

## Evidence Brief: Predictors and risk factors of texting and driving among youth



October 2014

### Background

#### ***Distracted Driving***

Distracted driving occurs when a driver's attention is temporarily diverted from the task of driving to an object, person, or task not related to driving.<sup>1</sup> This might include distractions which are visual (i.e., taking your eyes off the road), manual (i.e., taking your hands off the wheel) or cognitive (i.e., taking your mind off the road).<sup>2-4</sup> Distractions may be internal (i.e., coming from within the vehicle or the individual's mind), or external (i.e., coming from outside the vehicle such as signs or other vehicles).<sup>4-6</sup> For instance, texting and driving can be considered a visual, manual and cognitive distraction which is internal to the car and requires the driver to remove their eyes, hands and mind from the task of driving.

Distracted driving is a particular concern for youth. Previous data have suggested that younger drivers are more frequently engaged in distracted driving than older drivers.<sup>7,8</sup>

According to a 2007 Traffic Injury Research Foundation (TIRF) report, Canadians ages 16 to 24 were more likely than their older peers to have steered or braked to avoid a collision due to an in-car distraction.<sup>9</sup> Additionally, between 2008-10, 19.4% of female and 15% of male teen driver fatalities (ages 16 to 19) were due to distraction.<sup>9</sup> According to current collision trends, fatalities from the impacts of distracted driving are forecasted to exceed those from drinking and driving by 2016.<sup>10</sup>

#### ***Texting and Driving***

Among all causes of distracted driving, youth texting and driving is of particular concern. Tisen et al., (2011) found that drivers younger

than 25 years of age were more likely than older drivers to read or send text messages or e-mails while driving.<sup>8</sup> Atchley et al., (2011) found that 70% of young American adult drivers surveyed (ages 18 to 30) reported initiating texts while driving, while higher numbers reported replying to (81%) and reading texts (92%) while driving.<sup>11</sup> Within Ontario, the Ontario Student Drug Use and Health Survey (OSDUHS) reported that in 2013, over one-third (35.9%) of Ontario student drivers, grades 10-12, self-reported texting and driving at least once in the past year.<sup>12</sup> Males (34.9%) and females (37.1%) were equally likely to report texting and driving in the past year, and there were no significant differences by geographic location.<sup>12</sup>

These high rates of texting and driving behaviour among youth are concerning as texting and driving increases collision or near-collision event risk by 23 times compared to those driving without any distraction.<sup>13</sup> A simulation study conducted by Hosking et al., (2006) noted that young drivers (ages 18 to 21) spent 400% more time looking away from the road when they were texting compared to when they were not texting.<sup>14</sup> Additionally, Long et al., (2012) found that cognitive reaction time increased by 74% when texting while driving.<sup>15</sup>

### ***Preventing Texting and Driving***

#### ***Laws***

To limit the risk and harm associated with distracted driving, particularly distractions associated with hand-held devices, Ontario introduced a ban on the use of hand-held devices while driving in October, 2009.<sup>16</sup> The law prohibits drivers from talking, texting, typing, dialing or emailing using hand-held cell phones and other hand-held communication or entertainment devices. Previously, failing to comply with the law resulted in a \$155 fine and no demerit points;<sup>16</sup> however as of March 2014, Ontario introduced its *Keeping Ontario's Roads*

*Safe Act*. Supporting amendments to the Highway Traffic Act are intended to make highways and roads safer and include increasing fines for distracted driving from \$60 - \$500 to a range of \$300 - \$1,000 and assigning three demerit points upon conviction.<sup>10</sup>

#### ***Education***

To complement the distracted driving law of 2009, a number of campaigns and programs have taken place in Ontario to reduce distracted driving. For instance, the Ministry of Transportation introduced a program called *iDrive* which raises awareness among youth about the risks of unsafe driving behavior.<sup>16</sup> Posters and brochures were distributed in communities across the province, reminding drivers of all ages to keep their hands on the wheel and their eyes on the road while driving. Additionally, signs have been placed on roads reminding drivers that hand-held devices are prohibited, and to put their phones away.<sup>16</sup> There have also been a number of distracted driving campaigns in Canada specifically targeting youth including the *Drop It and Drive*, *Think and Drive*, and *Is It Worth It?* campaigns.<sup>17</sup>

