers to the period between childhood and adulthood. Several United Nations organizations treat 'youth' and 'young people' as having the same meaning, but adopt different age ranges (e.g., 15–24 years for the UN Secretariat, UNESCO and the ILO; 15–32 years for UN Habitat; under 18 years for UNICEF; and 15–35 years for the African Youth Charter).[5] UNICEF, the WHO, and UNFPA distinguish between adolescents (10–19 years), young people (10–24 years), and youth (15–24 years). In the USA, youth means the same as teenager (10–19 years). In Japan, young adults refer to those aged 15–34 years,[6] and 16–24 years in the UK.[7] According to the United Nations Population Fund (2014), there are 1.8 billion young people aged 10–24 years in the world, with currently 90 % of them living in developing countries.

This chapter is especially focused on young people's driving safety. WHO (2015) reported that road traffic accidents are a leading cause of death among young people, and the main cause of death among those aged 15–29 years. Young drivers are more likely to speed, to which alcohol is seen as an attributing factor; in particular, talking on mobile phones and texting while driving are seen as the main reasons for young people's risk of death and injury.

11.2 Theories of Risky Behaviors

Risky behaviors have been studied in various disciplines. Instead of attempting to provide a comprehensive list of theories, we select here some examples to illustrate how risky behaviors have been understood, aiming especially at clarifying the roles of domain-specific factors and social networks in explaining risky behaviors.

11.2.1 Heinrich's Domino Model

Heinrich's (1931) seminal work, known as Heinrich's Law, provided the foundation of behavior-based safety research. It claims that in a workplace, for every accident that causes a major injury, there are 29 accidents that cause minor injuries

[5] http://www.un.org/esa/socdev/documents/youth/fact-sheets/youth-definition.pdf (accessed January 31, 2016).

[6] Statistics Bureau of Japan: http://www.stat.go.jp/english/data/nenkan/1431-02.htm (accessed January 31, 2016).

[7] http://www.ukyouth.org/events/item/292-statistics-about-young-people-in-the-uk.html#.VmbxmbiLRD8 (accessed January 31, 2016).

and 300 accidents that cause no injuries, based on 5000 documented industrial accidents. Heinrich emphasized the role of human error and chance events in causing accidents. Based on observations from the 5000 accidents, Heinrich (1931) proposed the domino model, which emphasizes the worker as cause. This model argues that an accident is an end result of a chain of decision fallacies: (1) ancestry and social development; (2) fault of person; (3) unsafe act; (4) accident; and (5) injury. In other words, if one of the factors leading to an injury can be removed or corrected, then the injury will not happen. The first domino in the chain deals with a worker's undesirable personality traits (e.g., stubbornness, greed, or recklessness), which is either transferred through inheritance or has developed from a person's social environment. The second domino indicates inborn or learned character flaws (e.g., bad temper, inconsiderateness, ignorance, and recklessness) and claims that natural or environmental flaws in the *worker's family or life* cause these secondary personal defects. For example, temper means not only a tendency to become angry suddenly or easily (i.e., personal character), but also the way a person is feeling at a particular time (i.e., affective experience). Over the past decade, affective experience has been widely studied under the research framework of subjective well-being (SWB) in the field of behavioral economics (e.g., Diener 1994, 2009; Kahneman et al. 2004). Concerning personality, Diene and Lucas (1999) concluded: "One of the most consistent and robust findings in the field of subjective well-being is that the components of SWB are moderately related to personality. … The personality traits that are most consistently and strongly related to SWB are extraversion and neuroticism. Extraversion is moderately correlated with pleasant affect; neuroticism is strongly correlated with unpleasant affect. … [G]reater SWB results from the degree to which our personalities fit with our environment (p. 213)." Here, the environment in which people live is emphasized. From this perspective, as an example, bad temper may also result from an unhappy family life (a long-term affective experience), or unhappy moments experienced at home before going to work (a short-term affective experience). Thus, Heinrich was the first researcher who attached a higher importance to an individual's family or life. To reduce risky behaviors, efforts should focus on people's daily life, which is indirectly associated with the chain of the domino model.

11.2.2 Problem Behavior Theory

Risky behaviors have also been studied as a problem behavior (e.g., Miller 2008; Lam 2015). As noted by Steinberg and Morris (2001), the problem behavior theory proposed by Jessor and Jessor (1977)[8] is perhaps the most influential theory used to treat in particular adolescent problem behaviors (e.g., drug use, sexual behavior, alcohol drinking, and the problem behavior associated with excessive

[8]http://www.colorado.edu/ibs/jessor/pb_theory.html (accessed February 1, 2016).

use of alcohol). The theory explains risk taking and unconventional lifestyles in terms of three interactive systems of psychosocial influence: personality, perceived environment, and behavior (e.g., delinquency). Jessor and Jessor (1977) found that (1) there are more serious problem behaviors at the college level than at the high school level; (2) personal control has the most influence on the set of problem behaviors, followed by motivational instigations; (3) the adolescent who values academic achievement is less likely to engage in problem behavior, and the influences of *peer groups*, *the family*, *and the community* are significant. Each of these three interactive systems either serves as an instigator of, or control against, engaging in problem behavior, and the proneness to problem behavior is determined by the balance between instigators and controls across the three systems (Lam 2015). It may be assumed that these three groups of factors may be attributable to different risky behaviors in different ways.

Problem behavior theory has been applied in various fields. For example, Yu et al. (2012) noted that personality variables (e.g., positive attitudes toward tobacco use and depressive affect) and delinquent behaviors can well explain adolescent tobacco use; however, perceived environment variables (e.g., exposure to delinquent peers) cannot. Sterrett et al. (2014) observed that the trajectories of substance use, sexual behavior, and conduct problems among low-income African-American youths co-occurred with the influence of peer pressure, parental monitoring, self-worth, and belief in the inevitability of violence. Similarly, Melkman (2015) discovered that sensation seeking and deviant peer associations mainly contribute to the occurrence of problem behaviors such as delinquency, substance abuse, and risky sexual behavior, suggesting the importance of holistic group interventions addressing multiple risk factors. Lam (2015) reported that an increasing number of studies reveal the relationship between familial and parental factors and Internet addiction among adolescents, and reconfirmed existing findings empirically by showing that there was a significant relationship between parental mental health, particularly depression, and the Internet addiction status of their children.

Similarly, the US Department of Health and Human Services summarized the long-term impact of adolescent risky behaviors and family environment from a broad review of the literature (Pergamit et al. 2001). It was found that most existing studies suggest that engaging in risky behaviors as a teenager is associated with less successful adult outcomes and in most cases, earlier engagement is more likely to lead to a poor outcome as an adult. Such long-term adult outcomes are associated with parents' level of education; however, the effects of parents' help on the prevention of poor outcomes for their children differ across different domains. The influence of family on young people's risky behaviors has also been investigated by other theories/models. For example, Feinberg et al. (2013) developed a model of sibling and family influences on youth development and adjustment and showed that the sibling relationship should be reflected into practices for preventing substance use via family. The influence of family is also observed in the case of traffic safety (e.g., Taubman-Ben-Ari and Katz-Ben-Ami 2012), which will be discussed further in Sect. 9.3. Focusing on the effects of marketing on gambling,

drinking, and smoking behaviors, Prentice and Cotte (2015) revealed the influence of peer group in problem driving behaviors; in addition, they clarified how casino employees' communication with casino guests affects problematic gaming behaviors. Recently, Buckley and Chapman (2016) reported that adolescents value protecting friends from harm and intervene as bystanders in friends' risky and dangerous behavior based on a model of social context for intervention.

11.2.3 Social Development Model for Representing Antisocial Behavior

The above influences of the perceived environment (e.g., peer groups, the family, and the community) on risky behaviors have been generalized under the so-called social development model (an integration of social control theory and social learning theory), which was originally conceived to prevent youth crime (Hawkins and Weis 1985). The model was developed from a life-course perspective in which four developmental periods are distinguished, namely preschool, elementary school, middle school, and high school (Elliott 1994; Catalano et al. 1996). It is argued that similar developmental processes could lead to either prosocial or antisocial outcomes, where the most important units of socialization—family, schools, peers, and community—influence behavior sequentially, both directly and indirectly (Hawkins and Weis 1985). Whether a youth's participation in each unit of socialization contributes to the development of a bond of attachment and commitment to and belief in conventional society is determined by three types of process variables: opportunities for involvement, skills, and reinforcements. Hawkins and Weis (1985) argued that opportunities for involvement are necessary, but not sufficient, for the development of a social bond, and social bonding can be achieved only if youths experience and evaluate the interventions and interactions with other members in the socialization unit positively. Their experiences and evaluations are further affected by the level of their skills and reinforcements from the environment for desired behavior. The bonding process starts in the family, where consistent rewarding is required for the development of the bond of attachment, commitment, and belief in the family. Bonding to school is conditional on how fully social bonds to the family have been developed before entering school, experiences of opportunities for involvements and skill development, as well as rewards for skillful performance at school. Similarly, bonding to peers is determined by experiences of opportunities for involvement with peers, the skills expected by peers, and rewards for interactions with peers. This bonding involves a process through which youths learn patterns of behavior, either prosocial or antisocial, from members of the socialization units, the norms and values of which are also influential (Catalano et al. 1996). It is further suggested that strong bonds to family and school reduce the likelihood of youths being attached to delinquent peers, despite exposure to high levels of risk factors. In other words, uncaring or

inconsistent parents, poor school performance, and inconsistent and/or unrewarding teachers will unfortunately increase the likelihood of youths performing delinquent behaviors.

