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Effects of parental vigilant care and feedback on novice driver risk



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A B S T R A C T

Keywords:

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Driving feedback
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Vigilant care aims at reducing adolescent risk behaviors while matching parental involvement to the level of alarm signs. This study examined the effect of parent training in vigilant care and technological feedback on driving risk of novice male drivers. A sample of 217 Israeli families was divided into four conditions: a) no-feedback, b) individual feedback, c) family feedback, and d) family feedback plus parent training in vigilant care. Feedback and risk assessment were conducted through in-vehicle data recorders. A significant difference was found in favor of the vigilant care group compared to the no feedback group. When only the drivers in the high risk percentiles were considered, the vigilant care group was found superior to the family feedback group. The findings suggest that parental training in vigilant care may help reduce driving risk.

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Introduction

The high rate of road crashes involving young drivers ([Israel Central Bureau of Statistics \[ICBS\], 2011](#)) presents a major challenge for parents and society. In many countries, young drivers are now required to be accompanied by an experienced driver for the initial months after licensure. During the accompanied driving period, the involvement of novice drivers in crashes is very low ([Glendon, 2014](#); [Langford, 2006](#); [Lotan & Toledo, 2007](#)). However, when unsupervised driving begins, crash rates rise drastically, then gradually decline with the driver's growing experience ([Lotan & Toledo, 2007](#); [McCartt, Teoh, Fields, Braitman, & Hellinga, 2010](#); [Simons-Morton et al., 2011](#); [Williams, 2003](#)).

Males are involved in considerably more fatal crashes per mile driven compared to females ([OECD/ECMT, 2006](#); [Williams, 2003](#)). This difference may be explained by young males' more aggressive driving behaviors, stronger inclination to risk-taking, and higher susceptibility to peer influence ([Farah, 2011](#); [OECD/ECMT, 2006](#); [Prato, Toledo, Lotan, & Taubman-Ben-Ari, 2010](#)). These high-risk characteristics seem to be of the kind that might respond to enhanced parental involvement

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(Burrus et al., 2012; Farmer, Kirley, & McCartt, 2010; Racz & McMahon, 2011; Scott-Parker, Watson, King, & Hyde, 2012; Simons-Morton, 2007). However, parents show difficulties in maintaining involvement in this area (Goodwin, Foss, Margolis, & Harrell, 2014; Mirman, Lee, Kay, Durbin, & Winston, 2012).

Several interventions have been developed to help parents increase their involvement, either by supplying information through the Internet (e.g., <http://www.teendriversource.org>; www.roads2survival.com.au) (Chaudhary, Ferguson, & Herbel, 2004) or by attempting to engage parents directly (e.g., Goodwin et al., 2013; Scott-Parker et al., 2012; Soole, Scott-Parker, Buckley, Senserrick, & Watson, 2013; Zakrajsek et al., 2013). Still, only modest indication currently exists that these programs reduce driving risk (Soole et al., 2013). Another promising intervention uses feedback through in-vehicle data recorders, which the parents can access as a way to remain involved (Carney, McGehee, Lee, Reyes, & Raby, 2010; Farmer et al., 2010; Lee, 2007; McGehee, Raby, Carney, Lee, & Reyes, 2007; Toledo & Lotan, 2006). However, communication difficulties and parental helplessness remain obstacles for improved parent involvement (Guttman & Gesser-Edelsburg, 2011; Papakosmas & Noble, 2011). The model of vigilant care attempts to overcome these obstacles.

Vigilant care

Until a few years ago, it seemed clear that parental monitoring was the best way to increase child safety in virtually any area of risk. However, a wave of critical studies, centered on the concepts of psychological control, overparenting, and parental knowledge, have cast doubts on the assumption that more monitoring invariably leads to less risk. The model of vigilant care was developed in response to these criticisms (Omer, 2011, 2013).

The belief that parental monitoring helps to prevent risk has been upheld by considerable evidence (Bowman, Prelow, & Weaver, 2007; Chamberlain & Reid, 1998; Dishion & McMahon, 1998; Jang & Smith, 1997; Magoon & Ingersoll, 2006; Rai et al., 2003; Steinberg, Fletcher, & Darling, 1994; Wilder & Watt, 2002). This evidence has led to the oversimplification that more monitoring invariably means less risk. However, such a linear relationship does not seem to fit the facts, and inappropriate or excessive monitoring may boomerang, leading to negative effects, such as increased lying, conflict, and mutual distancing (Bernstein & Triger, 2011; Ungar, 2009; Wang, Pomerantz, & Chen, 2007).

