Running Head: Truck drivers and healthy eating

Effects of Self-Efficacy on Healthy Eating Depends on Normative Support: A Prospective Study of Long-Haul Truck Drivers

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Abstract

Purpose. Fruit and vegetable intake (FV) is insufficient in industrialized nations and there is excess of discretionary food choices (DC; foods high in fat, sugar, and salt). Long-haul truck drivers are considered a particularly at-risk group given the limited food choices and normatively-reinforced eating habits at truck rest-stops. Self-efficacy and normative support are key determinants of eating behavior yet the processes underlying their effects on behavior are not well understood. We tested the direct and interactive effects of self-efficacy and normative support on healthy eating behaviors in long-haul truck drivers in a prospective correlational study. *Methods*. Long-haul truck drivers (N = 82) completed an initial survey containing self-report measures of behavioral intentions, perceived normative support, and self-efficacy for their FV and DC behaviors. Participants completed a follow-up survey one-week later in which they self-reported their FV and DC behavior. *Results*. A mediated moderation analysis identified an interactive effect of self-efficacy and normative support on behavior mediated by intention for FV and DC behavior. Specifically, we confirmed a compensation effect in which self-efficacy was more likely to have an effect on FV and DC behavior through intentions in participants with low normative support. *Conclusion*. Results indicate the importance of self-efficacy in predicting FV and DC intentions and behavior in the absence of a supportive normative environment. The compensatory effect of self-efficacy beliefs on behavior through intentions when normative support is low should be confirmed using experimental methods.

Key words: self-confidence; social support; group norms; fruit and vegetable intake; discretionary choices; nutrition.

Introduction

Consuming a nutritionally-balanced is associated with reduced all-cause mortality and risk of chronic disease [1]. Yet despite this, fruit and vegetable intake at the population level in industrialized countries is insufficient while there is excess consumption of discretionary foods (i.e., foods high in fat, sugar, and salt) [2-4]. Poor diet may contribute to the global rise in obesity. Obesity rates have more than doubled since 1980, with 2014 WHO global estimates suggesting that over 39% of adults are overweight and 13% are obese [2]. In response to high levels of obesity and rises in lifestyle-related chronic diseases, governmental and public health guidelines advocate, in addition to performing physical activity, increasing fruit and vegetable consumption and limiting discretionary foods [3, 4]. Specifically, it is suggested that adults consume two serves of fruit and five serves of vegetables each day and limit discretionary foods to one serve or less each day [4]. Adherence to these guidelines is especially important for groups recognized as being at higher risk of unhealthy eating, including long-haul truck drivers who have a high incidence of overweight and obesity [5, 6].

The application of social cognitive and motivational theories from social psychology has enhanced understanding of the antecedent factors and associated processes that give rise to healthy eating. Prominent among the social psychological factors identified as determinants of eating behavior, and in line with social cognitive theory [7], are self-efficacy and perceived social support [8, 9]. Self-efficacy is an individual's belief in his or her ability to perform a specific action required to attain a desired outcome [7]. Social or normative support refers to the perceived explicit or implicit endorsement of one's attitudes and behaviors as a member of a specific reference group in a specific context [10]. These two constructs may be particularly relevant for truck drivers who, while working, can only take breaks at official truck stops due to their vehicle size and parking regulations. Consumer research has indicated that truck stops offer limited healthy food options, like fruit and vegetables, while offering a large selection of discretionary foods. Thus, high levels of self-efficacy may be needed to maintain a healthy

diet even when the conditions to do so are difficult. In addition, given the majority of truck drivers consume meals in truck stops, this environmental eating context may increase the salience of other truck drivers as a reference group due to a large group presence [5, 6]. The increased salience means that perceived endorsement of accepted eating behaviors by the reference group (other truck drivers) will likely be an important influence on truck drivers' food choices.