Based on the above social development model, some practical measures of risk and protective factors have been developed One of the more popular measures is the Communities That Care Youth Survey (CTC-YS) (Feinberg et al. 2007). CTC-YS broadly assesses both risk and protective factors across domains (i.e., community, family, school, and peers) that have been shown to be linked to adolescent behavior problems (violence, substance abuse, dropping out, and teen pregnancy), and support policy decisions. In total, there are 22 risk factors and nine protective factors.

A similar approach is called the participatory approach (Mason et al. 2013). It is neither top-down nor paternalistic (i.e., an approach that restricts individuals' choices in their own interests and without their consent); it is a bottom-up approach that involves youths themselves, their peers and families, and the community where they are living, with the aim of increasing healthy social bonding. This approach attempts to understand vulnerability from youths' own viewpoints, and empowers them to define the issues and develop solutions to the challenges they face. It emphasizes that risky behavior is often not an outcome of a single choice, but a series of choices in the form of lifestyle experimentation that consider various trade-offs. The usefulness of this approach is supported by the fact that community-based programs tend to be the most effective (e.g., Lantz et al. 2000). More importantly, the participatory approach involves co-creation with youths and their social networks in the design and evaluation of programming.

11.2.4 Life History Theory

According to Wang et al. (2009), risk-taking propensities are domain specific, as suggested by evolutionary psychology. Domains include social exchange, mating, parental investment, within-group competition, between-group competition, foraging, dealing with kin, and parenting. Some studies classify risk-taking domains into financial, health/safety, ethical, recreational, and social domains (e.g., Weber et al. 2002).

However, people not only make risky choices in different task domains, but also make risky choices at different stages of life. For example, existing studies reveal that adolescence is a stage of life in which children are at greatest risk of using and developing problems associated with alcohol, tobacco, and other drugs. The early onset of regular tobacco use is a good predictor of lifetime drug use (Hanna et al. 2001). Kabiru et al. (2014) reported that adverse life events increase the likelihood of delinquent behavior among adolescents living in urban slums in Kenya. Parental monitoring, religiosity, and self-esteem may moderate the effect of adversity on delinquent behavior. Such findings are also consistent with those in the context of high-income countries. Furthermore, risky lifestyles are associated

with participation in a range of violent behaviors both as offenders and as victims (Baron et al. 2007). Such phenomena might be explained by life history theory, which assumes that individuals make specific trade-offs at different times in life (e.g., Stearns 2004; Kaplan and Gangestad 2005).

Aiming to provide a stronger theoretical basis for capturing such domain-specific risk-taking behaviors, Wang et al. (2009) identified five domains: between-group competition (sports watching and driving), within-group competition, environmental challenge, mating and resource allocation and fertility and reproduction. They made an initial attempt to examine the effects of life history traits on risk-taking propensity by domain, measured by subjective likelihoods of engaging in risky behaviors. As a result, it was found that risk-taking propensities in different domains are sensitive to different life history variables; furthermore, subjective life expectancy, age, and reproductive goals were identified as serving as temporal reference points that guide risk perception and risk preference. Both Heinrich's domino model and problem behavior theory emphasize the role of personality in the analysis of risky behaviors. Wang et al. (2009) suggested the need to examine whether life history traits modify personality traits. In addition, based on life history theory, Wenner et al. (2013) showed empirically that traditional assumptions in psychology about risky, deviant, and delinquent acts[9] may be incorrect and suggested that incorporating the influence of developmental contexts is crucial if we are to understand fully the ultimate causal factors driving these acts. McDonald et al. (2012) claimed that how and how much individuals engage in aggressive or antisocial behavior are a relevant outcome of one's life history strategy. Applications of life history theory have led to breakthroughs in understanding the structure of personality traits, which are, in fact, a part of life history strategy (Dunkel and Decker 2010).

11.2.5 Lifetime Utility Theory

Life history theory was developed in the sociological field. In the context of economics, a so-called lifetime utility theory (Friedman 2013) was developed to investigate the effects of distressing life events on engagement in risky behaviors as a coping response. The concept is similar, but the approach is more quantitative. Here, an individual is assumed to accumulate lifetime utility over a composite good, x_t, and behavior, b_t, where the latter contains consumption of addictive goods (e.g., cigarettes), as shown below.

$$W_t = U(b_t, x_t, S_t; H_t) + \Sigma_s \, \delta_s U(b_{t+s}, x_{t+s}, S_{t+s}; H_{t+s})$$

[9]Psychologists traditionally assume that individuals engaging in risky, deviant, and delinquent acts suffer from some form of psychopathology.

Here, W_t is the present (t) discounted value of utility over the life course with the discount rate δ. H_t indicates health capital, which is a function of one's endowment of health at birth, its depreciation and investment. When H_t falls below a critical value, it means that death ensues. S_t is one's addictive stock, which reflects past consumption of addictive substances and increases the marginal utility of addictive substances of current consumption. It is assumed that an individual chooses x_t (a composite addictive good) and x_t (other goods) to maximize his/her present discounted value of lifetime utility, incorporating the influence of health capital and life expectancy, conditional on a standard budget constraint ($Y = P_b b_t + x_t$, where P_b indicates the price of addictive goods, b, and the price of x_t normalized to 1). To represent risky behaviors, it is assumed that $\partial H_{t+s}/\partial b_t < 0$, meaning risky behaviors lead to negative investments in future health capital and it is further assumed that risky behaviors may temporarily improve immediate mental health (H_t), i.e., consuming an addictive good increases present utility. Furthermore, to represent the effects of an adverse life event (Z) on risky behaviors, the part of utility with respect to b is defined as a function of event Z and it is assumed that $\partial U_b/\partial Z > 0$, to reflect the argument that an adverse event may increase distress, which leads to an increase in risky behavior b, especially if its effects on the marginal utility of such behavior exceed those on the marginal utility of other goods, x. Friedman (2013) summarized this theory as yielding three predictions: "individuals should be more likely to try a costly behavior after a distressing event; use of positive coping mechanisms should increase after such events; and, more access to low cost coping devices should dampen the risky behavior response." To specify concretely the utility structure, Friedman (2013) applied three models of risky behavior: rational addiction, time-inconsistent preferences, and nonrational frameworks.

11.2.5.1 Rational addiction model

It is assumed that an individual chooses to consume addictive goods by maximizing his/her utility, given his/her current beliefs and information. In this model, expected risk of addiction and associated costs, and immediate benefits of addiction as well as a perceived probability of becoming addicted are reflected. Even if an individual does not think addiction desirable *ex ante*, he/she may still consume addictive substances if he/she underestimates their probability of becoming addicted. The individual considers intertemporal trade-offs with costs realized in the future in his/her utility-maximizing decision. In this context, a reduced likelihood of experiencing long-term costs can encourage risky behaviors. On the one hand, adverse events might produce this effect by lowering perceived life expectancy (e.g., in response to a violent crime); on the other hand, the impact of reduced life expectancy may depend on the expected cause of death. Expectation of a faster depletion of health capital might motivate reduced risky behavior and increased positive investments in health capital to protect or expand one's length of life. However, if the expected cause of death is a fatal event outside the

individual's control (e.g., a car accident, gun violence), an earlier death may be anticipated regardless. Lowering the perceived likelihood of realizing later-life costs, would increase risky behavior.

11.2.5.2 Time-Inconsistent preference model

In this model, hyperbolic discounting is introduced into the rational addiction model by incorporating the influence of time inconsistency, where the newly introduced parameter β reflects the value placed on immediate gratification. Introducing parameter β allows the model to include the effect of stressful or distressing events on intertemporal calculations in a way that increases risky behavior.

$$W_t = U(b_t, x_t, S_t; H_t) + \beta \, \Sigma_s \, \delta_s U(b_{t+s}, x_{t+s}, S_{t+s}; H_{t+s}), \text{ where } \beta \in (0, 1)$$

11.2.5.3 Nonrational model

Here we adopt the System 1–System 2 model of cognition developed in psychology. It is argued that any decision involves two cognitive systems: one is unconscious and instinctive (System 1), and the other is conscious and deliberative (System 2). Most decisions in reality are driven by System 1 because they are habitual and involve intuitive judgment. When conscious and more deliberative processing is called for, System 2 monitors System 1 with considerable effort, even though individuals usually have a limited stock. If a certain level of effort is exceeded, individual decisions may shift to rely on System 1, leading to a variety of nonrational tendencies (e.g., reference dependence). In the case of addictive behaviors, if adverse events absorb the efforts or cause distress that increases the efforts required to engage in basic activities, they would constrain System 2, thereby increasing decisions based on System 1. As a result, overweighting of salient and near-term outcomes alongside less attention to the long run would dampen perceived disincentives to risky behaviors (Friedman 2013: p. 9).