### ***Predictors and Risk Factors of Texting and Driving among Youth***

Education and awareness might not be enough to deter youth from engaging in distracted driving behaviors. Peters et al., (2001) suggested that “merely conveying the fact that distractors result in accidents will not appreciably reduce the risks when there are perceived benefits or incentives to use the distractors”.<sup>18</sup> For instance, Cazzulino et al., (2014) found that despite being aware of the risks of distracted driving, many young drivers continued to engage in the behavior.<sup>19</sup> Therefore it is important to understand the predictors and/or risk factors that influence texting and driving among youth in order to better target their behavior. Gauld (2014) suggests that understanding the beliefs and factors that motivate a behaviour may be

helpful in developing effective countermeasures for the behaviour.<sup>20</sup>

## Issue and Research Question

Youth texting and driving is likewise a concern among public health professionals. Despite being considered a serious problem, many youth still engage in the behavior, resulting in fatal collisions. To better inform the development of interventions targeting this risky behavior, this Evidence Brief asks: What are the risk factors and predictors of texting and driving among youth ages 16 to 24?

## Methods

A literature search was conducted on July 22, 2014 by a Research Librarian for articles published from its earliest records to present. The search involved five databases including MEDLINE, Embase, CINAHL, Transport Research International Documentation (TRID) and Scopus. The full search strategy can be obtained from Public Health Ontario (PHO). All articles retrieved by this search were assessed for eligibility by one reviewer with a 20% sample screened by three secondary reviewers (each screening 6.6% of the total). Discrepancies between reviewers resulted in a full text article review. Articles were eligible for inclusion if they were a primary study that examined the predictors and/or risk factors of texting and driving behavior among youth ages 16 to 24. Articles that focused on impairments to driving (i.e., drinking and driving, Attention Deficit Hyperactivity Disorder (ADHD) or fatigue) and/or were set within a developing country were excluded from this review. Full text articles were retrieved, reviewed and relevant information was extracted from each article by one reviewer.

## Main Findings

The search identified 722 articles of which 19 primary studies were selected for full text

review and eight unique primary studies met the inclusion criteria.

Of the eight included primary studies, four examined constructs from the theory of planned behaviour (TPB),<sup>20-23</sup> two examined risk perceptions,<sup>11,24</sup> one examined mindfulness and emotion regulation<sup>25</sup> and the remaining study examined adolescent binge drinking<sup>26</sup> as predictors of texting and driving.

### ***Constructs from the Theory of Planned Behaviour***

Four studies examined constructs from the theory of planned behaviour (TPB) as predictors of texting and driving.<sup>20-23</sup> Of those, two focused specifically on concealed texting and driving defined as ‘a conscious effort to hide one’s texting’ (e.g., hiding phone below the window).<sup>22</sup> The remaining two studies examined obvious texting and driving (i.e., not making a conscious effort to hide texting and driving) or general (i.e. obvious and/or concealed) texting and driving respectively.

The theory of planned behaviour is a widely used model to explain human social behaviour.<sup>27</sup> According to this model, attitudes and subjective norms are suggested to predict intentions, while intentions are proposed to predict behaviour. Perceived behavioural control (PBC) is thought to predict both intentions and behaviour.<sup>27</sup>

### ***General Texting and Driving (Including Obvious and Concealed Texting)***

Nemme et al., (2010) used a self-reported survey to test an extended TPB model to predict young drivers’ (n =169, ages 17 to 24) intentions to engage in general texting and driving (i.e., both obvious and concealed texting).<sup>21</sup> Consistent with the TPB, the survey measured participants’ attitudes, subjective norms, PBC, intentions and behaviour related to reading and sending text messages while driving. Additional

measures including group norms, moral norms and past behaviour were also examined.

Consistent with the TPB, they found that attitudes predicted intentions to send and read text messages while driving. Subjective norms and PBC predicted intentions to send, but not to read text messages while driving, and did not predict texting behaviour.<sup>21</sup> Intentions to text and drive predicted texting and driving behaviour (both reading and sending messages) one week later.

Among the additional constructs measured, group norms, moral norms and past behaviour significantly predicted intentions to text while driving (both sending and reading text messages) with past behaviour and moral norms also predicting texting behaviour (both sending and reading text messages). Of note, gender did not significantly predict youth intentions to engage in texting and driving.<sup>21</sup> Overall, the full model accounted for 38.8% and 49.1% of the variance in sending and reading text messages while driving respectively, demonstrating that the TPB performs well in explaining texting and driving behaviour.