In addition, excessive monitoring means more parental control, which has been shown to be detrimental to development of autonomy and self-esteem, besides damaging the parent–child relationship (Barber & Harmon, 2002; Luyckx, Soenens, Vansteenkiste, Goossens, & Berzonsky, 2007; Soenens, Park, Vansteenkiste, & Mouratidis, 2012). The attempt to salvage the concept of monitoring by differentiating between psychological control, which is assumed to have negative effects, and behavioral control, which is assumed to have positive effects, proves confusing (Barber, 1996; Barber & Harmon, 2002; Steinberg, 1990). For instance, studies have shown that behavioral control could have negative effects similar to those of psychological control (Hoeve et al., 2009; Kuppens, Grietens, Onghena, & Michiels, 2009; Segrin, Woszydlo, Givertz, Bauer, & Taylor Murphy, 2012). Moreover, adolescents often experience behavioral control as psychological control and react accordingly (Hasebe, Nucci, & Nucci, 2004; Nucci, Hasebe, & Lins-Dyer, 2005; Smetana & Daddis, 2002). The contention that monitoring invariably reduces risk is also weakened by evidence regarding the negative effects of overparenting (Bernstein & Triger, 2011; Padilla-Walker & Nelson, 2012; Ungar, 2009).

Kerr and Stattin (2000) initiated another line of criticism, and argued that what had been measured in research on parental monitoring was actually parental knowledge. These authors and those who followed their lead (e.g., Hamza & Willoughby, 2011; Hoeve et al., 2009; Lahey, Van Hulle, D'Onofrio, Rodgers, & Waldman, 2008) argued that most positive effects attributed to parental monitoring actually result from an atmosphere of trust and dialogue that fosters spontaneous disclosure. In contrast, parental attempts to monitor the child's activities unilaterally impair this process.

However, the contention that the positive effects of parental knowledge are the exclusive result of spontaneous disclosure is not upheld. Particularly with children in some risk categories (e.g., behavioral problems, or problem neighborhoods), active parental monitoring that is not restricted to open dialogue reduced risk (Coley, Morris, & Hernandez, 2004; Lahey et al., 2008; Laird, Marrero, & Sentse, 2010). Moreover, these monitoring activities are not necessarily opposed to spontaneous disclosure, but under certain circumstances, actually enabled such disclosure (Hamza & Willoughby, 2011; Laird, Pettit, Bates, & Dodge, 2003; Soenens, Vansteenkiste, Luyckx, & Goossens, 2006).

Criticisms have made it clear that an optimal kind of parental involvement is a more complex process than was assumed by either those who favored parental monitoring or those who favored open dialogue and spontaneous disclosure (Racz & McMahon, 2011). In our view, what is needed is a new concept that integrates the ideas of open dialogue and active monitoring. Such a concept should consider the negative effects of overparenting and parental control. A graded approach that specifies different levels of parental involvement would allow parents to be minimally intrusive, but to increase their involvement in a legitimate way according to need. Adolescents are more accepting of parental involvement when they perceive it as linked to their safety or to accepted social norms (Hasebe et al., 2004). Thus, linking increases in parental involvement to explicit considerations of safety and accepted norms would make those steps more legitimate and acceptable. These are the challenges that the model of vigilant care was designed to meet (Omer, 2011, 2013).

Vigilant care is a flexible attitude by which parents continuously adjust their levels of involvement to the alarm signs they detect. The lowest level of vigilant care is that of *open attention*, which is characterized by a caring interest in the child's life. At this level, parents foster trust, dialogue, and openness, and establish positive and non-intrusive contacts with people in the child's environment (e.g., teachers, friends, other parents). This level likely parallels the atmosphere of trust that leads to optimal parental knowledge (Stattin & Kerr, 2000). So long as no alarming signs are detected, parents should stay mostly at this level.

However, if such signs appear (e.g., the child lies, scholastic achievements recede, problematic friendships develop), parents should move to the level of *focused attention*. At this point they start checking and asking the child specifically about the *what*, *when*, *where*, and *with whom* concerning his or her activities. If the alarm signs recede, the parents go back to the level of open attention. If the child refuses to collaborate or supplies unreliable information, or if there are other signs that he or she is probably involved in problematic activities, the parents move to *active protection*; that is, they take actual steps to reduce the risk.

In the model of vigilant care, the active positive ingredient is not assumed to be parental control (either behavioral or psychological), but *parental presence* (Omer, 2002, 2004, 2011). In our program, parents are trained to understand that they cannot control the child, only themselves (Omer, 2011, 2013). A common result of parental attempts at control is that parent-child conflicts escalate. In contrast, when parents are trained to abstain from controlling messages and acts, escalation of conflict occurs much less often (Lavi-Levavi, Shachar, & Omer, 2013).

The adjustment of parents' levels of involvement to the levels of alarm signs also helps them overcome the tendency to overparent. In our program, we describe overparenting as *anxious care* (Omer, 2013) and help parents change their attitude to one of graded vigilant care. When anxious parents are offered a clear and positive way to exercise vigilant care, they find it easier to overcome their tendencies to overparent, which is very difficult for them to do when they are merely told that overparenting is bad.

Parental training in vigilant care involves instruction regarding how to stay close through open attention, supplies decision rules of when and how to move to focused attention, and details interventions for situations requiring protective actions (Omer, 2011; 2013). In developing parental training in vigilant care, we drew from our experience on helping parents cope with violent and self-destructive children using non-violent resistance. This approach involves a combination of decided parental presence with the prevention of conflict escalation (Lavi-Levavi et al., 2013; Ollefs, Schlippe, Omer, & Kriz, 2009; Omer, 2004; Weinblatt & Omer, 2008).