The positive effects of self-efficacy and perceived normative support on health behavior are well-established. Data on the interactive effect of these factors on health behavior is, by comparision relatively scarce, and there is a need for research investigating these effects [11]. The core premise underpinning the roles of self-efficacy and normative support is that they are do not necessarily impact behavior independently, but do so interactively [7]. In the relatively sparse research conducted in this area, interactive effects of self-efficacy and perceived social support have been found such that individuals are more likely to engage in a health behavior when reporting high levels of both resources – a *synergistic hypothesis* [11]. Self-efficacy has, however, also been found to compensate for low perceived social support, in that individuals who report being unsupported benefit from their strong optimistic self-beliefs toward physical activity engagement – a *compensation hypothesis* [12, 13].

The aim of the current study was to test the process by which self-efficacy and perceived normative support predicted eating behaviors - fruit and vegetable intake (FV) and discretionary food choices (DC) – in a sample of long-haul truck drivers. By simultaneously investigating the effects of self-efficacy and normative support on eating behaviors we can examine the unique and interactive effects of these variables to test the two hypotheses [14]. An important initial step in our analysis was to test whether truck drivers' self-efficacy for FV and DC was related to their actual consumption of FV and DC mediated by their behavioral intentions. This hypothesis is consistent with many social cognitive models that conceptualize

intentions as an intermediary of beliefs on action [15, 16]. The models assume that individuals form intentions to act consistent with their beliefs and then act on those intentions. Assuming confirmation of the effect of self-efficacy on FV and DC via intentions (self-efficacy → intentions → behavior), we then tested whether that indirect effect was moderated by normative support. Specifically, we tested two possible hypotheses. To support a synergistic hypothesis, the mediated effect of the interaction term through intentions should be positive and high. This hypothesis assumed that trucker drivers who perceived that significant others would support their decisions to eat FV and limit DC would be more likely to have stronger effects of self-efficacy on consumption of FV and DC through intentions relative to those who believed that support was lacking. Essentially, trucker drivers who perceived that they have normative support for their consuming FV and limiting DC would be more likely to act on their confidence beliefs. In contrast, we also proposed a compensation hypothesis. In this case, one interpersonal resource (e.g., self-efficacy) should compensate for a lack in the respective other (e.g., normative support). In line with previous research, high self-efficacy should buffer against the effects of low normative support [13]. This means that trucker drivers who perceived a lack in normative support, would be able to compensate for that perceived lack of support such that their FV and DC was a function of their self-efficacy through intentions. This would mean that the indirect effect of self-efficacy on FV and DC via intentions would be higher for trucker drivers that perceived they had low normative support relative to those who perceived high normative support.

Method

Participants and Procedure

Results reported are part of a larger study investigating psycho-social processes of truck drivers' eating behavior. A prospective survey design was adopted with participants completing self-report measures of the target psychological and behavioral variables and demographic items on recruitment at time 1 (T1) with follow-up behavioral measures taken

by telephone interview one-week later at time 2 (T2). To reduce possible order effects, the presentation of measures of the two target behaviors FV and DC was counterbalanced. The final page of the T1 survey asked for contact details for a one week phone follow-up of actual behavior with anonymity protected through the use of a personalized code number. Recruited participants (N = 212; M_{age}= 45.18, SD_{age} = 11.90) comprised Australian men who drove a ≥12 tonne truck for at least 200 km in a daily work period (Stevenson et al., 2010). Participants had an average of 20.09 (SD = 12.19) years driving experience. The majority of participants (81.2%) were classified as overweight - defined as a body mass index (BMI) greater than 25 (M_{BMI} = 30.91, SD = 8.05, Range = 16.84 to 77.85). Approximately half (46.70%) of the participants had completed junior high school while the remainder had completed at least senior high school (20.28%), and received a vocational/trade (28.77%) or university (4.25%) qualification.

Measures

We defined the target behaviors in each measure according to health-promotion guidelines and time frame derived from Australian dietary guidelines for adult males (NHMRC, 2013). FV was defined as "eat fruit and vegetables following the recommended serves each day in the next week" and DC was defined as "limit consumption of discretionary foods to a maximum of 0-1 serves each day in the next week".

