

REGULATORY FOCUS, NUTRITION INVOLVEMENT, AND NUTRITION KNOWLEDGE

Abstract

Few studies have examined the antecedents of nutrition involvement. Similarly, conflicting results have been recorded on the relationship between nutrition involvement and knowledge, knowledge and dietary behaviors, and nutrition involvement and dietary behaviors. This paper addresses these research gaps by exploring the role of regulatory focus as an antecedent of nutrition involvement. It also examines the effect of nutrition involvement on nutrition knowledge and the effects of both involvement and knowledge on diet adjustment. A large-scale study with 1125 Taiwanese consumers demonstrates a positive effect of promotion focus and no significant effect of prevention focus, on nutrition involvement. Sex and income moderate the effect of promotion focus on nutrition involvement, which in turn has positive effects on nutrition knowledge and diet adjustment. Nutrition knowledge also has a positive effect on diet adjustment. The study clarifies these relationships and provides suggestions to policy making.

Keywords: regulatory focus; nutrition involvement; nutrition knowledge; promotion; prevention.

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59 REGULATORY FOCUS, NUTRITION INVOLVEMENT, AND NUTRITION
60 KNOWLEDGE
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64 **1. Introduction**

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66 Consumer decisions regarding eating behaviors and nutrition lead to consequences such
67 as illness and obesity that have direct public policy implications (Andrews, Netemeyer &
68 Burton, 2009; Chandon & Wansink, 2007). An important construct that can inform the
69 stream of research on food selection/nutrition is the involvement construct (Zaichkowsky,
70 1985, 1986); more specifically, consumer involvement in nutrition (nutrition
71 involvement). This is so because obesity is preventable and enhancing consumer
72 involvement in nutrition enables achieving this goal. This study examines the effect of
73 nutrition involvement on nutrition knowledge and dietary behaviour as well as the effect
74 of regulatory focus on nutrition involvement.
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86 Whereas a few studies have examined the consequences and moderating effects of
87 nutrition involvement (e.g., Mulders, Corneille, & Klein, 2018), little research has
88 examined its antecedents. This study addresses this gap by examining the effects of
89 regulatory focus on nutrition involvement based on the fundamental motivational
90 differences between promotion and prevention focus (Higgins, 1997). Regulatory focus
91 theory has been employed to examine food intake and nutrition issues (e.g. Sengupta &
92 Zhou, 2007). The theory proposes two types of foci – promotion (pursuit of positive
93 outcomes) and prevention (avoidance of negative outcomes). The present study finds
94 differential effects of promotion and prevention focus on nutrition involvement.
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105 The study also examines the effect of (a) nutrition involvement and (b) nutrition
106 knowledge on diet adjustment following advice. The relationship between nutrition
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113 involvement and food selection and intake is unclear (Chandon & Wansink, 2007;
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115 Moorman, 1990). Similarly, research has recorded a weak association between nutrition
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117 knowledge and dietary intake (Sapp & Jensen, 1997). A possible reason for this
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119 inconsistent association is that the assessment of nutrition knowledge was not reliable
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121 (Parmenter & Wardle, 1999). The current study employs a reliable and valid scale of
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123 nutrition knowledge and demonstrates a positive relationship between knowledge and
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125 diet adjustment following advice. By documenting the effect of nutrition involvement and
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127 nutrition knowledge on diet adjustment following advice, the study makes useful
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129 contributions to the realm of nutrition and health policy making.
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134 In sum, this study makes the following contributions to the literature. First, the
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136 literature is scarce on the antecedents of consumer's nutrition involvement. Second, it
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138 extends the current understanding of the effects of regulatory focus on health and
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140 nutritional issues. Third, the study provides empirical clarification on the relationship
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142 between (a) nutrition involvement and consumer's knowledge of nutrition, and (b)
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144 nutrition involvement and nutrition related behavior, where ambiguous findings have
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146 been reported. Finally, by demonstrating the effect of nutrition knowledge on dietary
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148 behavior (diet adjustment following advice), the study seeks to clarify the inconsistencies
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150 regarding this effect reported earlier and showcases the benefits of enhancing consumer's
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152 nutrition involvement and knowledge.
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155 **2. Literature review**

156 *2.1. Involvement*

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158 Involvement is a person's perception of the relevance of the object based on needs,
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160 values, and interests (Zaichkowsky, 1985). For the present study, the behavioral form of
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171 involvement was adopted, following the definition by Stone (1984): “Involvement shall
172 be defined as time and/or intensity of effort expended in the undertaking of behaviours”
173 (p. 210). Zaichkowsy (1986) proposed personal factors (e.g., interest and values), object
174 or stimulus factors (e.g., source/ content of communication) and situational factors (e.g.,
175 occasion) as antecedents of involvement. Further to the early studies, little research has
176 examined the antecedents of involvement. Also, given the domain specificity of
177 involvement (a person’s involvement with domain X may not be correlated with her
178 involvement with domain Y), it is important to understand the specific factors that lead to
179 nutrition involvement which will inform actionable strategies.