Availability of feedback and vigilant care

In-vehicle data recorders (IVDRs) were developed to provide feedback to drivers or to those responsible for their driving (Lotan & Toledo, 2007). These systems enable identification of potentially dangerous maneuvers, such as hard braking, acceleration, and sudden swerves. The risk indicators provided by IVDR systems have been shown to predict crashes (Toledo & Lotan, 2006). Additionally, monitoring through IVDR systems has been shown to improve driving behaviors and increase safety (Musicant, Lotan, & Toledo, 2007).

Providing IVDR feedback to young drivers and their parents may also be helpful in reducing risky driving by young novice drivers (Carney et al., 2010; Farmer, Kirley, & McCartt, 2009; McGehee et al., 2007; Prato et al., 2010). However, many parents who were offered the opportunity to do so were reluctant to access or make use of the feedback, saying that it would increase conflict (Farmer et al., 2010; Guttman & Gesser-Edelsburg, 2011). We assumed that training parents in vigilant care might help them cope with these difficulties and enable them to make better use of the feedback.

For this study, we developed a brief training in vigilant care to be used in conjunction with IVDR feedback. The training was administered in the young driver's presence to guarantee transparency and reduce potential conflicts. Special attention was given to minimizing conflicts, especially when parents moved to a higher level of vigilant care. The issue of legitimization was also addressed by making it clear that, as long as the young driver was driving safely, he would have maximum autonomy and driving rights. However, if there were signs of risk, it was the parents' duty to intervene.

Study questions and hypotheses

Three main questions and hypotheses guided this study:

Q1: Is vigilant care training associated with parental use of feedback?

H1: Parents receiving training will access the IVDR website more frequently than will parents who do not receive training.

Q2: How does feedback availability affect the riskiness of young adult's driving?

H2: Low driving risk will be associated with family feedback; medium driving risk will be associated with individual feedback; high driving risk will be associated with no feedback.

Q3: Can training in vigilant care reduce risk over and beyond technological feedback?

H3: Parental training in vigilant care will be associated with lower driving risk compared to feedback alone.

Methodology

Participants and recruitment

A rolling recruitment procedure was used. In total, 6290 phone calls were made to potential candidates (drivers immediately after licensure); 2380 candidates expressed interest in participating and were asked to fill out a web questionnaire that served as a screening tool to evaluate their relevance to the study. Of these, 872 candidates completed the web questionnaire. To be eligible for the study, each candidate was required to meet the following criteria: (1) male young driver, licensed no

more than 1.5 months (i.e., still in the accompanied driving period); (2) parents had access to the internet; and (3) the young driver drove the family car (i.e., did not have a car of his own).

Of the 242 families recruited for the study, 217 were followed up for 6 months (90% retention rate). Young participants' age range was 17–22 years ($M = 17.5$, $SD = 0.8$). Family participants included 194 fathers (range 33–62 years, $M = 50.2$, $SD = 5.4$), and 207 mothers (range 37–59 years, $M = 47.6$, $SD = 4.9$). Of the families, in 184 both parents participated, in 10 only the fathers and in 23 only the mothers participated. Among the parents, 53% had academic degrees. Each family received 1000 NIS (approximately \$250) for their participation.

Experimental design

The families were randomly allocated to one of four groups.

- No feedback: Neither the parents nor the young driver received any feedback from the IVDR system.
- Individual feedback: The parents and the young driver received feedback from the IVDR system regarding their own driving, but not regarding that of the other family members.
- Family feedback: The parents and the young driver had access to the IVDR feedback regarding their own driving and the driving of other family members.
- Vigilant care: In addition to family feedback, as in the previous group, the parents received a 90-min training session on vigilant care and three to five booster telephone calls.

Measures

Driving-risk measure

The GreenRoad System was used in this study (Prato et al., 2010). This type of IVDR is a G-force based system that tracks all trips made by the vehicle and records the following information: (a) trip start and end times; (b) driver identification, and (c) events of excessive maneuvers as defined by patterns of G-forces measured in the vehicle. These events are classified into severity groups according to the intensity of the G-forces. The system can identify 20 different types of excessive maneuvers, which are classified into five major categories: braking, accelerating, turn handling, lane handling and speeding. Drivers had to identify themselves at the beginning of each trip using Dallas keys (personal magnetic identification keys).

Feedback was conveyed in two ways: by an in-vehicle display (immediate feedback of three lights [green, yellow, red] that would light up during driving) and by a web-based application (cumulative feedback that could be viewed at any time). As is shown in Fig. 1a, a green (in the web version), yellow (in the web version), or red (in the web version) light indicated low, intermediate and high risk levels, respectively. The web-based application provided drivers with reports that summarized trip information and events. The chart in Fig. 1b shows the trips that the driver undertook during the month; each square represents a trip. The X-axis indicates the day of the month, and the Y-axis indicates the number of trips taken each day. Trips are color-coded according to their risk level, which is based on the rate of risky maneuvers recorded in the trip. Drivers were classified as low, intermediate, or high-risk if they record less than 2, 2 to 5, or more than 5 risk maneuvers per driving hour. Black triangles indicate night trips. For a more detailed description, see Prato et al. (2010) and Toledo, Musicant, and Lotan (2008).