Behavioral intention at T1 (FV: α = .92; DC: α = .91) was measured on three items (e.g., "I intend to [target behavior definition and time frame]?"). Normative support at T1 (FV: α = .69; DC: α = .58) was measured on four items developed by Terry and Hogg [17] and assessed the behaviors and attitudes of an important referent group in this context (e.g., "How many other truck drivers you know would [target behavior definition and time frame]?"). The social group of 'other truck drivers' was deemed an appropriate normative referent group as truck drivers often perform eating behaviors in truck stops with other truck drivers present [18]. Self-efficacy at T1 (FV: α = .79; DC: α = .82) was measured on four

items (e.g., “I am confident that I could [target behavior definition and time frame]?”). Behavior at T2 (FV: $\alpha = .94$; DC: $\alpha = .98$) was measured consistent with Australian Dietary Guidelines [4] using three self-report questions (e.g., “In the previous week, how often did you [target behavior definition and time frame]?”). All items were measured on seven-point scales. Full details of measures are presented in Appendix A (supplemental materials).

Results

Of the participants completing the T1 questionnaire, 82 completed the follow-up questionnaire at T2, one week later (38.67% retention rate). Descriptive statistics and correlations among study variables for FV and DC for the participants retained at follow-up are presented in Appendix B (supplemental materials). Attrition analyses revealed no significant differences between participants that remained in the study at T2 and those that dropped out at T1 on the demographic (age, number of years driving, BMI, and education level; p’s > .489) and psychological (intention, normative support, and self-efficacy for FV and DC; Fs < 1.34, p’s > .262) variables.

Data were analysed using mediated and moderated linear multiple regression analyses [19] using Hayes’ [20] PROCESS program. Analyses for each of the two dietary behaviors were conducted separately. Data were analysed in two steps. In the first step, we tested the indirect effect of self-efficacy on dietary behavior (FV or DC) mediated by intentions. In the second step, we tested whether this indirect effect tested in the first step was moderated by perceived normative support. Specifically, the independent effects of self-efficacy and normative support on intentions were estimated along with the effect of a self-efficacy x normative support interaction term. The effects of self-efficacy, and the interaction term of self-efficacy and normative support, on T2 eating behavior were then estimated with intention as the mediator. Bootstrapped path estimates and confidence intervals (95%) were generated with 1,000 re-samples as recommended by Hayes [20]. Age, number of years driving, BMI, and education level were included as covariates in each analysis. The model tested is depicted

in Figure 1. Parameter estimates of the models tested for both FV and DC are provided in Table 1.

We found indirect effects of self-efficacy on behavior mediated by intention for both FV (β = .33, CI 95% [.03, .59]) and DC (β = .39, CI 95% [.06, .71]) behaviors. This confirmed our initial assumption that self-efficacy would predict behavior through intentions and allowed us to proceed to the moderated mediation analysis in which the interaction effect of self-efficacy and normative support was mediated by intention.

We found statistically significant effects of self-efficacy (FV: b = 1.53, CI 95% [0.91, 2.15], p < .001; DC: b = 1.37, CI 95% [0.77, 1.97], p < .001) and normative support (FV: b = 1.04, CI 95% [0.17, 1.92], p = .020; DC: b = 1.04, CI 95% [0.18, 1.90], p = .018) on intention. The self-efficacy x normative support interaction effect on intention was statistically significant (FV: b = -0.18, CI 95% [-0.34, -0.02], p = .033; DC: b = -0.15, CI 95% [-0.31, -0.01], p = .046). The model accounted for a substantial amount of variance in intentions while also controlling for age, number of years driving, BMI, and education level (FV: R^2 = .62, F (7,74) = 17.43, p < .001; DC: R^2 = .54, F (7,74) = 12.25, p < .001). We also found direct effects of intention (b = .36, CI 95% [.04, .68], p = .029) and self-efficacy (b = .48, CI 95% [.10, .86], p = .014) on FV behavior, but only a significant direct effect of intention (b = .48, CI 95% [.08, .88], p = .020) on DC behavior. Effects of age, number of years driving, BMI, and education level were trivial and not statistically significant.