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Regarding the consequences of nutrition involvement, Moorman (1990) found that involvement, measured as enduring motivation, enhanced self-assessed ability to process nutritional information, but not comprehension of information. Chandon and Wansink (2007) noted that consumer involvement leads to better calorie estimations.

2.2. *Regulatory focus*

Regulatory focus theory suggests that two types of foci - promotion and prevention - guide people’s behaviors (Higgins, 1987, 1997). Individuals with a promotion focus are concerned about the presence or absence of positive outcomes that lead to desired end states, whereas those with a prevention focus are concerned about the absence or presence of negative outcomes. Promotion focus is concerned with people’s wishes and aspirations, whereas prevention focus is concerned with their duties and responsibilities. The theory also suggests that the two foci are not always a stable, individual difference variable (Higgins, 1998). Rather, the foci can be situationally induced.

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227 The theory has been employed by scholars studying health and nutrition (Keller,
228 2006; Sengupta & Zhou, 2007; Karnal et al. 2016). For example, Sengupta and Zhou
229 (2007) showed that impulsive eaters develop a promotion focus when they see food items
230 that are tempting, which in turn drive their choice behavior to consume the hedonically
231 tempting food.
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238 *2.3. Consumer knowledge of nutrition*

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240 Consumer knowledge refers to information, both conceptual and relational, regarding the
241 domain stored in consumer's memory. Studies have examined consumer knowledge of
242 nutrition. For example, Moorman et al. (2004) found that subjective knowledge of
243 nutrition affects where consumers search and this in turn leads to better quality choices.
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245 While some researchers found that nutrition knowledge does not have an effect on food
246 label use (Nayga 2000), Miller and Cassady (2015), in their review, report a positive
247 effect.
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255 Studies have found that nutrition knowledge is correlated with greater weight loss
256 among low-income mothers who are either obese or overweight (Klohe-Lehman et al.,
257 2006). Men have been found to have poorer knowledge of nutrition compared to women,
258 and nutrition knowledge decreases among people with lower education level and those
259 who belong to lower socio-economic classes (Parmenter, Waller & Wardle, 2000). A
260 salient finding from this stream of research is the weak and inconsistent association
261 between nutrition knowledge and (a) dietary intake (Sapp & Jansen, 1997; Perlstein et al.
262 2017) and (b) nutrition related behaviors in general (Sapp, 1991). A possible reason for
263 this is the unreliable assessment of nutrition knowledge (Parmenter & Wardle, 1999).
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274 **3. Hypotheses**

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283 *3.1. Effect of regulatory focus on nutrition involvement*
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285 Promotion and prevention focus serve the purpose of goal pursuit, though the specific
286 strategies employed by individuals with different foci will differ (Lanaj et al., 2012).
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288 Both serve the purpose of health pursuit, albeit through approach (e.g. engaging in
289 healthy behaviors) and avoidance (e.g. avoiding unhealthy behaviors) routes (Crowe &
290 Higgins, 1997). Therefore, both foci can be related to nutritional involvement.
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Prior research has noted that promotion focused individuals engage in relational processing of information while prevention focused individuals engage in item level processing (Zhu, 2003). Relational elaboration involves “generating a wide range of associations that pertain to the similarities, connections, or relationships among a provided set of items, or to a given item” (Zhu, 2003; p. 4). But item specific elaboration focuses on the specific details of each piece of information (Meyers-Levy, 1991). Consequently, only limited and rather immediate associations are generated (Zhu, 2003).

People often encounter information related to diseases and health conditions resulting from poor dietary habits. Promotion focused individuals, through relational processing, are able to generate a variety of associations using this information, and thereby connect it to the nutrition domain, which enhances saliency of this domain. It also enhances the utilitarian value of nutritional practices, as such practices can prevent diseases. In addition, relational processing enhances the risk probability of poor nutritional choices by highlighting the connection between poor choices and diseases. Following research findings, increased saliency of the domain, greater utilitarian value, and greater risk probability enhances people’s nutrition involvement (Kapferer & Laurent, 1993). Hence, promotion focused people are likely to exhibit greater levels of

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339 nutrition involvement. Prevention focused people engage in item level processing, focus
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341 on the particularities of the given data and therefore generate only limited associations
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343 (Zhu, 2003). When they encounter information related to diseases as well as health
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345 conditions, they are unlikely to relate the information to nutrition. Consequently, for
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347 prevention focused individuals, nutrition domain is not salient, utilitarian value of
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349 nutrition is not brought to the fore, and perceived risk probability of poor nutritional
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351 choices is not highlighted. Given the possible association of prevention focus with
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353 nutrition involvement discussed earlier (since both serve the purpose of health pursuit),
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355 we expect a weak positive effect between prevention focus and nutrition involvement.
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359 H1a: Promotion focus will have a positive relationship with consumers' nutrition
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361 involvement.