Using data from 2002 to 2010 extracted from the National Longitudinal Survey of Youth, Friedman (2013) revealed empirically that adverse events (being a victim of a violent crime, the death of someone close to the respondent: less than 20 % in the total data) contributed clearly to an increased probability of first cigarette use and first use of an illegal drug other than marijuana for adolescents under 19 years old, based on a regression model with a first-order difference of addiction behaviors between two successive periods of time being the dependent variable. Friedman concluded that distressing events result in risky behaviors, to which a coping response is attributable.

Gardner (1993) developed a life-span rational choice theory of risk taking targeting youths' health, which is similar to the lifetime utility theory. This assumes that an individual maximizes his/her lifetime expected utility, where different attitudes toward health risks are treated as rational choices at different points in the

life-span. The model also describes decisions in a life-span context that provide limited but developmentally changing information about the self and the consequences of choices.

11.3 Young People's Risky Driving

Young drivers worldwide are involved in car accidents more than any other age group (Taubman-Ben-Ari and Katz-Ben-Ami 2012). Fatalities for persons aged 16–25 are mainly caused by road accidents, which are also the second most common cause of disability for adolescents (WHO 2014). A variety of factors affect young drivers' driving safety (Scott-Parker et al. 2015a): distraction, insufficient experience, driving together with friends, sensation seeking (driving for fun, self-expression, driving for a sense of freedom, driving to feel independent), and lifestyle habits (e.g., consuming alcohol and/or illicit drugs, engagement in and awareness of religious matters). Here, lifestyle is a key concept in examining risky driving behavior.

Lifestyle has various meanings and consequently has been defined and measured in various ways (e.g., Van Acker 2016). For example, Gnardellis et al. (2008) identified five lifestyle patterns (amusement, culture, religion, sport, work) for studying vehicle accidents and confirmed that the higher the frequency of fatigue and fall-asleep incidents while driving, the greater the likelihood of causing car accidents. They further concluded that road safety measures should target drowsiness-prone drivers. According to Bina et al. (2006), male adolescents practicing risky driving tend to show a lifestyle characterized by high involvement in antisocial behaviors, tobacco smoking, and time spent in nonorganized activities with friends; girls who practice risky driving are more involved in other risk-taking behaviors, antisocial behaviors, and drug use. Thus, risky driving is not an isolated behavior but is just another risky behavior of young people. Because lifestyle is reflected in one's daily activities, these activities (some are related to driving) might be associated with risky driving behavior. In addition, because social networks and psychological factors also affect drivers' lifestyles, their influence on risky driving behavior cannot be ignored.

11.3.1 Driving Tasks

A driver needs to perform various tasks before, during, and after driving. Some tasks are completed before driving (e.g., destination and departure time), others are performed while driving (e.g., vehicle control, lane change, and car following), while the remainder are completed after driving (e.g., taking a rest before the next drive, recalling what happened during the previous drive, and review of the driving experience). Stradling (2011) summarized 10 driving tasks as follows.

(1) Strategic tasks: decisions about activity choice, travel mode, and departure time, and recognition of route alternatives and travel time.
(2) Navigation tasks: find and follow the chosen or changed route, identify and use landmarks and other cues.
(3) Road tasks: choose and maintain the correct position on the road.
(4) Traffic tasks: maintain mobility while avoiding collisions.
(5) Rule tasks: obey rules, regulations, signs, and signals.
(6) Handling tasks: use in-car controls correctly and appropriately.
(7) Secondary tasks: multitasking while driving.
(8) Speed tasks: maintain a speed appropriate to the conditions.
(9) Mood management tasks: avoid boredom and anxiety.
(10) Capability maintenance tasks: avoid compromising driver capability with alcohol or drugs, fatigue, or distraction.

Each task contributes differently to a different part of the 300–29–1 ratio (behind one serious accident lie 29 minor accidents and 300 risky actions), as suggested by Heinrich's Law (Heinrich 1931; Ward 2012). A well-prepared trip plan—part of (1) strategic task—allows a driver to concentrate more on second-by-second driving, without thinking about, for example, tasks awaiting at the destination, or choosing whether to take a toll road. Because a well-prepared trip plan may drastically reduce multitasking behavior during driving (e.g., talking on the phone, sending or reading a text message), risky actions could be reduced. Dahlen et al. (2005), O'Brien and Gormley (2013), and Le Bas et al. (2015) found that higher levels of young people's driving risks were associated with higher levels of impulsivity, implying that young drivers are less likely to prepare trip plans, and consequently supporting the importance of better trip planning before driving in promoting driving safety. Most of the above tasks (2–10) are directly related to driving; some involve habitual judgment (e.g., speed control, obeying traffic rules), while others involve second-by-second judgment (e.g., car following, lane change). Harre (2000) further classified these judgments by young drivers into five psychological risk states; that is, two desirable states: habitually cautious driving and active risk avoidance; and three undesirable states: reduced risk perception, where the actual risk is high, but the perceived risk is low; acceptance of risk as a cost, where the actual risk is high, the perceived risk is high, and risk is valued negatively; and risk seeking, where the actual risk is high, the perceived risk is high, but the risk is valued positively. Clearly, an unsafe judgment may increase the risk of an accident. For further details, refer to Sect. 11.3.2 on risk homeostasis theory.

No study has examined the role of after-driving tasks on driving safety. Even though multitasking while driving is regarded as inherently risky driving, analysis of time use while driving has been completely ignored in the literature. Dealing with a number of driving tasks at the same time involves various risks that should be avoided. Nevertheless, this experience is also useful to teach a young driver to establish a lifetime of safe driving. Huang and Winston (2011) argued that "novice teen drivers are not 'defective' or 'deficient' adult drivers. Rather, these young people are undergoing an explosive period of physical, social, emotional,

and behavioral development within an expanding environmental context. … [A] dolescence is a period not only of vulnerability for teens but also of opportunity." Traffic safety measures should also benefit from such positive thinking (p. 315).

11.3.2 Risk Homeostasis Theory

Risk homeostasis theory (Wilde 1982, 1998) argues that crash rates are entirely governed by a driver's target level of risk and that the risk of an action is determined by risk perception and acceptable risk. It is assumed that the amount of risk that people prefer to take depends on expected benefits/costs of risky/safe behavior alternatives. The target level of risk is achieved when the net benefit (e.g., gaining time and increasing mobility by speeding, being punished by speeding tickets, and paying insurance surcharges caused by car repairs) is maximized. At any given moment, a driver compares the amount of risk he/she perceives with the target level of risk and adjusts his/her behavior to eliminate any discrepancies between the two. Such adjustments may lead to either more aggressive or more careful driving. Based on this theory, the annual accident rate can theoretically be calculated as the sum of injury likelihood levels resulting from all actions taken by people over a year. Note that this accident rate in turn affects the level of risk that people perceive and their subsequent decisions and actions. Because of the existence of such a target level, moderate effects of safety measures should be expected and safety measures should be taken to encourage drivers to reform their target risk levels (Hoyes et al. 1996; Hatfield et al. 2014). This theory does not claim that no safety measures will be effective; rather, it argues the ineffectiveness only of those measures for which the current risk level is desirable (Slovic and Fischhoff 1982). Because future expectations affect risky driving behavior, there is evidence to suggest that incentives may increase the perceived benefits of safe driving behavior (Wilde 1998; Bolderdijk et al. 2011). Interestingly, Bolderdijk et al. (2011) examined the effects of insurance-based incentives on speed choices of young drivers (under 30 years old; $n = 141$) over a year and found that the incentives significantly reduced speed violations of those young drivers. Thus, although the short-term effects of incentives have been observed, the long-term effects have not been elucidated.

Risk homeostasis theory also supports the argument that objective crash risk is most usefully portrayed as a function of the choices made by the driver (Wilde 1982; Harre 2000) and that this should be given appropriate attention in making decisions on traffic safety measures. From this perspective, the driving tasks listed in Sect. 11.3.1 should be reflected in decisions on various safety measures.

Just as with any other theory, risk homeostasis theory is not without limitations. For example, Chung and Wong (2012) noted that heterogeneous driver groups may exhibit structural discrepancies that reflect their various decision-making mechanisms, a point that are ignored in this theory. Trimpop (1994) argued that the theory "does not account for risk as a desirable, pleasant activity, which is actively sought out by people and offers intrinsic and extrinsic rewards, such as pleasant

emotions or pleasant arousal-highs" (p. 282). The importance of paying attention to positive aspects of risky driving in promoting young people's driving safety is also supported by Huang and Winston (2011).

11.3.3 Applications of Theory of Planned Behavior

Cost-effective traffic safety measures need the support of drivers' voluntary behavioral change toward safer driving. The theory of planned behavior (TPB) (Ajzen 1988, 1991, 2011) is relevant here. It is a general theory that links beliefs and behavior. It is argued that a behavior is determined by a limited set of psychological constructs: (1) the intention (the degree to which the person intends to perform the behavior); (2) the attitude toward the behavior (one's beliefs about the likely consequences of the behavior); (3) the subjective norm (the degree to which the person thinks important others value the behavior); and (4) the perceived behavioral control (the degree to which a person thinks the behavior is under his/her personal control). Constructs (2)–(4) are interrelated and jointly affect construct (1), the intention.