The effect of the interaction of self-efficacy and normative support on behavior through intentions was statistically significant with a confidence interval that did not include zero (FV: b = -.06, CI 95% [-.18, -.01]; DC: b = -.07, CI 95% [-.19, -.01]). This indicated that the indirect effect of self-efficacy on behavior through intentions was stronger with lower perceived normative support. For both FV and DV behaviors, the conditional indirect effect of self-efficacy on behavior through intentions was highest in participants reporting low normative support (FV: b = .37, CI 95% [.09, .71]; DC: b = .46, CI 95% [.11, .85]) compared

to participants reporting high normative support (FV: *b* = .22, CI 95% [.06, .48]; DC: *b* = .27, CI 95% [.06, .56])[1], pointing to the fact that the effect of self-efficacy on these eating behaviors through intentions was likely to be stronger in participants with lower normative support.

Discussion

We aimed to test the process by which self-efficacy and normative support predicted FV and DC behaviors in long-haul truck drivers. Specifically, we tested two key hypotheses derived from social cognitive theory which described how these two social-cognitive variables impacted behavior mediated by intentions. We proposed either a synergistic effect in which high levels of both self-efficacy and normative support predicted behavior via intentions, or a compensatory hypothesis in which effects of self-efficacy on behavior through intentions occurred at lower levels of normative support and vice versa. These effects were tested for each behavior using a mediated moderation effects analysis [19].

For both FV and DC, we found an interactive effect of self-efficacy and normative support on behavior mediated by intention on behaviour, with the effect of self-efficacy on behavior through intentions stronger at lower levels of normative support. This finding indicates that the effect of self-efficacy on these eating behaviors through intention for long-haul truck drivers is dependent on their perceived level of normative support from significant others (e.g., other truck drivers). Truck drivers who have low levels of normative influence for these healthy eating behaviors are, therefore, more likely to base their intentions and behavior for FV and DC on their self-efficacy beliefs. This suggests that when the environment is unsupportive of healthy eating behaviors, personal beliefs regarding capacity to eat FV and limit DC foods are a key influence on behavior. Current findings provide preliminary evidence for the compensatory rather than synergistic effect, in which self-

[1]Consistent with convention in moderated regression analyses, low and high levels of normative support were defined as one standard deviation below and one standard deviation above the sample mean for normative support, respectively.

efficacy predicted behavior through intentions but only when normative support was low. This is consistent with previous research on physical activity in younger populations that found an interactive effect of both variables and a compensation of low support by high self-efficacy [13].

From a practical perspective, intervention efforts might benefit from promoting the self-efficacy of truck drivers, especially in cases where normative support for FV and DC consumption is likely to be perceived as low. Given research has suggested truck drivers are often confronted by environments where they are not exposed to healthy foods, or are unlikely to receive any normative support for healthy food choices [6, 18], current results indicate that self-efficacy may be the most appropriate target for intervention and yield the most substantive changes in intentions and behavior in the presence of low normative support. Intervention efforts should therefore focus on providing truck drivers with successful experiences of eating healthily, perhaps in the form of testimonials that could be placed on tables of truck stops in the same manner that has been done in workplace cafeterias [18]. Simple alterations to the social or physical environments of truck stops could also help to make healthful eating more likely. These might include providing information about what others are doing ("social norm feedback") framed to make healthy behaviors more salient or designating sections of truck stops for FV and healthy food options. Intervention efforts could also provide truck drivers with appropriate strategies and self-models of healthful eating, perhaps through imagery [21] and planning techniques [22].

Despite some conceptual and methodological limitations of the current study including a self-report measure of behavior and the relatively short-term one week follow-up period, the findings are novel and add to the literature investigating the complex relationship between self-efficacy and normative support on influencing health behaviour, including dietary behaviours [23]. Further research should seek to manipulate either self-efficacy or normative support or both factors to unveil causal pathways for the compensatory mechanisms.

Compliance with Ethical Standards

Funding: This study was not funded.