Procedure

In Israel, at the time this study was conducted, the accompanied driving period lasted for 3 months after licensure. The IVDR system began operating during the first month of accompanied driving (upon installation); however, the feedback

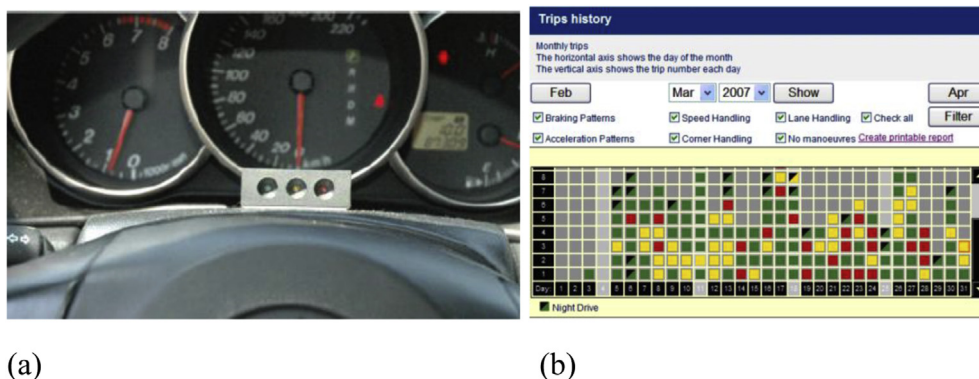


Fig. 1. Feedback media: (a) In-vehicle display; (b) web-based application.

groups gained access to the feedback only 2 weeks before the end of the accompanied driving period (2.5 months after licensure). The control group did not receive any feedback. The parent training session took place in the last 2 weeks of the accompanied driving period. The booster phone calls were made during the first 3 months of unaccompanied driving. The study was approved by the Tel-Aviv University Helsinki Committee.

Treatment

Parents in the feedback groups received training on how to access the feedback, which was provided at the time of installation. Training in vigilant care consisted of one 90-min session conducted in each family's home. In 12 cases (out of 54 families in this group), only one parent attended the session, in all other cases, both attended. The young driver always attended. Trainers included three psychologists and two psychology graduate students with experience in parental training in vigilant care. In the training, the three levels of vigilant care (open attention, focused attention, protective action) were matched to the three levels of risk (green, yellow, red). Parents also received a booklet on vigilant care and a hotline telephone number.

Open attention

When the young driver was mostly “green” according to the IVDR data and followed the rules regarding car use (e.g., driving with no more than the agreed number of passengers or abiding by the stipulated driving hours), parents were advised to allow maximum autonomy, while maintaining open interest and open communication regarding the young driver's and their own driving. At this level, parents should regard the young driver as a full member of “the driving community.” This is illustrated by *drivers' talks*, which parents were advised to carry out on a weekly basis.

During *drivers' talks*, parents and the young driver should examine together each other's driving records and set goals to improve the family record. These talks should be conducted in an egalitarian atmosphere, in which the youngster was allowed to comment on his parents' driving as well as the other way around. Parents and young drivers were encouraged to share *drivers' observations* (e.g., remarks about events witnessed on the road, driving dilemmas) on a routine basis.

In an attempt to increase parental presence in potentially dangerous situations, parents were instructed to give special attention to weekend drives, night drives, and drives to unfamiliar locations. At those times, parents were advised to engage in conversations on coping with special difficulties (e.g., fatigue, bad weather). Another tool offered to parents was that of *conjoint route planning*. Parents were advised to set aside a few minutes with the young driver to plan routes to new destinations. It was considered likely that the young driver would remember the conversation when he came to the various points mentioned in the route planning. By these means, a virtual kind of parental presence was created, though the parents were not in the car.

Focused attention

Parents were instructed to move to this level of vigilant care when the feedback showed a “yellow” driving record for at least 3 consecutive days, three “red” trips in one week, or when the young driver did not meet the stipulations for use of the car. At this level, parents were advised to institute *feedback talks*, which were specifically focused on the problematic driving patterns exhibited by the young driver and on finding solutions to the patterns. For instance, a feedback talk could be concluded by saying: “During the next week, we want to see a clear decrease in 'yellow rides'. You had three last week and, we want to set a goal of maximum one for the next week!” At this level, parents were also instructed to conduct *focused questioning* after weekend drives and night drives.

Protective action

Parents were instructed to proceed to the third level of vigilant care when the feedback showed a “red” driving record for more than 3 days a week, or when there was continuous disregard of car use stipulations. At this level parents were advised to intensify their involvement and reduce driving rights, such as driving on weekends, on highways, and with friends, until the record showed improvement and the young driver kept the rules. Parental actions at this level are not popular; therefore, they require preparation and support. The booster phone calls often devoted to help parents fulfill this task.

Booster phone calls

Parents received three to five booster phone calls, according to need. These phone calls occurred at approximately 3-week intervals, each lasting approximately 15 min. The purpose of the phone calls was to support the parents and encourage them to stay involved. Each call was followed by an email summary addressing the chief points covered in the conversation.