Some recent studies summarize the applications of the TPB to investigate driving safety (e.g., Chorlton et al. 2012; Castanier et al. 2013; Gwyther and Holland 2015; Rowe et al. 2016). Some studies of young drivers' behavior are briefly summarized as follows.

Desrichard et al. (2007) confirmed the significant role of parents in supervising their children in France to improve their risky driving behavior and revealed that attitudes and subjective norms partially mediate the effects of age, prior behavior, and parental supervision. In a study of young drivers in Costa Rica, Leandro (2012) differed from Desrichard et al. (2007) in reporting only the significant influence of norms and perceived behavioral control on intention to reduce speed and actual speed selection. Because the original TPB did not work well, Leandro (2012) proposed to connect norms directly to speed selection and remove the direct link from perceived behavioral control to intention. In a case study in Cambodia, Brijs et al. (2014) found that helmet use was mostly determined by perceived behavioral control over a specific set of inhibiting situational factors (mostly when driving short distances, at night, or when dressed up to go out), followed by perceived behavioral control in general, perceived susceptibility, personal norms, and behavioral intentions, in decreasing order. Targeting the concealed texting of young drivers, the case study by Gauld et al. (2014) in Australia revealed that high intenders (to engage in concealed texting while driving) tended to believe more that concealed texting while driving would result in sharing information with others and using time effectively, while behavioral, normative and control beliefs showed significant differences between low and high intenders. Horvath et al. (2012) also successfully identified the significant differing impacts of these three beliefs on young drivers' speeding behaviors.

Young drivers tend to overestimate their own driving skills and underestimate the hazards involved in driving, under the influence of alcohol (Basch et al. 1989;

DeJoy 1989; Guppy 1993). Marcila et al. (2001) showed that young males' intention to drink and drive was primarily predicted by attitude, followed by perceived behavioral control, and slightly by subjective norms. In a case study of young drivers (under 35 years old) in Norway, Moan and Rise (2011) showed that the TPB variables explained just 10 % of the variance in intention not to drink and drive; they subsequently added moral and descriptive norms, which resulted in only a 2 % point increase. Based on this extended TPB, they found that perceived behavioral control was the strongest predictor of intention, followed by descriptive norm, attitude, and moral norm. Focusing on intoxicated young drivers, Moan (2013) further extended the TPB by adding past behavior, moral norm, descriptive norm, demographic variables, and frequency of alcohol use; this extension resulted in a 4 percentage point increase in the explained variance compared with the original TPB (from 19 to 23 %). Perceived behavioral control was estimated to be the strongest predictor of intention, followed by moral norm, past behavior, descriptive norm, and subjective norm. In contrast, focusing on Chinese youngsters' (19–35 years old) intention to drive after drinking, Chan et al. (2010) found that the TPB variables explained 79 % of the total variance of the intention and highlighted the youngsters' irrational beliefs of invulnerability to danger, which was added to the TPB. Focusing on young drivers in France, Cestac et al. (2011) extended the TPB by adding in the analysis drivers' past behavior, sensation seeking, comparative judgment of risk, and social image of typical deviants (self-descriptions, descriptions of typical deviants, and perceived similarity to the typical deviant). They found that attitude, normative variables, and past behavior had the most influence on the intention to speed, and the effects of perceived behavioral control on the intention increased with driving experience. Gender differences were also revealed; sensation seeking and injunctive norms showed a stronger influence on men's intention to speed than other factors, whereas self-description variables had a greater impact on women's intention. To increase the predictive power of the TPB, Cristea et al. (2013) suggested adding frequency of driving with passengers and driving while angry. Finally, given that driving is a habitual behavior, Chung (2015) observed that habit strength is a crucial mediator between intention antecedents (e.g., attitude) and the intention itself. Adding habit strength in the TPB increased the explained variance of speeding intention by about 30 %. Habit strength was measured by 12 items reflecting not only repetition of the same driving behavior but also other features such as automaticity and self-identity.

11.3.4 Influences of Family, Peers, and Passengers on Young People's Risky Driving Behavior

As noted by Desrichard et al. (2007), parents play a significant role in supervising their children to improve their risky driving behavior. Using Bowen's family systems theory (Bowen 1978), Miller and Taubman-Ben-Ari (2010) confirmed that

driving styles of parents and their children are strongly correlated, suggesting the existence of intergenerational transmission of driving styles. Family systems theory argues that multigenerational emotional processes are transferred from generation to generation, where these processes include emotions, perceptions, attitudes, beliefs, and values. Intergenerational transferability of risky behaviors from parents to their children has also been observed elsewhere (e.g., Beck et al. 2001a, b; Ferguson et al. 2001; Bianchi and Summala 2004). In contrast, in a case study of young drivers in Israel, Guttman (2013) found that "parents tended to be optimistic about their own child's driving compared with other young drivers and were relatively unconcerned about speeding. … Most also believed many parents feel they are unable to influence young drivers' driving." Thus, the influence of parents on young drivers' risky driving behavior might differ across different cultures.

Related to the influence of parents, Taubman-Ben-Ari and Katz-Ben-Ami (2012) proposed a new concept of family climate for road safety, "which refers to the values, perceptions, priorities and practices of parents and the family in regard to safe driving, as perceived by young drivers" and is composed of seven dimensions: (1) modeling (parents' driving behavior and attitudes shown to their children); (2) feedback (parents' positive feedback and encouraging comments to their offspring in regard to safe driving); (3) communication between parents and adolescents; (4) monitoring (parental supervision and monitoring of their youngsters' driving habits); (5) parents' commitment to road safety; (6) parents' verbal safety messages; and (7) limits (the extent to which parents set systematic and clear-cut limits to their adolescents' driving behavior and discipline them for traffic violations).

Simons-Morton et al. (2008) stated that "the two most important decisions parents can make to reduce teenagers' driving risk are to delay licensure and impose limits on high-risk driving conditions (such as driving at night and with teenage passengers) during the first year of licensure." According to Bingham et al. (2006), parents in many US states are required to supervise their teenage children during 30–50 h of practice driving; moreover, graduated driver licensing programs rely on parents to supervise and monitor their teenage children's adherence to graduated driver licensing (GDL) laws.

Young people's social networks also affect their driving behavior. Pilkington et al. (2014) identified five types of young people's social driving: (1) driving as a social event in itself (i.e., without a prespecified destination); (2) driving to or from a social event; (3) driving with accompanying passengers; (4) driving late at night; (5) driving where alcohol or drugs are a feature of the journey. They further concluded that "road safety interventions need to take a more community development approach, recognizing the importance of social context and focusing on social networks of young people."

Allen and Brown (2008) stated that peers often influence young drivers' risky behaviors through direct/indirect active pressure and passive-pressure forms of intervention. Gheorghiu et al. (2015) confirmed this influence of peers. Scott-Parker et al. (2015a) concluded that both parent-specific interventions and peer-targeted interventions should be designed in a more effective way. They also

emphasized that modeling safe driving behavior by parents, active monitoring of driving during novice licensure, minimization of social reinforcement, and promotion of social sanctions for risky driving should be further studied.

Fleiter et al. (2010) reported the influence on driving speed of people known to the driver (passengers and parents) and unknown other drivers. The influence of other drivers was reflected in the form of speeding to keep up with traffic flow and perceived pressure to drive faster. Chung et al. (2014) confirmed the effectiveness of an adult passenger's presence on young drivers' speed control, especially as the effect was transferred even when they drove alone afterward.

11.3.5 Avoidance Driving

Driving avoidance behavior is related to after-driving experience. Recent studies about avoidance behavior theory have mainly focused on punishment avoidance behaviors (Liourta and Empelen 2008; Scott-Parker et al. 2014) and situational avoidance behaviors (Stewart and Peter 2004; Motak et al. 2014). Punishment avoidance behavior indicates that drivers might evade detection by police by avoiding driving in police enforcement activity areas to avoid a potential traffic citation for speeding behavior due to substance-impaired driving behaviors, such as drunk driving and driving after consuming drugs (Fleiter and Watson 2005; Scott-Parker et al. 2011). Fleiter and Watson (2005) noted that traffic rule violation behavior, especially speeding behavior, is strongly correlated with the prediction of an individual's punishment avoidance behavior. This result is consistent with the findings of Scott-Parker et al. (2011), who showed that more risky driving behavior is in general practiced by punishment avoiders. Situational avoidance behavior is derived mainly from drivers' after-driving experience, especially experience of accidents while driving. Drivers tend to perform avoidance behaviors in situations in which their impairments identified or obtained from previous crash involvement might expose them to an increased risk of accident (Motak et al. 2014). Ten situations were identified by Motak et al. (2014): driving at night, at night in the rain, long distances, in the rain, in fog, during rush hour, at roundabouts, left turns, in the snow, and on highways.