Gauld et al. (2013, 2014) also used a self-reported survey to test an extended TPB model among youth drivers (n = 171, ages 17 to 25).<sup>20,22,23</sup> They examined the original constructs of the TPB (i.e., attitudes, subjective norms, PBC, intentions and behaviour) along with additional predictors of moral norms, mobile phone involvement, and anticipated regret to predict young drivers' intentions to engage in texting and driving and subsequent behaviour.<sup>22,23</sup> Unlike Nemme (2014), they examined obvious and concealed texting behaviour separately and found significant differences between the two behaviours for all standard and extended TPB constructs.<sup>22,23</sup> Gauld (2014) also examined the underlying beliefs associated with young drivers' intentions to engage in concealed texting and driving.<sup>20</sup>

#### *Obvious Texting and Driving*

For obvious texting, all of the standard TPB predictor variables (i.e., attitudes, subjective norms, PBC) were significantly and positively correlated with intentions.<sup>22</sup> Of the extended predictor variables, mobile phone involvement was significantly and positively correlated with intentions, while moral norms were negatively correlated with intentions. Anticipated regret did not emerge as a significant predictor of obvious texting and driving behaviour in the final model.<sup>22</sup> Overall, the standard TPB model (not including extended predictor variables) accounted for 54.6% of the variance in intentions to engage in obvious texting and driving.

#### *Concealed Texting and Driving*

For concealed texting and driving, attitudes, subjective norms, PBC, moral norms, and mobile phone involvement were significant predictors of intentions; intentions were the only significant predictor of self-reported concealed texting and driving behaviour.<sup>23</sup>

Of the extended TPB constructs, moral norms and mobile phone involvement emerged as significant predictors of intentions; however, anticipated regret did not in the final model.<sup>23</sup> Mobile phone involvement was significantly and positively correlated with intentions while moral norms were significantly negatively correlated with intentions. Overall, the full model accounted for 69% of variance in drivers' intentions, and the extended predictors contributed an additional 6% of variance in intentions beyond the standard TPB constructs.<sup>23</sup>

Gauld et al., (2014) also used focus groups and a survey to develop and assess the underlying TPB beliefs (e.g., behavioural beliefs, normative beliefs and control beliefs) regarding concealed texting and driving among youth.<sup>20</sup> They found significant differences between high intenders (i.e., those with high intentions to engage in concealed texting and driving) and low

intenders (i.e., those with low intention to engage in concealed texting and driving) for behaviour beliefs and control beliefs; no significant differences in normative beliefs were found between high and low intenders.<sup>20</sup> For instance, high intenders were more likely to believe that concealed texting while driving would result in positive information sharing with others and using time effectively compared with low intenders. High intenders were also less likely to believe that 'free flowing traffic' would prevent them from concealed texting and driving compared with low intenders.<sup>20</sup>

### *Summary of TPB constructs*

Overall, the standard and extended predictor variables of the TPB model accounted for 54%-69%<sup>20,22,23</sup> of the variance in predicting intentions to text and drive and 39-49% of the variance in predicting behaviour.<sup>21</sup> Of the standard TPB constructs, attitudes significantly predicted intentions to text and drive.<sup>20-23</sup> Subjective norms and PBC also predicted intentions to text and drive<sup>22,23</sup>; however when separated into sending versus reading messages, subjective norms and PBC predicted intentions to send, but not read text message while driving, and did not predict texting and driving behaviour.