Conflict of interest: Author A declares that he/she has no conflict of interest. Author B declares that he/she has no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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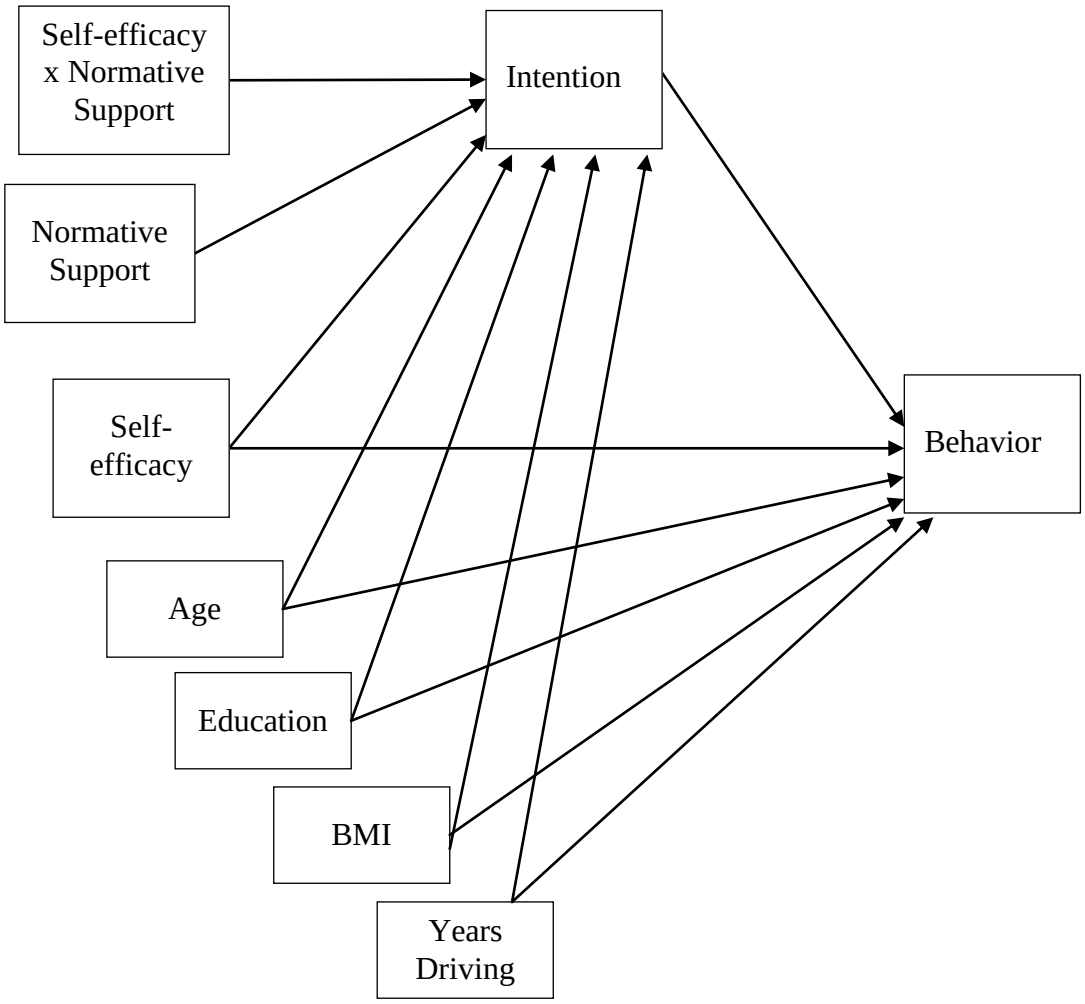
Table 1

Unstandardized Path Coefficients (B), 95% Confidence Intervals (CI_{95}) and Significance Levels (p) of Effects in Mediated Moderation Regression Analyses for Truck Drivers' Fruit and Vegetable Intake and Discretionary Food Choices.