In more general avoidance driving research conducted by Stewart and Peter (2004), a questionnaire for the Driving and Riding Avoidance Scale was developed. Four types of avoidance behavior—general avoidance, traffic avoidance, weather avoidance, and riding avoidance—were generated from 20 related items. Stewart and Peter (2004) also showed that stronger avoidance behaviors could be identified from drivers who experienced medical treatments from crash-related injuries than from those who were uninjured or injured and not medically treated. Naumann et al. (2011) investigated drivers' self-restriction behaviors (or avoidance behaviors) by focusing on three high-risk conditions: driving at night, driving in bad weather, and driving on highways or high-speed roads. They showed that self-restriction was not only observed in older drivers, but also in young drivers: 25 %

of drivers aged 18–24 years reported avoiding driving at night, 50 % reported avoiding driving in bad weather (the percentage was higher among young female drivers than older female drivers), and nearly 20 % reported avoiding driving on highways or high-speed roads. Le Bas et al. (2015) used the Multidimensional Personality Questionnaire 28-item harm avoidance subscale to predict young drivers' driving risk together with a series of self-report items and found that higher levels of driving risk related to higher levels of impulsivity and lower levels of harm avoidance (indicating fearlessness).

11.3.6 Mood During Driving and Driving Purpose

Because of the time and money spent on car use, transportation demand models have traditionally assumed that drivers derive negative utility from car use. However, a recent study in Denmark showed that Danish adolescents can be classified into three groups (Sigurdardottir et al. 2014): "The first group are car enthusiasts who associate cars with high instrumental, affective, symbolic and relational values, have car-oriented social networks and imagine a car-oriented lifestyle. The second group are car pragmatists, who associate cars with high instrumental and relational values, perceive car expenses as a barrier and imagine a car-oriented lifestyle only in the long term. The third group are car skeptics, who have low interest in cars and imagine a cycling-oriented future." Belgiawan et al. (2014) conducted a cross-country comparison (including both developed and developing countries) of university students' car ownership motivations and found that the emotional attachment of students to cars can be grouped into four categories: symbolic affective (whether cars allow one to distinguish oneself from others, are trendy, bring prestige, are cool, allow one to express oneself, are fun to have); independent (whether cars are convenient, give freedom to travel anytime, help one to save time when making a trip, are useful to pick up or drop off others); negative aspects (whether cars are expensive to own and maintain, disturb one's neighborhood, give an arrogant impression); and social orderliness (whether cars allow one to travel safely, are environmentally friendly). This evidence suggests that, at least for young people, car use may also involve a variety of positive feelings during driving.

In the case of risky driving, although a large body of work has accumulated on the effects of anger on driving, only a limited number of studies have focused on the effects of positive emotions on both perceptions of and experiences while driving. According to the review by Rhodes et al. (2015), (1) young male drivers tend to enjoy risky driving, (2) people in a happy mood tend to engage in less effortful information processing, leading them to engage in risky driving, and (3) individuals in a negative mood are more likely to engage in effortful and systematic processing of information, resulting in better driving. Based on a driving simulation experiment, Rhodes et al. (2015) confirmed that faster driving speed was significantly associated with driving in a happy mood and with a passenger,

but that careless driving was not related to mood. As described in Sect. 11.3.1, mood management is an important driving task for drivers. Do such findings suggest that traffic safety policy makers should work out how to make drivers unhappy to avoid risky driving? Should policy makers force or encourage drivers to concentrate on driving by distracting them from enjoying a pleasant/happy driving experience? Is the implication that the role of traditional traffic safety measures in reducing risky driving is very limited, as partially indicated by the risk homeostasis theory? None of these inferences seems convincing.

Mood during driving is not only induced by driving or the driving environment. It may also come from participation in activities before and after driving (e.g., enjoying talking to a close friend before driving, or having a quarrel with a family member; anticipating talking to a close friend waiting at the destination, or going to meet a customer to apologize to them for some reason). Mood management for safe driving should go on continuously over time (i.e., before, during, and after driving). Studies of young drivers suggest that a happy mood usually results in risky driving, especially in the presence of a friend. On the other hand, experiencing risky behavior might be positive for promoting lifelong traffic safety measures because of the effects of drivers' learning behavior over time. To examine this hypothesis, it is necessary to understand better drivers' use of time and affective experience while driving.

People drive for various purposes, which may affect their mood during driving. The risky driving behavior of young people is particularly associated with psychosocial maturation during the development of their identity as a driver (Scott-Parker et al. 2015b). Scott-Parker et al. (2015b) summarized the various purposes of driving: meeting mobility needs (having a reliable, flexible, efficient, and economical means of transport; readily meeting a variety of needs; engaging in multipurpose trips); facilitating time spent with friends; driving for leisure, relaxation, fun, and excitement; the enjoyment of driving; sensation seeking; self-expression; and gaining social status, independence, and freedom. Because some of these purposes might be met by performing other activities rather than driving, it suggests that driving might be interrelated with the other activities and therefore mood management should be go on not only while driving, but also when performing the other activities.

11.3.7 Driving and Nightlife

Traffic accidents, sexually transmitted diseases, unwanted pregnancies, drunkenness, and drug use (especially of psychostimulants) are negative aspects associated with recreational nightlife (Becoña Iglesias et al. 2011). Road accidents associated with nightlife alcohol and recreational drug use are a major health problem for young people (Calafat et al. 2009a). In OECD countries in recent decades, over 8500 young drivers were killed each year in accidents that tended to occur on weekend nights and when driving under the influence of alcohol (Scagnolaria et al.

2015). Using data collected from regular nightlife users in nine European cities in 2006, Calafat et al. (2009a) found that males were more likely to be drunk and take drugs, resulting in getting a lift from someone drunk or driving drunk; drunkenness was related to risky behaviors and older young people were less likely to cause traffic accidents. Impulsivity, a preference for using a private car to get to nightlife venues, and being unemployed were associated with riding with a driver under the influence of alcohol or drugs (Calafat et al. 2009b). It seems that there are some potential associations between cultural patterns, social norms, and nightlife risk behaviors (Calafat et al. 2011). Indeed, young people admit that fines, speed cameras, and alcohol breath testing reduce risky driving; however, they also claim that a lack of public transport alternatives on weekends and at night is associated with their risky driving behavior (Ramos et al. 2008). Based on a stated preference survey, Scagnolaria et al. (2015) reported young people's greater preference for using minibuses and sharing a taxi to enjoy their nightlife; moreover, to keep young people from using their cars, they suggested the need to provide low-cost, fast, and flexible public transport to get to events and back home, which would contribute to fewer traffic accidents.

It is obviously important to change young people's attitudes toward drink-driving and to recognize more clearly the risky driving behavior involved. Smartphones may play a positive role in this respect. Pocuca et al. (2016) noted that young people's knowledge of the consequences of drink-driving and ways to avoid it may be improved with the assistance of a well-designed smartphone app. Jiang et al. (2015) reported that a GPS-enabled smartphone app (Zhang et al. 2014) that diagnoses driving safety by measuring three types of driving risks—compliance level with speed limits, abrupt acceleration and deceleration, and driving stability—was more effective in assisting drivers to comply with speed limits than in controlling acceleration and deceleration. The effects showed a large variation depending on driving propensity.

11.3.8 Self-driving Cars and Young People

Young people are always curious about new things, and self-driving cars will be no exception. A self-driving car (autonomous car, driverless car, or robotic car) is a vehicle that is able to move by itself with the assistance of various sensing and positioning technologies, without any human input while moving. It is designed for a zero-accident society. Because of the likely natural curiosity of young people, some automakers have even released a self-driving concept vehicle created for young people.[10] Other advantages of autonomous cars have been reported from the perspectives of safety, congestion, energy use, and land use (Anderson et al. 2014), even though autonomous vehicles with current technologies are still far

[10]http://www.dezeen.com/2015/10/28/mercedes-benz-autonomous-electric-concept-car-vision-tokyo-urban-hipsters/ (accessed February 13, 2016).

from the ambitious zero-accident goal. The University of Michigan's Transportation Research Institute has reported that autonomous cars were five times more likely to crash than conventional cars, with the current very low distance accumulated by autonomous cars.[11] Nevertheless, it is expected that more advanced technologies will improve further the safety level in the future.

Schoettle and Sivak (2014) conducted a public opinion survey about autonomous and self-driving vehicles in the US, the UK, and Australia. Younger respondents were more interested in having their vehicles equipped with self-driving technologies and were more willing to ride in self-driving vehicles, probably because they were more likely to expect less traffic congestion, shorter travel time, and lower insurance rates with self-driving vehicles. Somers and Weeratunga (2015) argued that younger generations, who value their time on social networks more than older generations, may be more receptive to autonomous cars. LoBello (2015) noted that 65 % of students would use a self-driving car if it was controlled by both computer and humans and over 90 % of students would use a self-driving car if auto insurance premiums were to be cut by 50 %. In contrast, Casley et al. (2013) reported that younger persons seemed to be more worried about the safety of autonomous cars and felt less comfortable in one. Young people's greater concerns about safety issues of self-driving cars were also reported by Anderson et al. (2014) and LoBello (2015).