Among extended TPB constructs, group norms, moral norms, mobile phone involvement and past behaviour significantly predicted intentions to text while driving with past behaviour and moral norms also predicting texting and driving behaviour.<sup>21,22</sup> Anticipated regret was not a significant predictor of texting and driving behaviour.<sup>22,23</sup>

Behaviour beliefs and control beliefs were also found to be predictors of concealed texting and driving; youth who were more likely to intend to text and drive believed that concealed texting and driving would result in positive information sharing and effective use of time, and that traffic would not stop them from

concealed texting. Normative beliefs were not associated with intentions to engage in concealed texting and driving.<sup>20</sup> None of the normative beliefs differed significantly between the high and low intenders. However, there was a general perception of disapproval of texting and driving among both high and low intenders from parents and police, yet more positive perceptions of approval of the behaviour by their peers.<sup>20</sup>

### **Risk Perception**

Two studies used online surveys to examine risk perceptions as a predictor of texting and driving behaviour among youth and adults.<sup>11,24</sup>

Hallet et al., (2013) conducted an online survey of New Zealand youth and adults (n=1057, ages 16 to 86) examining the relationship between perceptions of safety and self-reported texting and driving behaviour.<sup>24</sup> Using Pearson's correlation coefficient they found a significant negative linear relationship between the number of self-reported text messages read while driving in one week and perceptions of safety when reading text messages while driving; however this relationship was relatively weak ( $r = -0.24, p < 0.001$ ). Stronger relationships were found between the average number of text messages sent while driving and perceptions of safety, ( $r = -0.31, p < 0.001$ ).<sup>24</sup> These results indicate that those who perceived texting while driving to be somewhat safer or less risky were more likely to self-report sending or reading text messages while driving.

Atchley et al., (2011) conducted an online survey of American youth and young adults (n=401, ages 18 to 30) and found a similar pattern of results.<sup>11</sup> They used structural equation modelling (SEM) to predict whether perceived risk predicted the likelihood of reading, replying to or initiating text messages while driving. They found that perceived risk accounted for less than 1% of the variance in the model suggesting that risk perception was a weak predictor of texting and driving and that participants' texting and driving behaviour was

not largely affected by their perceptions of how safe the behaviour was. Consistent with Hallett's (2013) findings, risk perception was a significant predictor for initiating text messages while driving, but not for reading or replying to messages; however, the relationship was relatively weak ( $\beta = -0.12$ ).<sup>11</sup>

Overall, risk perception was a relatively weak predictor in texting and driving behaviour. Although weak, this relationship was stronger for sending or initiating text messages compared with reading text messages while driving.

### ***Mindfulness and Emotion Regulation***

Individual differences in mindfulness have also been associated with texting and driving behaviour among young adults. Mindfulness is defined as "as the tendency to intentionally attend to present-moment internal and external experiences with an attitude of openness and acceptance".<sup>25</sup> Feldman et al., (2011) used a path analysis to test whether individual differences in self-reported levels of mindfulness predicted texting and driving in a sample of young adult female drivers ( $n = 231$ , mean age 19.74 years). They also examined whether this relationship would be mediated by emotion-regulation motives (i.e., using text messaging as a means of reducing unpleasant emotions) and attention-regulation motives (i.e., the degree to which individuals limit texting in order to focus on the present moment).<sup>25</sup>

They found a significant association between between greater mindfulness and less texting and driving (total effect:  $\beta = -.164$ ,  $p = 0.008$ ). This association was partially mediated by emotion regulation motives (i.e., texting to regulate emotions) (indirect effect:  $\beta = -.053$ ,  $p = .011$ ). Less variance was explained by attention-regulation motives ( $R^2 = .05$ ,  $p = .09$ ). Covariates of the model included; 1) whether their phone has full keyboard for typing messages, 2) whether their cell phone plan had

unlimited texting, and 3) frequency of driving throughout the year; all three covariates were found to be independent, significant predictors of texting and driving.<sup>25</sup>

Overall, results suggest that mindfulness may be an important predictor of texting and driving whereby individuals lower in mindfulness are more likely to engage in texting and driving. This relationship may be mediated by an individual's use of text messaging as a means of reducing unpleasant emotions (i.e., emotion regulation).

### ***Adolescent Binge Drinking***

Lastly, adolescent binge drinking has been found to be positively associated with texting and driving. Marcotte et al., (2012), compared 38 adolescent binge drinkers and non- binge drinkers (ages 16 to 18) on a number of risky driving behaviours including texting and driving using a self-reported survey.<sup>26</sup> In this study, binge drinkers were those adolescents who had more than 100 occasions of alcohol use, more than three periods of heavy drinking episodes (>5 drinks per occasion) in the past month, experienced more than one withdrawal symptom following a recent drinking episode and had limited exposure to other substances. Control participants had little or no alcohol/drug experience and no history of alcohol/drug problems. Results indicated that although infrequent, adolescent binge drinkers were significantly more likely to have texted while driving ( $p = 0.007$ ) compared with non-drinking controls.<sup>26</sup>