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363 H1b: Prevention focus will have a positive relationship with consumers' nutrition
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365 involvement; the effect will be significantly weaker than the effect of promotion focus on
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367 nutrition involvement.

368 369 *3.2. Moderating effects of sex, age, and income*

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371 In this section, we propose the moderating effects of sex, income, and age on the effect of
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373 promotion focus on nutrition involvement. No hypotheses are offered regarding the effect
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375 of prevention focus on involvement since our expectation, as shown above, is at best a
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377 weak positive effect.

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379 *3.2.1. Sex:* Prior research has recorded that females have greater knowledge of nutrition
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381 and healthier habits compared to males (Yahia et al. 2016). von Bothmer and Fridlund
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383 (2005), in a study among Swedish university students, found that female (vs. male)
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385 students had healthier nutritional habits. Similar results were obtained in a study among
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395 older adults in the United Kingdom (Baker & Wardle, 2003) and athletes in a U. S.
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397 university (Dunn, Turner, & Denny, 2007). Studies have also found that females (vs.
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399 males) eat more fruits and vegetables (Wardle, Parmenter & Waller, 2000). Therefore,
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401 the overwhelming evidence suggests that females have higher levels of nutritional
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403 involvement. Hence, the effect of promotional focus on nutritional involvement will be
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405 weaker among females compared to males. In other words, females are likely to have
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407 nutritional involvement irrespective of promotion focus. But males have lower nutritional
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409 involvement and consequently, their involvement levels will be more responsive to their
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411 regulatory promotion focus. Hence we propose the following hypothesis:
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414 H2: Sex moderates the effect of promotional focus on nutrition involvement such that the
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416 effect is stronger among males, compared to females.
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419 *3.2.2. Income:* Research has recorded a positive association between income and health
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421 (Ecob & Smith, 1999). Low income people experience greater pressure to make ends
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423 meet. Hence, they are less able to devote time to issues such as nutrition. It has also been
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425 noted that low income consumers use fewer information cues and try to avoid “the cost of
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427 thinking” (Shugan, 1980). They are also likely to avoid the cost of searching information
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429 (Walsh, Evanschitzky, & Wunderlich, 2008). In addition, they will also not be able to
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431 spend extra money on nutritious food. Consequently, even when they are more promotion
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433 focused, the effect on nutritional involvement will be weak. Note that low-income
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435 consumers experience constraints (time, money) that limit the resources they can devote
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437 for nutritional issues; hence we argue this effect. But higher income people have more
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439 time and money for issues concerning health. Research has noted that income and
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441 education are correlated (Arnould, Plastina, & Ball, 2009) and hence higher income
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449 consumers process information better and are able to reason better, especially when
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451 motivated to do so. Therefore, when their promotion focus increases, their nutritional
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453 involvement is likely to show greater increase. Hence,
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458 H3: Income positively moderates the effect of promotion focus on nutritional
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460 involvement such that the effect is greater among high (vs. low) income consumers.
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462 3.2.3. *Age*: Older consumers are more likely to have health problems and are more
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464 concerned about health. Hence, they will be more concerned about nutrition related
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466 issues, leading to greater levels of nutritional involvement. This is especially so as older
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468 consumers have more free time (East et al., 2000), which enables them to devote
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470 attention to nutrition and health issues. This effect will operate irrespective of promotion
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472 focus. But younger consumers are less likely to be concerned about nutritional issues,
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474 leading to lower levels of nutritional involvement. Promotion focus will likely enhance
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476 nutritional involvement among younger consumers. In other words, the effect of
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478 promotion focus is likely to manifest more strongly among younger compared to older
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480 consumers. Therefore,
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483 H4: Age negatively moderates the relationship between promotion focus and nutritional
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485 involvement such that the effect is stronger among younger (vs. older) consumers.
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487 3.3. *Effect of nutrition involvement on knowledge of nutrition*

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489 As noted earlier, the relationship between nutrition involvement and nutrition knowledge
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491 is unclear. Wansink (2005) suggested that consumers high in nutritional involvement are
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493 likely to be more knowledgeable about nutritional issues than their low-involvement
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495 counterparts are. Moorman (1990) found that nutrition involvement, measured as
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497 enduring motivation, does not increase comprehension of nutrition information.
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507 Involvement is associated with (a) more time and effort that are spent on
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509 searching the domain (Stone, 1984) and (b) cognitive elaboration and greater processing
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511 of relevant information (Celsi & Olson, 1988). Highly involved, compared to uninvolved,
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513 consumers are more motivated to form accurate judgements. Therefore, they engage in
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515 more intensive search of relevant information (Pillai & Hofacker, 2007). These effects
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517 will operate with nutrition involvement thereby resulting in the acquisition of greater
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519 amounts of nutritional information by involved consumers. Therefore,
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522 H5: Nutrition involvement is positively related to the level of nutrition knowledge.
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524 *3.4. Effect of nutrition knowledge on diet adjustment following advice* 525