Results

Treatment implementation

Assessments were made to determine the extent to which parents in the vigilant care group implemented the various elements of the training. One goal of the training was to increase parent readiness to access the website. In Fig. 2, we present the number of families in each group that accessed the website at least once a month.

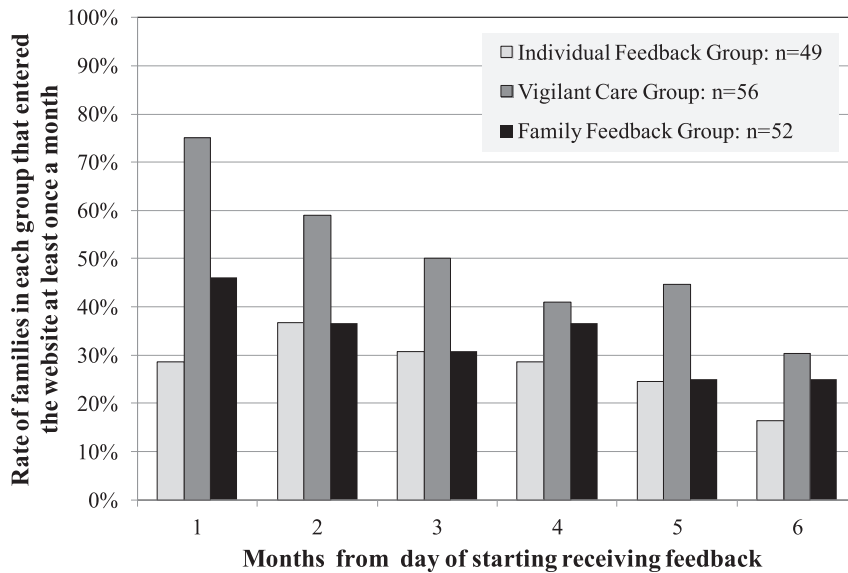


Fig. 2. Number of families that entered the website at least once a month by groups and months.

A non-parametric Kruskal–Wallis ANOVA test was conducted to examine the differences among the three feedback conditions with respect to the rate that families accessed the website at least once a month. A statistically significant difference was found between the groups, $\chi^2(2, df) = 7.85, p = .02$, with a mean rank of 14.17 for the vigilant care group, 5.67 for the individual feedback group, and 8.67 for the family feedback group.

To examine which groups differed significantly from each other, a Mann–Whitney *U* test was conducted for each pair of groups. The results of the comparisons showed that entry rates of the vigilant care group were significantly higher than were those of the individual feedback group, $p = .01$, and the family feedback group, $p = .05$. No significant difference was found between the individual feedback group and the family feedback group, $p = .26$.

Regarding the extent to which parents in the vigilant care group engaged in the relevant actions (e.g., attended drivers' talks, weekend and night drive questioning, feedback talks, reductions of driving rights), 98.1% of parents reported implementing at least one vigilant care action, 90% reported implementing at least two, and 46.3% reported implementing at least three. We divided these parents into two groups based on their reports on the color of their teen's driving record ("green" vs. "yellow" or "red"). 25 families (46.3%) reported that their young drivers had a "green" driving record throughout the study period, while 29 families (53.7%) reported that their young drivers had been rated "yellow" or "red" for at least 1 week during the first 3 months of independent driving. Implementation of the various actions of vigilant care for these groups is presented in Table 1. Table 1 shows that parents implemented the interventions in the graded fashion prescribed by the model, with the parents of "yellow" and "red" drivers implementing considerably more steps than parents of "green" drivers.

Driving behavior

Driving exposure data among the four groups is presented in Table 2. As seen in Table 2, drivers in the four groups drove similarly in terms of number and duration of trips. Next, a comparison among the four groups was conducted, with driving behavior measured by the rate of risky events recorded per month, normalized by the number of driving hours. Fig. 3 shows the mean events rate of the four groups during the accompanied period and the first six months of unaccompanied driving. The beginning of unaccompanied driving is designated by "0". The last 2 months of accompanied driving are indicated by

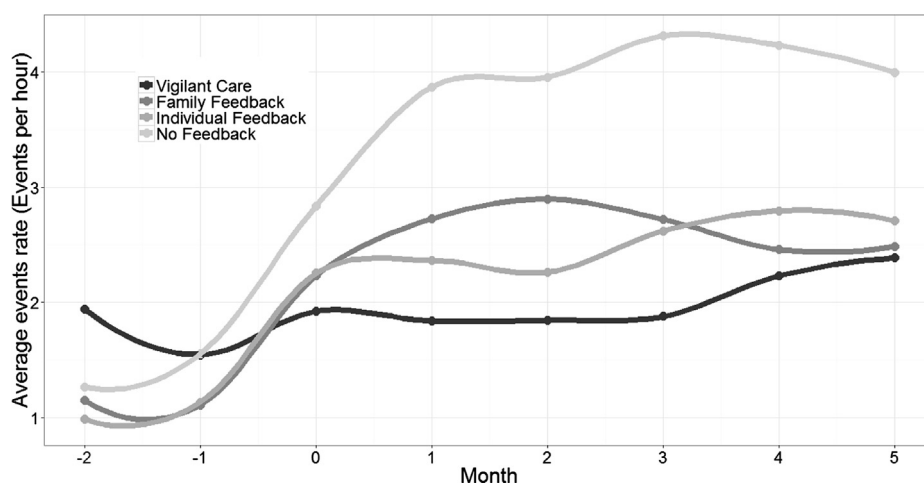
Table 1
Reported Implementation of Vigilant Care Actions among Parents of "Green" vs. "Yellow" and "Red" Young Drivers.