Effect	Fruit and vegetable intake				Discretionary food choices			
	B	CI_{95}		*p*	B	CI_{95}		*p*
		LL	UL			LL	UL	
Direct effects								
Self-efficacy→Intention	1.53	0.91	2.15	<.001	1.37	0.77	1.97	<.001
Normative support→Intention	1.04	0.17	1.92	.020	1.04	0.18	1.90	.018
BMI→Intention	0.03	-0.01	0.08	.119	0.03	-0.02	0.07	.280
Age→Intention	0.01	-0.02	0.05	.539	0.01	-0.03	0.05	.587
Education level→Intention	-0.28	-0.80	0.25	.301	-0.34	-0.92	0.24	.243
Years driving→Intention	-0.03	-0.06	0.01	.137	-0.01	-0.04	0.03	.807
Intention→Behavior	0.36	0.04	0.68	.029	0.48	0.08	0.88	.020
Self-efficacy→Behavior	0.48	0.10	0.86	.014	0.05	-0.43	0.52	.850
BMI→Behavior	0.01	-0.05	0.08	.665	-0.01	-0.09	0.08	.820
Age→Behavior	0.02	-0.03	0.07	.385	0.09	0.21	0.16	.012
Education level→Behavior	0.36	-0.40	1.13	.346	0.06	-0.97	1.10	.905
Years driving→Behavior	-0.02	-0.07	0.03	.413	-0.03	-0.10	0.04	0.34
Interaction effect								
Self-efficacy x Normative support →Intention	-0.18	-0.34	-0.02	.033	-0.15	-0.31	-0.01	.046
Indirect effects[a]								
Self-efficacy→Intention→ Behavior	0.33	0.03	0.59	–	0.39	0.06	0.71	–
Self-efficacy x Normative support→Intention→Behavior	-0.06	-0.18	-0.01	–	-0.07	-0.19	-0.01	–
Self-efficacy→Intention → Behavior at Normative support +1SD[b]	0.22	0.06	0.48	–	0.27	0.06	0.56	–
Self-efficacy→Intention→ Behavior at Normative support M[b]	0.30	0.07	0.57	–	0.36	0.08	0.66	–
Self-efficacy→Intention→ Behavior at Normative support -1SD[b]	0.37	0.09	0.71	–	0.46	0.11	0.85	–

Note. [a]Significance levels (*p*-values) not provided when standard errors are computed using bootstrap simulation; [b]Conditional indirect effects of self-efficacy on behavior at three levels of normative support: the mean (M) and one standard deviation above (+1SD) and below (-1SD) the mean. B = Unstandardized regression coefficient; CI_{95} = 96% confidence intervals of B; *p* = Significance level of B.

Figure 1. Truck drivers and healthy eating: Path diagram depicting effect of self-efficacy on behavior mediated by intention and interaction of self-efficacy and normative support on intention.



Appendix A

Truck Drivers and Healthy Eating: Details of Survey Items Used to Measure Study Variables

Scale	Items	Scale points and anchors
Behavioral intention	I intend to eat fruit and vegetables following the recommended serves every day in the next week [I intend to limit my consumption of discretionary choices to a maximum of 0-1 serves every day in the next week].	1 = "strongly disagree", 7 = "strongly agree"
	I plan to eat fruit and vegetables following the recommended serves every day in the next week [I plan to limit my consumption of discretionary choices to a maximum of 0-1 serves every day in the next week].	1 = "strongly disagree", 7 = "strongly agree"
	I expect I will eat fruit and vegetables following the recommended serves every day in the next week [I expect I will limit my consumption of discretionary choices to a maximum of 0-1 serves every day in the next week].	1 = "strongly disagree", 7 = "strongly agree"
Normative support	Think about other truck drivers you know. What percentage of them would eat the recommended serves of fruit and vegetables every day in the next week? [Think about other truck drivers you know. What percentage of them would limit consumption of discretionary choices to a maximum of 0-1 serves every day in the next week?].	1 = "0%", 7 = "100%"
	Think about other truck drivers you know. How much would they agree that eating the recommended serves of fruit and vegetables every day in the next week is a good thing to do? [Think about other truck drivers you know. How much would they agree that limiting consumption of discretionary choices to a maximum of 0-1 serves every day in the next week is a good thing to do?].	1 = "not at all, 7 = "completely"
	How many other truck drivers you know eat the recommended serves of fruit and vegetables every day in the next week? [How many other truck drivers you know limit consumption of discretionary choices to a maximum of 0-1 serves every day in the next week?].	1 = "none", 7 = "all"
	How many other truck drivers you know would think that eating the recommended serves of fruit and vegetables every day in the next week is a good thing to do? [How many other truck drivers you know would think that limiting consumption of discretionary choices to a maximum of 0-1 serves every day in the next week is a good thing to do?].	1 = "none", 7 = "all"
Self-efficacy	It is mostly up to me whether I eat fruit and vegetables following the recommended serves every day in the next week [It is mostly up to me whether I limit my consumption of discretionary choices to a maximum of 0-1 serves every day in the next week].	1 = "strongly disagree", 7 = "strongly agree"
	I have complete control over whether I eat fruit and vegetables following the recommended serves every day in the next week [I have completed control whether I limit my consumption of discretionary choices to a maximum of 0-1 serves every day in the next week].	1 = "strongly disagree", 7 = "strongly agree"
	I am confident that I can eat fruit and vegetables following the recommended serves every day in the next week [I am confident I can limit my consumption of discretionary choices to a maximum of 0-1 serves each day].	1 = "strongly disagree", 7 = "strongly agree"
	It would be easy for me to eat fruit and vegetables following the recommended serves every day in the next week [It would be easy for me to limit my consumption of discretionary choices to a maximum of 0-1 serves every day in the next week].	1 = "strongly disagree", 7 = "strongly agree"
Behavior	In the previous week, to what extent did you ensure that you ate fruit and vegetables following the recommended	1 = "not at all", 7 = "to a large extent"