Considering these conflicting viewpoints of young people about self-driving cars, more studies are required, especially concerning the various potential ways of using self-driving cars.

11.4 Conclusions

We recognize that there are many relevant theories and models of risky behaviors that explore a range of factors. In their systematic literature review of the relationship between risky decision making and aggression, Kuin et al. (2015) found that increased risk taking on decision-making tasks was related to higher levels of aggression, especially with respect to reactive aggression (with a premeditated aim to gain an intended advantage), as well as to proactive aggression (as a result of perceived provocation/threat or intense emotion and lack of impulse control). The two types of aggression are highly correlated. More importantly, the problems in risky decision making and reactive aggression both derive from the same underlying orbitofrontal deficit (e.g., Mehta and Beer 2010). This neurological finding suggests a potential correlation between risky decision making and aggression. Related to this argument, Kuin et al. (2015) further found that previous violent (criminal) behaviors or current aggressive feelings were significantly correlated with greater risk taking in decision-making tasks. As a concrete example, Hanna et al. (2001) showed that for young people, being a former alcohol drinker was

[11] http://fortune.com/2015/10/29/self-driving-cars-crash/ (accessed February 13, 2016).

associated with being a current smoker, which was also a strong predictor for using other drugs, implying that drinking and smoking might share some common factor inherent in an adolescent's biological or psychological makeup from childhood or birth. With a focus on low-income African-American youth, Hsieh et al. (2015) found that risks in one domain manifested as risks in the same domain across time in addition to spreading to other domains. This conclusion is consistent with the findings from studies reviewed by Hsieh et al. (2015): "high risk driving during youth is associated with other risk-taking behaviors, such as delinquency, unprotected sex, drinking, and the use of drugs". These conclusions suggest that risky behaviors tend to covary, implying that interventions should jointly target multiple risky behaviors. Indeed, this argument is supported by the concept of developmental cascades, which refer to the notion that developmental effects in one ecological domain may spill over to influence multiple domains later in development (Donovan 1993; Pharo et al. 2011).

As for risky driving, it seems that young people's various habits in daily life and at least some criteria (e.g., value of life and/or time, social norms, attitudes, and liking) for life choices are associated with driving risks and safety as well as daily security. Effective traffic safety measures for young people may also be adopted with a focus on life situations and purposes. Different life purposes are associated with different life choices, such as family formation, social networks, and residential location. Various habits formed in daily life over years may affect driving risks and/or safety. People who tend to behave in a well-planned way may arrange their daily trips following a schedule determined in advance. They may drive following a predetermined schedule and consequently may not necessarily drive very fast to reach their destination. In such cases, their driving may be safer than other types of drivers. People who purposely choose to reside in a location free of natural disasters may also drive safely, partly because their awareness of safety and security may be a prioritized criterion in their daily decisions. Individuals who are likely to be risk takers in other daily activities (e.g., always being late for work and appointments, often making decisions without careful consideration, enjoying adventurous activities) might also take risks driving. People who usually behave strictly based on rules in general may also tend to obey traffic rules. Individuals who are usually good at multitasking and/or who like to multitask to save time may be likely to do other things while driving, which is in fact dangerous behavior. Traffic safety education in primary and secondary schools is such an example, while involving young people in regular safety campaigns may be another. Other examples may include the involvement of young people in various public decisions, encouraging them to undertake more voluntary activities (both during school and work), and providing them with attractive and convenient recreational environments with good access to public transportation systems.

This literature review suggests that risky behaviors in life are not independent, which implies that understanding them demands interdisciplinary approaches. Reducing risky behaviors—which are harmful not only to people themselves but also to society—requires various sectors to collaborate with each other to enhance

the efficiency and effectiveness of efforts such as laws and regulations, economic measures (both incentive-based and punishment-based measures), technological developments, and enlightenment.

References

Ajzen I (1988) Attitudes, personality, and behavior. Dorsey, Chicago, IL
Ajzen I (1991) The theory of planned behavior. Organ Behav Hum Decis Process 50:179–211
Ajzen I (2011) The theory of planned behavior: reactions and reflections. Psychol Health 26(9):1113–1127
Allen JP, Brown BB (2008) Adolescents, peers, and motor vehicles: the perfect storm? Am J Prev Med 35:S289–S293
American Psychiatric Association (2013) Diagnostic and statistical manual of mental disorders, 5th edn. American Psychiatric Association, Washington, DC
Anderson JM, Kalra N, Stanley KD, Sorensen P, Samaras C, Oluwatola OA (2014) Autonomous vehicle technology: a guide for policymakers. RAND Corporation. Available: http://www.rand.org/content/dam/rand/pubs/research_reports/RR400/RR443-2/RAND_RR443-2.pdf. Accessed 29 May 2016
Baron SW, Forde DR, Kay FM (2007) Self-control, risky lifestyles, and situation: the role of opportunity and context in the general theory. J Crim Justice 35(2):119–136
Basch CE, DeCicco IM, Malfetti JL (1989) A focus group study on decision processes of young drivers: reasons that may support a decision to drink and drive. Health Educ Q 16:389–396
Beck KH, Shattuck T, Raleigh R (2001a) Parental predictors of teen driving risk. Am J Health Behav 25(1):10–20
Beck KH, Shattuck T, Raleigh R (2001b) A comparison of teen perceptions and parental reports of influence on driving risk. Am J Health Behav 25(4):376–387
Becoña Iglesias E, López-Durán A, Fernández Del Río E, Martínez Pradeda Ú, Osorio López J, Fraga Ares J, Arrojo Romero M, López Crecente F, Domínguez González MN (2011) Drunkenness, driving and sexual relations in young cocaine and ecstasy users. Adicciones 23(3):205–218
Belgiawan PF, Schmocker J-D, Abou-Zeid M, Walker J, Lee T-C, Ettema DF, Fujii S (2014) Car ownership motivations among undergraduate students in China, Indonesia, Japan, Lebanon, Netherlands, Taiwan, and USA. Transportation 41(6):1227–1244
Bianchi A, Summala H (2004) The "genetics" of driving behavior: parents' driving style predicts their children's driving style. Accid Anal Prev 36:655–659
Bina M, Graziano F, Bonino S (2006) Risky driving and lifestyles in adolescence. Accid Anal Prev 38(3):472–481
Bingham CR, Shope JT, Raghunathan T (2006) Patterns of traffic offenses from adolescent licensure into early young adulthood. J Adolesc Health 39(1):35–42
Bolderdijk JW, Knockaert J, Steg EM, Verhoef ET (2011) Effects of Pay-As-You-Drive vehicle insurance on young drivers' speed choice: Results of a Dutch field experiment. Accid Anal Prev 43:1181–1186
Bowen M (1978) Family therapy in clinical practice. Jason Aronson, New York, London
Brijs K, Brijs T, Sann S, Trinh TA, Wets G, Ruiter RAC (2014) Psychological determinants of motorcycle helmet use among young adults in Cambodia. Transp Res Part F 26:273–290
Buckley L, Chapman RL (2016) Characteristics of adolescents who intervene to stop the risky and dangerous behavior of their friends. Accid Anal Prev 88:187–193
Calafat A, Blay N, Juan M, Adrover D, Bellis MA, Hughes K, Stocco P, Siamou I, Mendes F, Bohrn K (2009a) Traffic risk behaviors at nightlife: drinking, taking drugs, driving, and use of public transport by young people. Traffic Inj Prev 10(2):162–169

Calafat A, Adrover-Roig D, Blay N, Juan M, Bellis M, Hughes K, Mendes F, Kokkevi A (2009b) Which young people accept a lift from a drunk or drugged driver? Accid Anal Prev 41(4):703–709

Calafat A, Blay NT, Hughes K, Bellis M, Juan M, Duch M, Kokkevi A (2011) Nightlife young risk behaviours in Mediterranean versus other European cities: are stereotypes true? Eur J Pub Health 21(3):311–315

Casley SV, Jardim AS, Quartulli AM (2013) A study of public acceptance of autonomous cars. Worcester Polytechnic Institute, Bachelor Thesis

Castanier C, Deroche T, Woodman T (2013) Theory of planned behavior and road violations: the moderating influence of perceived behavioural control. Transp Res Part F 18:148–158

Catalano RF, Kosterman R, Hawkins JD, Newcomb MD, Abbott RD (1996) Modeling the etiology of adolescent substance use: a test of the social development model. J Drug Issues 26(2):429–455

Cestac J, Paran F, Delhomme P (2011) Young drivers' sensation seeking, subjective norms, and perceived behavioral control and their roles in predicting speeding intention: how risk-taking motivations evolve with gender and driving experience. Saf Sci 49(3):424–432

Chan DCN, Wu AMS, Hung EPW (2010) Invulnerability and the intention to drink and drive: an application of the theory of planned behavior. Accid Anal Prev 42:1549–1555

Chorlton K, Conner M, Jamson S (2012) Identifying the psychological determinants of risky riding: An application of an extended theory of planned behaviour. Accid Anal Prev 49:142–153