526 The effect of knowledge on the intention to perform the behavior and subsequent
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528 behavior has been highlighted by the theory of planned behavior (Ajzen, 1985; Ajzen &
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530 Fishbein, 1977). Research has documented the positive effects of diet adjustment and diet
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532 modification. For example, it has been shown that diet modification, which implies a
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534 move towards greater consumption of natural products, can help prevent cancer (Abdulla
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536 & Gruber, 2000) and is critical in managing diabetes (vanWormer & Boucher, 2004).
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539 Popular press and mass media constantly highlight the importance of diet modification
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541 for better health. Nutrition knowledge enables better understanding and processing of the
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543 messages which enables subsequent action. Consumers are also likely to receive several
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545 pieces of advice regarding nutrition from multiple sources in their day-to-day lives.
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548 Greater levels of nutrition knowledge enhance the processing of such messages, and
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550 enables consumers to understand the implications of following such advice. Therefore,
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552 greater levels of knowledge will lead to diet adjustment following advice.
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563 H6: Greater the level of nutritional knowledge, greater the incidence of diet adjustment
564 following advice.
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568 3.5. *Effect of nutrition involvement on diet adjustment following advice*

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570 As noted earlier, the effect of nutrition involvement on nutrition related behaviors is
571 unclear (Moorman, 1990; Chandon & Wansink 2007). A direct effect of involvement on
572 behavior is true by the definition of involvement. Nutrition involvement enhances the risk
573 importance and risk probability of nutritional domain (Kapferer & Laurent, 1993), which
574 will lead to individuals paying greater attention to advice regarding diet, and being more
575 likely to heed such advice. Hence we propose a direct effect of nutrition involvement on
576 diet adjustment following advice.
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584 H7: Greater the level of nutrition involvement, greater the incidence of diet adjustment
585 following advice.
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589 Hypotheses 5, 6, and 7 propose that nutrition involvement leads to both nutrition
590 knowledge and diet adjustment following advice, while nutrition knowledge leads to diet
591 adjustment. Taken together, the hypotheses propose a partial mediation effect of nutrition
592 knowledge on the relationship between nutrition involvement and diet adjustment. Hence,
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597 H8: Nutrition knowledge partially mediates the relationship between nutrition
598 involvement and diet adjustment following advice.
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601 Figure 1 shows the hypothesized model.
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608 **4. Method**

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610 The hypotheses were tested in a national level study conducted in Taiwan. We chose
611 Taiwan as a representative country for the region. The high per capita GDP is comparable
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619 to Hong Kong, Japan and South Korea, while the ethnic similarity with Chinese lead to
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621 meaningful extrapolation of the findings to urban China. Dietary habits have been
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623 changing in Taiwan. Increases in metabolic syndrome and diabetes were observed from
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625 the 1990s to mid 2000s. Positive dietary behaviors were catching up during this period
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627 (avoidance of animal fat, more intake of fruits, fish etc.) (Pan et al., 2011). All these
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629 trends make Taiwan a useful context for this study by providing insights about nutrition-
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631 related consumer attitudes and behaviors in East Asia.
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634 Data were collected through stratified sampling from all the major geographical
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636 regions in Taiwan – North, Middle, South and East in early 2009. Care was taken to
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638 ensure that the geographical distribution of the sample corresponded with the census data.
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640 The proportion of consumers aged 20-64 from each region in the national population
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642 matched with the proportion of consumers from each region in the sample, within a
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644 margin of 2%. Trained research assistants undertook the data collection. These research
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646 assistants contacted adults from the general population and sought participation in the
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648 study. 1176 questionnaires were completed. After rejecting incomplete ones, 1125 usable
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650 questionnaires were obtained.
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653 *4.1. Measures*