	serves every day? [In the previous week, to what extent did you ensure that you limited your consumption of discretionary choices to a maximum of 0-1 serves every day?]	
	In the previous week, on how many days did you ensure that you ate fruit and vegetables following the recommended serves every day? [In the previous week, on how many days did you limit your consumption of discretionary choices to a maximum of 0-1 serves every day?]	1 = “0 or 1 day”, 7 = “7 days”
	In the previous week, how often did you ensure that you ate fruit and vegetables following the recommended serves every day? [In the previous week, how often did you limit your consumption of discretionary choices to a maximum of 0-1 serves each day?]	1 = “never”, 7 = “very often”

Appendix B

Truck Drivers and Healthy Eating: Descriptive Statistics and Correlations among Study Variables for Fruit and Vegetable Intake and Discretionary Food Choices

Variable	Descriptive statistics		Correlations[a]							
	M	*SD*	1	2	3	4	5	6	7	8
1. BMI	29.96	6.11	–	.16	.17	.20	-.04	.19	.11	.05
2. Age (in years)	45.57	11.93	.16	–	.17	.79***	.11	-.09	.09	.35**
3. Education level[b,c]	–	–	.17	.17	–	-.01	-.02	-.08	-.08	.06
4. Years driving	20.73	11.87	.20	.79***	-.01	–	.10	-.09	.09	.21
5. Self-efficacy[d,e]	5.07 5.02	1.46 1.44	-.07	-.01	.02	-.06	–	.11	.68***	.29**
6. Normative support[d,e]	4.02 3.97	1.14 1.26	.04	-.20	.03	-.24*	.22*	–	.24*	.15
7. Intention[d,e]	4.94 4.67	1.75 1.70	.03	-.08	-.03	-.14	.75***	.27*	–	.38***
8. Dietary behavior[d,e]	3.88 4.38	2.03 2.44	.04	.03	.12	-.08	.59***	.27*	.58***	–

Note. $N = 82$; *M* = Mean; *SD* = Standard deviation. [a]Correlations printed below the principal diagonal are for fruit and vegetable intake and correlations printed above the diagonal are for discretionary food choices; [b]As educational level was a dichotomous variable coded as 1 = completed up to junior high school, 2 = completed senior high school or vocational/tertiary education descriptive statistics are not reported; [c]Correlations involving the education level variable are point biserial correlations; [d]Statistics reported in the upper row are for fruit and vegetable intake and statistics reported in the lower row are for discretionary food choices; [e]Scores range from 1 to 7.

*$p < .05$; **$p < .01$; ***$p < .001$