Chung YS (2015) Seemingly irrational driving behavior model: the effect of habit strength and anticipated affective reactions. Accid Anal Prev 82:79–89

Chung YS, Wong JT (2012) Beyond general behavioral theories: structural discrepancy in young motorcyclist's risky driving behavior and its policy implications. Accid Anal Prev 49:165–176

Chung EK, Choe B, Lee JE, Lee JI, Sohn YW (2014) Effects of an adult passenger on young adult drivers' driving speed: roles of an adult passenger's presence and driving tips from the passenger. Accid Anal Prev 67:14–20

Cieslik M, Simpson D (2013) Key concepts in youth studies. Sage, London

Cristea M, Paran F, Delhomme P (2013) Extending the theory of planned behavior: the role of behavioral options and additional factors in predicting speed behavior. Transp Res Part F: Traffic Psychol Behav 21:122–132

Dahlen ER, Martin RC, Ragan K, Kuhlman MM (2005) Driving anger, sensation seeking, impulsiveness, and boredom proneness in the prediction of unsafe driving. Accid Anal Prev 37(2):341–348

DeJoy DM (1989) The optimism bias and traffic accident risk perception. Accid Anal Prev 21:333–340

Desrichard O, Roché S, Bègue L (2007) The theory of planned behavior as mediator of the effect of parental supervision: a study of intentions to violate driving rules in a representative sample of adolescents. J Saf Res 38(4):447–452

Diene E, Lucas R (1999) Personality and subjective well-being. In: Kahneman D, Diener E, Schwarz N (eds) Well-being: the foundations of hedonic psychology. Russell-Sage, New York, pp 213–229

Diener E (1994) Assessing subjective well-being: progress and opportunities. Soc Indic Res 31(2):103–157

Diener E (2009) The science of well-being. Springer, New York

Donovan JE (1993) Young adult drinking-driving: behavioral and psychosocial correlates. J Stud Alcohol 54(5):600–613

Dunkel CS, Decker M (2010) Convergent validity of measures of life-history strategy. Personality Individ Differ 48:681–684

Elliott DS (1994) Serious violent offenders: onset, developmental course, and termination: the American Society of Criminology 1993 Presidential Address. Criminology 32:1–21

Feinberg ME, Ridenour TA, Greenberg MT (2007) Aggregating indices of risk and protection for adolescent behavior problems: the communities that care youth survey. J Adolesc Health 40:506–513

Feinberg ME, Sakuma K-L, Hostetler M, McHale SM (2013) Enhancing sibling relationships to prevent adolescent problem behaviors: theory, design and feasibility of siblings are pecial. Eval Program Plan 36:97–106

Ferguson SA, Williams AF, Chapline JF, Reinfurt DW, De Leonardis DM (2001) Relationship of parent driving records to the driving records of their children. Accid Anal Prev 33:229–234

Fleiter JJ, Watson B (2005) The speed paradox: the misalignment between driver attitudes and speeding behavior. In: Proceedings of the Australasian road safety research, policy and education conference. Wellington, New Zealand, 14–16 Nov 2005

Fleiter JJ, Lennon A, Watson B (2010) How do other people influence your driving speed? Exploring the 'who' and the 'how' of social influences on speeding from a qualitative perspective. Transp Res Part F 13(1):49–62

Friedman A (2013) Adverse events and risky behaviors: evidence from adolescents. Job Market Paper, Harvard University. http://scholar.harvard.edu/files/afriedman/files/jmp_abbyfriedman.pdf. Accessed 31 Jan 2016

Gardner W (1993) A life-span rational-choice theory of risk taking. In: Bell RW, Bell NJ (eds) Adolescent risk taking. Sage Publications, Newbury Park, pp 66–83

Gauld CS, Lewis I, White KM (2014) Concealed texting while driving: what are young people's beliefs about this risky behaviour? Saf Sci 65:63–69

Gheorghiu A, Delhomme P, Felonneau ML (2015) Peer pressure and risk taking in young drivers' speeding behavior. Transp Res Part F Traffic Psychol Behav 35:101–111

Gnardellis C, Tzamalouka G, Papadakaki M, Chliaoutakis JE (2008) An investigation of the effect of sleepiness, drowsy driving, and lifestyle on vehicle crashes. Transp Res Part F 11(4):270–281

Guppy A (1993) Subjective probability of accident and apprehension in relation to self-other bias, age, and reported behavior. Accid Anal Prev 25:375–382

Guttman N (2013) "My son is reliable": young drivers' parents' optimism and views on the norms of parental involvement in youth driving. J Adolesc Res 28(2):241–268

Gwyther H, Holland C (2015) An intervention encouraging planned self-regulation and goal setting in drivers across the lifespan: Testing an extended theory of planned behaviour. J Transp Health 2(2):289–301

Hanna EZ, Yi H, Dufour MC, Whitmore CC (2001) The relationship of early-onset regular smoking to alcohol use, depression, illicit drug use, and other risky behaviors during early adolescence: results from the youth supplement to the third national health and nutrition examination survey. J Subst Abuse 13:265–282

Harre N (2000) Risk evaluation, driving, and adolescents: a typology. Dev Rev 20(2):206–226

Hatfield J, Fernandes R, Soames Job RF (2014) Trill and adventure seeking as a modifier of the relationship of perceived risk with risky driving among young drivers. Accid Anal Prev 62:223–229

Hawkins JD, Weis JG (1985) The social development model: an integrated approach to delinquency prevention. J Primary Prev 6:73–97

Heinrich HW (1931) Industrial accident prevention: a scientific approach. McGraw-Hill, New York

Horvath C, Lewis I, Watson B (2012) The beliefs which motivate young male and female drivers to speed: a comparison of low and high intenders. Accid Anal Prev 45:334–351

Hoyes TW, Dorn L, Desmond PA, Taylor R (1996) Risk homeostasis theory, utility and accident loss in a simulated driving task. Saf Sci 22:49–62

Hsieh H-F, Heinze JE, Aiyer SM, Stoddard SA, Wang J-L, Zimmerman MA (2015) Cross-domain influences on youth risky driving behaviors: a developmental cascade analysis. J Appl Dev Psychol 38:11–21

Huang P, Winston FK (2011) Young drivers. In: Porter BE (ed) Handbook of traffic psychology. Academic Press, New York, pp 315–338
Jessor R (1991) Risk behavior in adolescence: a psychosocial framework for understanding and action. J Adolesc Health 12(8):597–605
Jessor R, Jessor SL (1977) Problem behavior and psychological development: a longitudinal study of youth. Academic Press, New York
Jiang Y, Zhang J, Chikaraishi M, Seya H, Fujiwara A (2015) Driving speed control behavior and safety on expressways under smart phone app based traffic safety information provision. In: Presented at the 14th international conference on travel behaviour research. Windsor, UK, 19–23 July 2015
Kabiru CW, Elung'ata P, Mojola SA, Beguy D (2014) Adverse life events and delinquent behavior among Kenyan adolescents: a cross-sectional study on the protective role of parental monitoring, religiosity, and self-esteem. Child Adolescent Psychiatry Mental Health 8:24
Kahneman D, Krueger AB, Schkade DA, Schwarz N, Stone AA (2004) A survey method for characterizing daily life experience: the day reconstruction method. Science 306(5702):1776–1780
Kaplan HS, Gangestad SG (2005) Life history theory and evolutionary psychology. In: Buss DM (ed) The handbook of evolutionarily psychology. Wiley, New York, pp 528–551
Kuin H, Masthoff E, Kramer M, Scherder E (2015) The role of risky decision-making in aggression: a systematic review. Aggression Violent Behav 25:159–172
Lam LT (2015) Parental mental health and internet addiction in adolescents. Addict Behav 42:20–23
Lane SD, Cherek DR (2000) Analysis of risk taking in adults with a history of high risk behavior. Drug Alcohol Depend 60:179–187
Lantz PM, Jacobson PD, Warner KE, Wasserman J, Larson B (2000) Investing in youth tobacco control: a review of smoking prevention and control strategies. Tobacco Control 9(1):47–63
Le Bas GA, Hughes MA, Stout JC (2015) Utility of self-report and performance-based measures of risk for predicting driving behavior in young people. Personality Individ Differ 86:184–188
Leandro M (2012) Young drivers and speed selection: a model guided by the theory of planned behavior. Transp Res Part F 15(3):219–232
Lenihan F (2007) Computer addiction—a sceptical view: invited commentary on: lost online. Adv Psychiatr Treat 13:31
Liourta E, Empelen PV (2008) The importance of self-regulatory and goal-conflicting process in the avoidance of drunk driving among Greek young drivers. Accid Anal Prev 40:1191–1199
LoBello A (2015) The implications of self-driving cars on insurance. Bryant University. Available: http://digitalcommons.bryant.edu/cgi/viewcontent.cgi?article=1020&context=honors_mathematics. Accessed 13 Feb 2016
Marcila I, Bergeron J, Audet T (2001) Motivational factors underlying the intention to drink and drive in young male drivers. J Saf Res 32:363–376
Mason MJ, Tanner JF, Piacentini M, Freeman D, Anastasia T, Batat W, Boland W, Canbulut M, Drenten J, Hamby A, Rangan P, Yang Z (2013) Advancing a participatory approach for youth risk behavior: foundations, distinctions, and research directions. J Bus Res 66:1235–1241
McDonald MM, Donnellan MB, Navarrete CD (2012) A life history approach to understanding the dark triad. Personality Individ Differ 52(5):601–605
Mehta PH, Beer J (2010) Neural mechanisms of the testosterone-aggression relation: the role of orbitofrontal cortex. J Cogn Neurosci 22(10):2357–2368
Melkman E (2015) Risk and protective factors for problem behaviors among youth in residential care. Child Youth Serv Rev 51:117–124
Miller KE (2008) Energy drinks, race, and problem behaviors among college students. J Adolesc Health 43(5):490–497