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655 Nutrition knowledge was measured using a 21 item scale developed by the current
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657 authors. Prior research has employed diverse methods to measure nutrition and health
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659 knowledge. For example, Moorman (1990) employed a ten item scale to measure
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661 consumers' health knowledge. Nayga (2000) used an 8 item knowledge scale. In the
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663 nutrition science domain too, various scales have been employed and concern has been
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665 raised that some of these scales do not meet standards of reliability or construct validity
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675 (Parmenter & Wardle, 1999; Sapp & Jensen, 1997). Attempts have been made to remedy
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677 the problem through the development of scales through accepted scale development
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679 procedures (Dickson-Spillmann, Siegrist, & Keller, 2011). However, food being
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681 culturally rooted, these scales are often based on the more popular food consumed in the
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683 countries in which they were developed. Therefore, we sought to develop our own scale
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685 suited to the context of study (Taiwan) to measure consumer's nutrition knowledge.
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688 The scale development followed standard psychometric procedure such as (a)
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690 initial review of the literature and consultations with dieticians in Taiwan to develop an
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692 initial pool of 179 items (b) paring down the number of items to 73 following interviews
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694 with dieticians and masters students in food and nutrition regarding accuracy and clarity
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696 of construction of the items, and (c) pretest among 60 Taiwanese students in the U.K to
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698 understand the difficulty and discrimination of the items. Items with poor discrimination
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700 scores were dropped and 21 items were selected.
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703 Nutrition involvement was measured using the five-item scale proposed by
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705 Chandon and Wansink (2007) (I pay close attention to nutrition information; Calorie
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707 levels influence what I eat; It is important to me that nutrition information is available; I
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709 ignore nutrition information (reverse coded); I actively seek out nutrition information).
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711 Responses were obtained on a 7 item scale. Promotion and prevention focus were
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713 measured using the Regulatory Focus Questionnaire (RFQ) (Higgins et al., 2001).
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715 Promotion focus scale comprises six items, while the prevention focus scale comprises
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717 five items. Responses were obtained on a 1 to 5 agree-disagree scale.
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720 Diet adjustment following advice was measured by a four item scale, adapted
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722 from the cues about the importance of eating a quality diet scale employed by Sapp and
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731 Weng (2007). The items included (1) I have once been affected by mass media
732 presentations to adjust my diet type (2) I have once listened to my doctor's
733 recommendations to adjust my diet type (3) I have once accepted my family member's
734 advice to adjust my diet type and (4) I have once accepted my friend's recommendation
735 to adjust my diet type. Responses were obtained on a yes-no format.
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742 The scales in English were translated to traditional Chinese by three PhD level
743 English-traditional Chinese bilingual researchers in Taiwanese academia who were
744 employed in the health or health psychology fields. Six Masters students studying
745 Chinese literature, with English as their mother tongue, back-translated the questionnaires
746 to English. The versions were compared and required modifications were made, after
747 consultations with the researchers and the Masters students. The translated questionnaire
748 was pretested with 42 consumers from different socio-economic backgrounds to ensure
749 that it works well.
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759 The moderating variables can have direct effects on the three dependent variables.
760 Literature provides unequivocal support only for the direct effect of sex on nutrition
761 involvement, nutrition knowledge and dietary behaviour. In order to account for any
762 potential direct effects and provide a more rigorous test of the proposed hypotheses, we
763 controlled for the effects of sex, income and age on nutrition involvement, nutrition
764 knowledge and diet adjustment following advice.
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771 4.2. *Scale reliability and validity*

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773 Nutrition involvement scale had reliability (coefficient alpha) of .83. The scale was also
774 found to be unidimensional as 60.2% of the variance was extracted by the first principal
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787 component. The coefficient alpha value of the six item promotion scale was .86, while
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789 that of the five item prevention scale was .85.
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791 The nutrition knowledge scale is a formative scale. Following the
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793 recommendations of Diamantopoulos and Winklhofer (2001), we examined indicator
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795 collinearity which could potentially lead to item redundancy. This was done through a
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797 dummy variable regression analysis, with knowledge as the dependent variable and the
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799 individual items as the independent variables. Maximum VIF obtained (1.39) was less
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801 than the recommended cut-off value of 10 (Neter, Kutner, Nachtsheim, & Wasserman,
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803 1996). Therefore, no significant redundancy was observed.
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806 Reliability estimates of the knowledge scale and the diet adjustment scale were
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808 also obtained using the Proportional Reduction of Loss method (Rust & Cooil, 1994).
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810 This method can be used to compute the reliability of formative scales. The measure is
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812 evaluated similar to the coefficient alpha, with .7 being the acceptable threshold of
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814 reliability. The PRL method gave estimates of .93 for the nutrition knowledge scale and
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816 .79 for the diet adjustment scale. These estimates can be considered as very conservative
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818 as they are obtained from the table with a maximum number of 20 judges (Rust & Cooil,
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820 1994, p. 7), whereas the sample size for the study is 1125. Note that reliability increases
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822 with the number of judges for a given proportion of inter-rater agreement. Overall, both
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824 the scales are deemed very reliable.
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827 Confirmatory Factor Analysis (CFA) using maximum likelihood estimation was
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829 employed to test the convergent and discriminant validities of the three multi-item
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831 constructs. The fit indices indicated that the model had a good fit ($\chi^2 (101) = 427, p <$
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833 $.001$; TLI = .95; CFI = .95; RMSEA = .05). We also computed construct reliabilities
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843 using standardized loadings. Construct reliabilities of nutrition involvement, promotion,
844 and prevention were .83, .86, and .85, all higher than the threshold value of .75 (Bagozzi
845 & Yi, 1988). Average variance extracted and factor loadings were examined to assess
846 convergent validity. AVE values of Nutrition Involvement, Promotion, and Prevention
847 were .50, .51, and .52, all of them being higher than the recommended cut-off value of .5.
848 Factor loadings of all the constructs were statistically significant at .05 level. In addition,
849 indicators load substantively on their respective constructs, as the standardized
850 coefficients are greater than .5. Together, these results indicate convergent validity. We
851 examined discriminant validity by comparing the AVE values with the square of the
852 correlation between the construct and each of the other constructs. Discriminant validity
853 is obtained if the square of the intercorrelation is less than the AVE values of the
854 corresponding constructs (Fornell & Larker, 1981). This was the case for all pairs of
855 constructs, establishing discriminant validity.
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871 Common method variance is discounted for the study as the responses for the
872 variables were obtained through different operational procedures (Likert scale items for
873 regulatory focus and involvement, multiple choice items for knowledge, yes-no response
874 choices for diet adjustment scale; response items for different income, age, sex groups).
875 This conforms to the recommendation by Podsakoff et al. (2003, p. 888) that the
876 predictor and criterion variables should be measured using different response formats. A
877 Harman's one factor test, run using the three multi-item scales (promotion, prevention,
878 nutrition involvement) yielded 28.2% of variance for the single factor, which is
879 acceptable. A common factor analysis was also run. The regression estimate between the
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899 common factor and each item was .00, denoting an extremely low common variance.
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901 Overall, it can be concluded that common method variance is not an issue.
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903 4.3. *Descriptive statistics*