Vigilant care actions/Families	Green ($n = 25$) %	Yellow/Red ($n = 29$) %
Attended Drivers' talks	24	31
Feedback talks	12	62
Weekend/night alert	84	76
Driving limitations/accompanied driving	36	35
Spontaneous driving chats	68	76
Implementation of >2 Types of vigilant care actions	24	66

Table 2

Driving exposure in terms of number and length of trips for the four groups.

	Family feedback minutes	Vigilant care minutes	Personal feedback minutes	Control minutes
Minimum trip time	1.52	1.52	1.52	1.23
Maximum trip time	332	353.75	329.07	342.32
Mean trip time	20.19	20.89	20.73	19.41
SD trip time	18.23	19.47	19.48	18.35
Total number of trips	101,277	101,426	92,605	98,882

**Fig. 3.** Young drivers' average events rate per group and month.

negative values. The improvement seen at time “0” can be attributed to the fact that families received the training and accessed the site in the weeks preceding the transition to unaccompanied driving.

As seen in Fig. 3, the no feedback group appeared to be consistently higher in events rate, the individual feedback and family feedback groups came next, and the vigilant care group was the lowest in events rate. To evaluate whether these differences were significant, we used the monthly scores in a mixed effect model. This model incorporated group (4 levels, with the no feedback group as a reference), month (a continuous number between 0 and 5), and the interaction between them. A random effect term was added to account for within-driver variance. Incorporation of group and month helped understand the various group behavior patterns during the first 6 months and provided an indication on the trend over time.

The differences between the four groups in driving risk over the first six months of independent driving are detailed in Table 3 and illustrated in Fig. 4. In Table 3, the intercept refers to the no feedback group at the start of solo driving. The linear results confirm that the vigilant care group fared better than did the other groups, although the only significant finding was in the comparison with the no feedback group.

We hypothesized that the lack of a significant difference in favor of the vigilant care group, relative to the other feedback groups, might have been due to the fact that the majority of drivers were “green” to begin with, thereby reducing the likelihood of showing improvement. Therefore, the vigilant care and family feedback groups were compared while considering only those drivers with a higher frequency of driving events. We did this using a quantile regression model (Davino, Furno, & Vistocco, 2013). In this analysis, only drivers with the 10%, 20%, 30%, 40%, 50% and 60% highest events rate were considered. In total, for each of the first six months, six comparisons were made. Fig. 5 illustrates these comparisons.

In the second month of independent driving, significant differences between the two groups were found for quantiles 0.5 ($t = -2.02, p = .05$) and 0.6 ($t = -2.27, p = .03$), and near significant differences were found for quantiles 0.7 ($t = -1.59, p = .12$) and 0.8 ($t = -1.70, p = .10$). In the third month, significant differences between the two groups were found for quantiles 0.7 ($t = -2.54, p = .01$), 0.8 ($t = -2.98, p < .01$), and 0.9 ($t = -2.72, p = .01$). In the fourth month, significant differences between the two groups were found for quantile 0.9 ($t = -1.98, p = .05$), and near significant differences were found for quantile 0.8 ($t = -1.65, p = .10$). In the fifth month, significant differences between the two groups were found for quantile 0.9 ($t = -2.61, p = .01$). These results suggest that for the higher quantiles (i.e. the more risky drivers), drivers in the vigilant care group had lower event rates than did those in the family feedback group. Data on quantile differences between the two groups are presented in Table 4.

Table 3
Results of linear mixed effect model^a for young drivers' events rate.

	Estimate (SE)
(Intercept)	0.058 (0.007)***
Individual Feedback	-0.02 (0.01)
Family Feedback	-0.015 (0.01)
Vigilant Care	-0.026 (0.01)*
Month	0.002 (0.001)***
Individual Feedback: Month	-0.001 (0.001)
Family Feedback: Month	-0.003 (0.001)**
Vigilant Care: Month	-0.001 (0.001)
σ^2 (Driver)	0.05

Note. * $p < .05$, ** $p < .005$ *** $p < .0001$.

^a $y_{ij} = \beta_0 + \beta_1(\text{Individual Feedback}) + \beta_2(\text{Family Feedback}) + \beta_3(\text{Vigilant Care}) + \beta_4(\text{Month}) + \beta_5(\text{Individual Feedback}) * (\text{Month}) + \beta_6(\text{Family Feedback}) * (\text{Month}) + \beta_7(\text{Vigilant Care}) * (\text{Month}) + \text{Driver}_{ij} + e_{ij}$.