### **Discussion and Conclusions**

Overall, the standard TPB constructs (i.e., attitudes, subjective norms, perceived behavioural control (PBC)) were shown to be good predictors of intentions to engage in texting and driving among youth, with intentions being an excellent predictor of texting and driving behaviour.<sup>20-23</sup> Additional constructs of group norms, moral norms,

mobile phone involvement and past behaviour significantly predicted intentions to text and drive, with past behaviour and moral norms also predicting texting and driving behaviour.<sup>21,22</sup> Anticipated regret was not a significant predictor of texting and driving, in the final models.<sup>22,23</sup> Behaviour beliefs and control beliefs were also found to be predictors of intentions to engage in concealed texting and driving while normative beliefs were not.<sup>20</sup>

Risk perception was found to be a relatively weak predictor of texting and driving behaviour. However, this relationship was stronger for sending or initiating text messages compared with reading text messages while driving.<sup>11,24</sup>

Mindfulness may be an important predictor of texting and driving where individuals lower in mindfulness are more likely to engage in texting and driving; this relationship may be mediated by an individual's use of text messaging as a means of reducing unpleasant emotions (i.e., emotion regulation). Lastly, binge drinking during adolescence may be predictive of risky texting and driving behaviour.<sup>26</sup>

### *Limitations*

It is important to note a few limitations of the included studies. First, all studies used some form of self-reported data that may have been subject to social desirability bias whereby individuals may have underestimated their texting and driving behaviour if it was an illegal behaviour in their jurisdiction. Additionally, generalizability of the findings may be limited by unrepresentative samples in some of the included studies. For instance, one of the included studies had a sample of only female participants<sup>25</sup> or a high percentage of females (i.e., 78%)<sup>20</sup> while two others included adults (>24 years) in their study<sup>11,24</sup> limiting the generalizability of these results to youth. Additionally, three of the included studies analyzed results from the same set of study participants.<sup>20,22,23</sup> Lastly, there may have been variability in participants' interpretation of the

behaviour 'texting and driving' across studies (e.g., does it include texting while stopped at traffic lights?).

### **Implications for Practice**

The findings from the included studies may assist health promoters in developing content for health messages targeting texting and driving behaviour among youth. For instance, risk perceptions were found to be a relatively weak predictor of texting and driving behaviour;<sup>11,24</sup> thus anti-texting campaigns or interventions should avoid exclusively focusing on the risks associated with texting as many youth are aware of the risk yet still choose to engage in the behaviour.

Instead, campaigns or interventions can focus on behavioural constructs from the TPB such as attitudes, norms or PBC which have been shown to be good predictors of intentions to text and drive<sup>20-23</sup>. This might involve interventions that challenge the driver's perception that they are in complete control when they are texting while driving (i.e., targeting PBC). It might also involve messages that aim to change youth attitudes towards texting and driving and challenge their perceived norms regarding the behaviour by highlighting the illegal nature of the behaviour and the unacceptance of the behaviour by their family and others.

Mindfulness was also an important predictor of texting and driving and was found to be mediated by emotion regulation.<sup>25</sup> While mindfulness may be difficult to change through targeted communication campaigns, health promotion programs can focus on communicating alternative strategies (e.g., other than texting) for dealing with unpleasant emotions while driving.

Lastly, because adolescent binge drinkers have been shown to be at greater risk of engaging in texting and driving behaviour<sup>26</sup>, health

promoters may choose to develop interventions targeted towards this at-risk population.

## Future Research

Future research should examine the identified predictors of texting and driving among more diverse populations to understand the generalizability of the results.<sup>23</sup> Additionally, future research should focus on developing and testing health messages targeting the previously mentioned predictors in order to determine their influence or effectiveness in changing texting and driving behaviour among youth.<sup>20</sup>

## Specifications and Limitations of Evidence Brief

This Evidence Brief presents key findings from the scientific literature. Its purpose is to investigate a research question in a timely manner in order to help inform decision making. This report is not a comprehensive review of the literature, but rather a rapid assessment of the best available research evidence. There may be relevant pieces of evidence that are not included and these may alter the conclusions drawn from the document.

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