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905 The sample exhibited a high level of nutrition involvement with a mean of 5.29 ± 1.76 .
906 Promotion (Mean = $3.34 \pm .86$) and prevention (Mean = $3.28 \pm .93$) were just above
907 average. Nutrition knowledge was moderate with a mean of 11 ± 2.91 . Diet adjustment
908 following advice too was above average (Mean = 2.47 ± 1.48). Table 1 provides the
909 descriptive statistics. We compared the distribution of age with the data for Taiwan
910 obtained from U. S. census bureau for 2008 and found that there is a broad
911 correspondence with the national figures on age distribution.
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922 Insert tables 1 and 2 here
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925 4.4. *Test of hypotheses*

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927 The hypotheses were tested using a structural model. The model obtained an acceptable
928 fit ($\chi^2 (215) = 612, p < .001$; IFI = .95; CFI = .95; RMSEA = .041). The supplementary
929 table shows the parameter estimates. It can be seen that promotion focus is positively
930 related to nutrition involvement but prevention has no relationship with involvement;
931 these results provide support for H1a but not H1b. Sex tended to have a directional
932 negative moderating effect on the effect of promotion on nutrition involvement ($p =$
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955 greater among high income people, thus supporting H3. The moderating effect of age is
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957 not significant; thus H4 is not supported. Nutrition involvement is found to have a
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959 positive effect on nutrition knowledge, supporting H5. As hypothesized by H6, nutrition
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961 knowledge has a positive effect on diet adjustment following advice. According to H7,
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963 nutrition involvement has a positive effect on diet adjustment following advice. It can be
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965 seen that this hypothesis is also supported.
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968 The significance of paths in hypotheses 5, 6, and 7 together seem to indicate a
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970 partial mediation effect. In order to provide a more rigorous test for the effect, we
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972 conducted the Sobel test (Sobel, 1982). Note that Sobel test is powerful when the sample
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974 size is large, as is the case with this study. The test was significant (Test statistic = 3.567;
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976 S.E. = .008; $p = .00$). Therefore, H8 is supported.
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979 It is possible to argue that nutrition knowledge leads to nutrition involvement. To
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981 rule out this possibility, we ran another model with nutrition knowledge leading to
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983 nutrition involvement and the other constructs remaining the same. It was found that the
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985 chi-square value for the second model went up from 612.4 to 651.6. The AIC for the first
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987 model was 782.4, whereas the same for the second model was 821.6. This indicates that
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989 the specified model is superior to the alternative model.
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991 **5. Discussion**