Discussion

This study proposed three main hypotheses: a) parents trained in vigilant care would report more extensive use of the IVDR feedback, b) driving risk would diminish with feedback availability, and c) training in vigilant care would improve on the results of feedback alone. The first hypothesis was supported: Parents in the vigilant care group had more entries on the IVDR website, which shows that the parents who received training were better able to surmount the difficulties that parents often experience using such feedback (Farmer et al., 2010; Guttman & Gesser-Edelsburg, 2011). The second hypothesis was not supported, as no significant differences were found between the three groups that did not involve parental guidance in vigilant care. Regarding the comparison between the vigilant care and the other groups, a significant difference was found between the vigilant care and the no feedback group. However, at first, no significant advantage was found for the vigilant care over the feedback groups. An additional analysis (by quantiles) was undertaken to allow a closer look at this issue.

The quantile analysis showed that when only the more risky drivers (those in the higher quantiles) were examined, the vigilant care group fared better than the family feedback group. Thus, training in vigilant care was found to be associated with lower risk over and beyond feedback effects, especially in the case of the more risky drivers.

A possible interpretation of this finding ascribes the effect to the additional attention given to the vigilant care group rather than to any peculiarities of the training. The data, however, show that parents in this group displayed many of the behaviors deemed central to the model. Specifically, they visited the IVDR website more frequently and regulated their interventions according to the risk levels indicated by the feedback. This finding can be interpreted as indicative of the graded function of vigilant care, which enables parents to remain vigilant, but to intervene more decisively only when there is a clear need to do so.

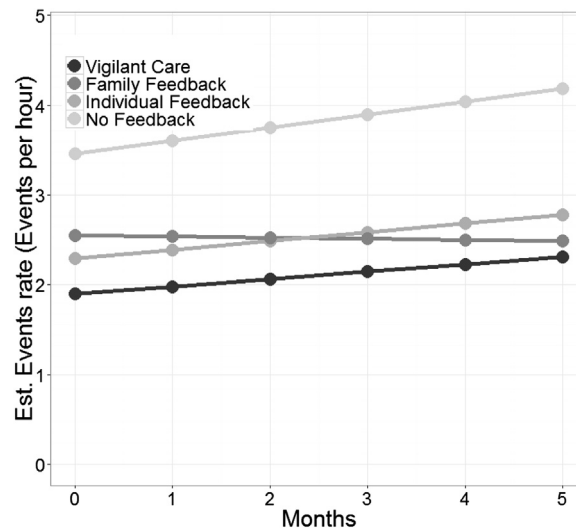


Fig. 4. Results of linear mixed effect model for young drivers' events rate.

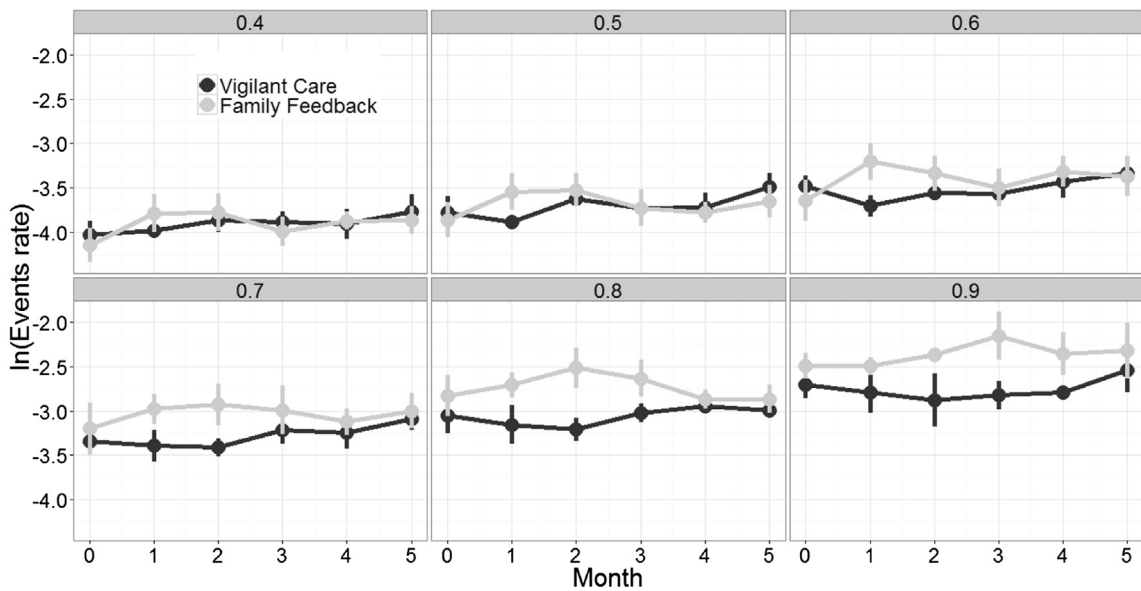


Fig. 5. Events rate of vigilant care and family feedback groups during the first six months of independent driving by quantiles.