Miller G, Taubman-Ben-Ari O (2010) Driving styles among young novice drivers—the contribution of parental driving styles and personal characteristics. Accid Anal Prev 42(2):558–570
Moan IS (2013) Whether or not to ride with an intoxicated driver: predicting intentions using an extended version of the theory of planned behaviour. Transp Res Part F 20:193–205
Moan IS, Rise J (2011) Predicting intentions not to "drink and drive" using an extended version of the theory of planned behaviour. Accid Anal Prev 43(4):1378–1384
Moore S (2011) Understanding and managing anti-social behaviour on public transport through value change: the considerate travel campaign. Transp Policy 18(1):53–59
Motak L, Cabaude C, Bouge J-C, Huet N (2014) Comparison of driving avoidance and self-regulatory patterns in younger and older drivers. Transp Res Part F 26:18–27
Naumann R, Dellinger AM, Krenow M (2011) Driving self-restriction in high-risk conditions: how do older drivers compare to others? J Saf Res 42:67–71
O'Brien F, Gormley M (2013) The contribution of inhibitory deficits to dangerous driving among young people. Accid Anal Prev 51:238–242
Pergamit MR, Huang L, Lane J (2001) The long term impact of adolescent risky behaviors and family environment. Submitted to the Office of the Assistant Secretary for Planning and Evaluation, U.S. Department of Health and Human Services. Available: https://aspe.hhs.gov/report/long-term-impact-adolescent-risky-behaviors-and-family-environment. Accessed 2 Feb 2016
Pharo H, Sim C, Graham M, Gross J, Hayne H (2011) Risky business: executive function, personality, and reckless behavior during adolescence and emerging adulthood. Behav Neurosci 125(6):970–978
Pilkington P, Bird E, Gray S, Towner E, Weld S, McKibben M-A (2014) Understanding the social context of fatal road traffic collisions among young people: a qualitative analysis of narrative text in coroners' records. BMC Public Health, Vol. 14, Article Number: 78
Pocuca N, Hides L, Zelenko O, Quek L-H, Stoyanov S, Tulloch K, Johnson D, Tjondronegoro D, Kavanagh DJ (2016) Initial prototype testing of ray's night out: a new mobile app targeting risky drinking in young people. Comput Hum Behav 54:207–214
Prentice C, Cotte J (2015) Multiple Ps' effects on gambling, drinking and smoking: advancing theory and evidence. J Bus Res 68:2045–2048
Ramos P, Díez E, Pérez K, Rodriguez-Martos A, Brugal MT, Villalbí JR (2008) Young people's perceptions of traffic injury risks, prevention and enforcement measures: a qualitative study. Accid Anal Prev 40(4):1313–1319
Rhodes N, Pivik K, Sutton M (2015) Risky driving among young male drivers: the effects of mood and passengers. Transp Res Part F 28:65–76
Rowe R, Andrews E, Harris PR, Armitage CJ, McKenna FP, Norman P (2016) Identifying beliefs underlying pre-drivers' intentions to take risks: an application of the theory of planned behaviour. Accid Anal Prev 89:49–56
Scagnolaria S, Walker J, Maggia R (2015) Young drivers' night-time mobility preferences and attitude toward alcohol consumption: a hybrid choice model. Accid Anal Prev 83:74–89
Schoettle B, Sivak M (2014) A survey of public opinion about autonomous and self-driving vehicles in the U.S., the U.K., and Australia. Report No. UMTRI-2014-21, Transportation Research Institute, The University of Michigan
Scott-Parker B, Watson B, King MJ, Hyde MK (2011) Mileage, car ownership, experience of punishment avoidance and the risky driving of young drivers. Traffic Inj Prev 12(6):559–567
Scott-Parker B, Watson B, King MJ, Hyde MK (2014) "I drove after drinking alcohol" and other risk driving behaviours reported by young novice drivers. Accid Anal Prev 70:65–73
Scott-Parker B, Watson B, King MJ, Hyde MK (2015a) "I would have lost the respect of my friends and family if they knew I had bent the road rules": parents, peers, and the perilous behaviour of young drivers. Transp Res Part F 28:1–13
Scott-Parker B, King MJ, Watson B (2015b) The psychosocial purpose of driving and its relationship with the risky driving behaviour of young novice drivers. Transp Res Part F 33:16–26

Sigurdardottir SB, Kaplan S, Moller M (2014) The motivation underlying adolescents' intended time-frame for driving licensure and car ownership: a socio-ecological approach. Transp Policy 36:19–25

Simons-Morton BG, Ouimet MC, Catalano RF (2008) Parenting and the young driver problem. Am J Prev Med 35(3):S294–S303

Slovic P, Fischhoff B (1982) Targeting risks. Risk Anal 2(4):227–234

Somers A, Weeratunga K (2015) Automated vehicles: are we ready? Internal report on potential implications for main roads Western Australia. Available: https://www.mainroads.wa.gov.au/Documents/Automated%20Vehicle%20Report.RCN-D15%5E2381741.PDF. Access 29 May 2016

Stearns SC (2004) The evolution of life histories. Oxford University Press, New York

Steinberg L, Morris AS (2001) Adolescent development. Annu Rev Psychol 52:83–110

Sterrett EM, Dymnicki AB, Henry D, Byck GR, Bolland J, Mustanski B (2014) Predictors of co-occurring risk behavior trajectories among economically disadvantaged African-American youth: contextual and individual factors. J Adolesc Health 55:380–387

Stewart AE, Peter CCS (2004) Driving and risking avoidance following motor vehicle crashes in a non-clinical sample: psychometric properties of a new measure. Behav Res Therapy 42:859–879

Stradling SG (2011) Travel mode choice. In: Porter BE (ed) Handbook of traffic psychology. Elsevier, Amsterdam

Taubman-Ben-Ari O, Katz-Ben-Ami L (2012) The contribution of family climate for road safety and social environment to the reported driving behavior of young drivers. Accid Anal Prev 47:1–10

Trimpop RM (1994) The psychology of risk taking behavior. North-Holland, New York

United Nations Population Fund (2014) The power of 1.8 billion: Adolescents, youth and the transformation of the future. Available: https://www.unfpa.org/sites/default/files/pub-pdf/EN-SWOP14-Report_FINAL-web.pdf. Accessed 31 Jan 2016

Van Acker V (2016) Lifestyles and life choices. In: Zhang J (ed) Life-oriented behavioral research for urban policy. Springer, Chapter 3

Wang XT, Kruger DJ, Wilke A (2009) Life history variables and risk-taking propensity. Evol Hum Behav 30:77–84

Ward RB (2012) Revisiting Heinrich's law [online]. In: Chemeca 2012: quality of life through chemical engineering, Wellington, New Zealand, vol 2012. A.C.T.: Engineers Australia, Barton, 23–26 Sept 2012, pp 1179–1187

Weber EU, Blais AR, Betz NE (2002) A domain-specific risk attitude scale: measuring risk perceptions and risk behaviors. J Behav Decis Making 15:263–290

Wenner CJ, Bianchi J, Figueredo AJ, Philippe Rushton J, Jacobs WJ (2013) Life history theory and social deviance: the mediating role of executive function. Intelligence 41:102–113

WHO (World Health Organization) (2014) Health for the World's Adolescents. A second chance in the second decade, www.who.int/adolescent/second-decade

WHO (World Health Organization) (2015) Global status report on road safety 2015

Wilde GJS (1982) The theory of risk homeostasis: Implications for safety and health. Risk Anal 2(4):209–925

Wilde GJS (1998) Risk homeostasis theory: an overview. Inj Prev 4:89–91

Young K (2010) Internet addiction over the decade: a personal look back. World Psychiatry 9:91

Yu M, Nebbitt VE, Lombe M, Pitner RO, Salas-Wright CP (2012) Understanding tobacco use among urban African American adolescents living in public housing communities: a test of problem behavior theory. Addict Behav 37:978–981

Zhang J, Jiang Y, Sasaki K, Tsubouchi M, Matsushita T, Kawai T, Fujiwara A (2014) A GPS-enabled smart phone app with simplified diagnosis functions of driving safety and warning information provision. In: Proceedings of the 21st world congress of intelligent transport systems. Detroit, USA, 7–11 Sept 2014