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993 Regulatory focus theory, proposes the existence of fundamental motivational differences
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995 among people (Higgins, 1997, 1998). The very existence of such differences, and their
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997 influence on consumer behaviors, make them very relevant to the study of issues that
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999 affects public policy. Not many studies have examined the effects of regulatory focus on
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1011 such issues (e.g., Dholakia et al., 2006). The results of this study point to the applicability
1012 of regulatory focus theory to the study of diet and nutrition.
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1015 The study found that promotion focus leads to consumer's nutrition involvement.
1016 Prevention focus had no effect on nutrition involvement. The former result is in line with
1017 theoretical expectations. It is important to note that promotion focused people are ideal
1018 focused (pursuing their own goals) whereas prevention focused people are ought focused
1019 (pursuing responsibilities). Expectedly, it is the former who are likely to devote attention
1020 to their nutrition needs. The higher aspirational levels of promotion focused consumers
1021 will lead to greater involvement with nutrition to enhance their well-being. More
1022 interesting are the moderating effects of sex and income. Sex tended to have a
1023 moderating effect such that the effect is likely to be greater among males (vs. females).
1024 The study found that the effect of promotion focus on nutritional involvement is greater
1025 among high (vs. low) income consumers.
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1039 Both regulatory foci serve the purpose of goal pursuit, albeit through different
1040 strategies (Lanaj et al., 2012). Thus, while both promotion and prevention focused
1041 individuals will be motivated to maintain good health, the former are more likely to
1042 employ approach strategies such as nutritional involvement, while the latter will employ
1043 avoidance strategies (e.g., avoiding risky behaviors). The findings of the study indicate
1044 that involvement is essentially an approach behavior.
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1051 The study found that nutrition involvement leads to nutrition knowledge. While
1052 the theory of involvement leads to such an expectation, prior findings have been rather
1053 equivocal (e.g., Moorman, 1990). The current study provides useful empirical
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1067 clarification regarding this effect. The finding was obtained using a rigorously developed
1068 scale, following recommended psychometric procedures, to assess nutrition knowledge.
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1071 The study also contributes to the literature by demonstrating a pertinent
1072 behavioral consequence of nutrition knowledge. In this context too, the study provides
1073 empirical clarification regarding an important effect where conflicting findings have been
1074 recorded (Nayga, 2000; Sapp, 1991; Sapp & Jensen, 1997). However, as noted by
1075 previous researchers, knowledge was often measured poorly, using scales comprising
1076 only a few items. This study reexamines the effect using a reliable 21 item scale and
1077 confirms the effect. In so doing, it provides valuable guidance to public policy efforts in
1078 enhancing consumer’s nutrition involvement and knowledge.
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1088 Finally, the study showed the effect of nutrition involvement on diet adjustment.
1089 The relationship between nutrition involvement and food selection is unclear in the
1090 literature (Moorman, 1990; Chandon & Wansink 2007). The finding of this study
1091 supports the conclusion that nutrition involvement has a positive effect on diet selection.
1092 The direct effect of nutrition involvement on diet adjustment is stronger than the indirect
1093 effect through nutrition knowledge. This underscores the importance of investing efforts
1094 to promote nutrition involvement.
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1103 The study employed data collected through a rigorous procedure, which broadly
1104 corresponded to the national distribution regarding relevant demographic variables. This
1105 is a key strength of the study and adds to the external validity of the findings.
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1109 *5.1. Theoretical implications and future research*

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1111 As mentioned earlier, few studies have examined the determinants of nutrition
1112 involvement. This is a major contribution of the study and furthers the research agenda in
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1123 this direction. Given the problems of obesity and illnesses directly linked to unhealthy
1124 eating habits and the direct effect of nutrition involvement on dietary behaviors
1125 demonstrated in this study, the construct of nutrition involvement merits greater scholarly
1126 attention. Future research can examine the role of other antecedents on nutrition
1127 involvement as well as the boundary conditions of these relationships. Future research
1128 can also examine the boundary conditions of the relationships between (a) nutrition
1129 involvement and nutrition knowledge (b) nutrition knowledge and dietary behavior and
1130 (c) nutrition involvement and dietary behavior that will help develop a more fine-grained
1131 understanding of these effects.
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1142 In trying to understand the effect of regulatory focus on nutrition involvement
1143 and thereby dietary behaviour, the study complements research in areas such as
1144 neuroeconomics that seeks to decipher the mechanism behind nutrition choices (Bruce,
1145 Krespi & Lusk 2015; Muller & Prevost 2016). Future research can investigate the
1146 neurological bases and neural responses of regulatory foci and the paths through which
1147 they influence dietary behavior.
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1155 5.2. *Managerial implications*

1156 Prior research has recorded that regulatory focus can be induced (Roney et al., 1995).
1157 Situational factors that can prime a person's aspirations (duties) can induce promotion
1158 (prevention) focus. Therefore, in addition to being an individual difference variable,
1159 regulatory focus can also be considered as a motivational state (Zhu, 2003). The
1160 implication is that public agencies can induce promotional focus through appropriate
1161 communication, which should enhance their nutritional involvement. The direct effect of
1162 promotion focus on nutritional involvement would call for such a course of action. But,
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1179 as the results of this study indicate, the efficacy of this intervention will vary between
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1181 high and low income groups and is likely to vary between males and females. The
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1183 demonstrated positive effects of nutrition involvement on nutrition knowledge and
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1185 dietary adjustment would call for such an intervention.
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1187 1188 *5.3. Limitations* 1189

1190 The study has some limitations. The hypotheses have been tested using correlational
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1192 design. Field experiments can further examine the hypothesized relationships. Further
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1194 research can also replicate the study in western contexts.
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1196 To conclude, the study makes useful contributions to the streams of research on
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1198 regulatory focus, nutrition involvement, and nutrition knowledge. It is hoped that the
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1200 reported findings will (a) fuel further research and (b) inform public policy formulation.
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Figure 1
Hypothesized model