Observations from the booster phone calls suggest that the intervention was well accepted and was not perceived as invasive or controlling by the young drivers. The parents of one youngster reported him as remarking in the course of a drivers' talk: "At first, I thought that the program's goal was to help you to control me. But, now I see that by driving well, I become a driver with full rights." Thus, the drivers' talks can be seen as a family ritual that celebrates the entrance of the young driver into the community of adult drivers. Parents reported that their sons participated actively in these talks, commenting on the parents' driving, and contributing observations about driving dilemmas.

The belief that parental involvement was not experienced as an attempt at control was strengthened by the findings of a parallel study (unpublished), in which parents and young drivers of 11 families were interviewed separately regarding ways they implemented and experienced the intervention. Only one of the 11 youngsters responded in the affirmative to the question "Did you feel that your parents acted in invasive or controlling ways?" This finding is encouraging because all the 11 sets of parents had implemented a number of focused and protective steps.

Most parents and drivers remarked that the training had led to greater readiness to talk openly about driving, and they described the atmosphere during the drivers' talks as very positive. Some parents who described themselves as especially anxious, commented that the training helped them allow their young drivers more autonomy than they had previously thought possible. This finding supports the assumption that vigilant care is an effective antidote against the tendency to overparent. Perhaps the best indication that parental involvement was experienced as a positive presence, rather than as an intrusive form of control, were comments by some of the young drivers to the effect that they felt more secure, especially in the initial weeks of unaccompanied driving. One said, "I had the feeling that, though I was alone in the car, it was as if someone was sitting by my side." The remark by this young driver raises an important issue about the model of vigilant care and the way parental vigilant care may become internalized.

Table 4

Quantile regression results of significant differences between vigilant care and family feedback groups by months and quantiles.

Time from solo	Quantile	Family feedback ln (event rate)	S.D. Family Feedback	Difference between family feedback (n = 53) and vigilant care (n = 54)	S.D difference between family feedback and vigilant care	t	p
Month 2	0.5	-3.56	0.11	-0.32	0.16	-2.02	0.05
	0.6	-3.20	0.16	-0.51	0.22	-2.27	0.03
	0.7	-2.97	0.19	-0.43	0.27	-1.59	0.12
	0.8	-2.71	0.18	-0.44	0.26	-1.70	0.10
Month 3	0.7	-2.93	0.13	-0.48	0.19	-2.54	0.01
	0.8	-2.51	0.17	-0.70	0.24	-2.98	<0.01
	0.9	-2.36	0.13	-0.52	0.19	-2.72	0.01
Month 4	0.8	-2.63	0.17	-0.40	0.24	-1.65	0.10
	0.9	-2.16	0.24	-0.64	0.34	-1.98	0.05
Month 5	0.9	-2.37	0.12	-0.43	0.17	-2.61	0.01

One assumption of the model is that vigilant care promotes self-care by the young adult. In contrast, a strictly controlling attitude by the parents would be less conducive to internalization, particularly in adolescence. Therefore, we would predict that the more parents were able to convey presence rather than control, the more the young adult will develop self-care in his driving. This would align the present approach with the hierarchical model of goals for driver education (Hattaka, Keskinen, Gregersen, Glad, & Hernetkoski, 2002). This model specifies the need to promote not only specific driving skills, but also attitudinal and motivational shifts in the direction of self-monitoring and self-control.

Conclusion and study contributions

This study highlights the potential utility of integrating technological feedback with parent training in vigilant care, especially when the young driver manifested high levels of risky maneuvers. This finding suggests a more cost-effective use of the program, in which young drivers would be sorted according to their risk levels and training would be administered only to the higher risk drivers. Various possibilities exist for developing such a selection procedure. For example, the parents of young drivers who (a) committed infractions, (b) defied parental rules for safe use of the car, or (c) scored high on questionnaires of aggressive driving could be selected as candidates for the intervention. Research on the identification of potentially dangerous driving is progressing apace (Begg, Suleiman, & Samaranyaka, 2012; Jerome, Segal, & Habinski, 2006). Eventually, this knowledge might provide licensing authorities and concerned parents with tools to pinpoint young drivers at high risk for whom special efforts such as the present training might be indicated. Regarding the potential effectiveness of parental involvement without the adjunct of technological feedback, the model predicts that vigilant care reduces young driver risk, even without direct feedback. A training protocol that may allow parents to increase their engagement without technological support is currently under development.

Limitations

Among the study's limitations, as a majority of the young drivers were safe ("green") throughout the study period, the sample was probably not representative of the young driver population. This selection bias probably meant that most recruited families perceived the issue of driving risk as important and worthy of their time and effort. The skewed sample probably limited the effectiveness of the intervention, which might have been more pronounced if a sample of higher risk drivers had been recruited. This assumption is upheld by the quantile regression analyses, which showed that the highest gains were achieved by the riskier drivers.

The relevance of the study may be compromised by its use of a cumbersome IVDR technology. Smartphone applications now available could be employed in future studies. However, this would depend on the young driver's willingness to switch on the application. We predict that parental training in vigilant care will increase the likelihood that the young driver will switch on the application.

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