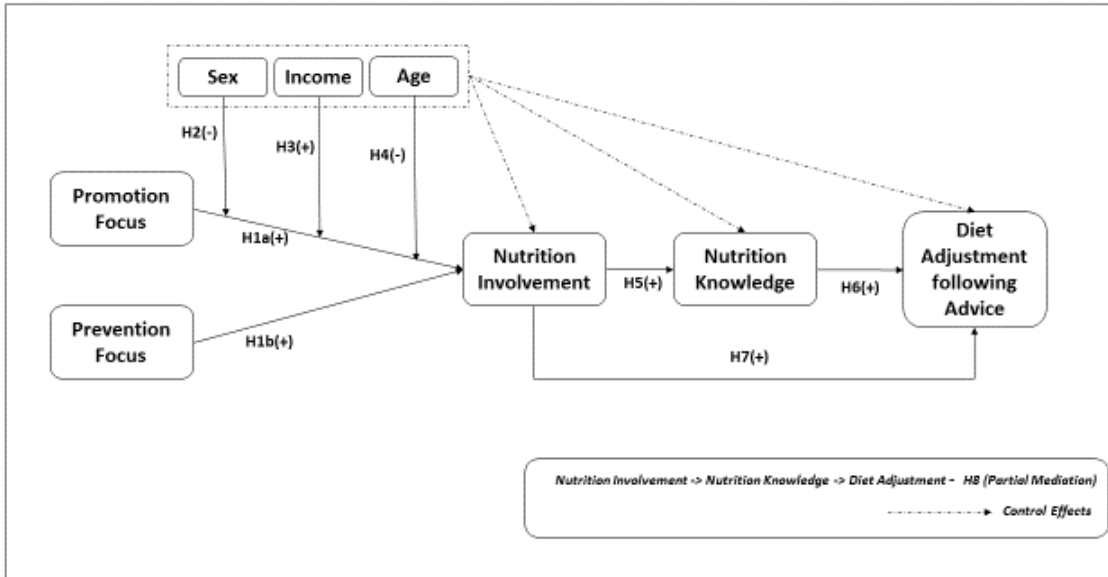


Table 1
Descriptive Statistics

	Mean ± SD
Nutrition involvement	5.29 ± 1.76
Promotion	3.34 ± .86
Prevention	3.28 ± .93
Nutrition knowledge	11 ± 2.91
Diet adjustment following advice	2.47 ± 1.48
	Percentage
Sex (Males)	42.1
Sex (Females)	57.9
Age (20-30)	32.5
Age (31-40)	27.9
Age (41-50)	21.1
Age (51-60)	14
Age (above 60)	4.5
Income (No income)	10.5
Income (Less than NT\$ 17280)	13.2
Income (NT\$ 17281-25000)	21.2
Income (NT\$ 25001-35000)	22.2
Income (NT\$ 35001-45000)	16.9
Income (NT\$ 45001-55000)	11.7
Income (NT\$ 55001-65000)	3.7
Income (Above NT\$ 65000)	.5

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Table 2
Correlation Matrix

	N.I.	Promo.	Preven.	N.K.	D.A.
N.I.	1.00				
Promotion	.161** (.00)	1.00			
Prevention	.019 (.52)	.309** (.00)	1.00		
N.K.	.233** (.00)	.065* (.03)	.009 (.75)	1.00	
D.A.	.215** (.00)	.096** (.00)	.068* (.02)	.171** (.00)	1.00

** significant at < .01 level.

* significant at < .05 level.

() indicates p values.

N.I - nutrition involvement; N.K. - nutrition knowledge; D.A. - diet adjustment following advice

Supplementary Table
SEM Parameter estimates

	S.P.C	S.E.	C.R.	P value
Promotion -> N.I.	.384	.077	5.002	.00
Prevention -> N.I.	-.095	.068	-1.394	.163
Prom.XSex -> N.I.	-.096	.049	-1.946	.052
Prom.XIncome -> N.I.	.145	.048	3.035	.002
Prom.XAge -> N.I.	.002	.050	.046	.963
N.I. -> N.K.	.457	.062	7.395	.000
N.K. -> D.A.	.054	.015	3.508	.000
N.I. -> D.A.	.187	.032	5.819	.000
Sex -> N.I.	.342	.101	3.393	.000
Income -> N.I.	.006	.030	.198	.843
Age -> N.I.	.013	.042	.320	.749
Sex -> N.K.	.693	.171	4.045	.000
Income -> N.K.	.081	.051	1.587	.113
Age -> N.K.	-.012	.070	-.174	.861
Sex -> D.A.	.250	.088	2.852	.004
Income -> D.A.	.026	.026	.994	.320
Age -> D.A.	.016	.036	.445	.657

S.P.C - Standardized path coefficient; S.E. – Standard error; C.R. – Critical ratio

N.I - Nutrition involvement; N.K. - Nutrition knowledge; D.A. - Diet adjustment following advice

Supplementary file
Appendix

1849	
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1858	NUTRITION KNOWLEDGE SCALE
1859	
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1861	1. Which is a safer method for long-term weight-loss?
1862	
1863	(1) Surgeries + Slimming products (2) High-protein diets + Slimming products (3) Balanced low calorie
1864	diets + Physical activities (4) Very low calorie diets + Physical activities
1865	
1866	2. Which of the following is classified as acidic pH food?
1867	
1868	(1) Milk (2) Citrus fruits (3) Green leafy vegetables (4) Meat products
1869	
1870	3. Which vitamin is water-soluble?
1871	(1) A (2) B (3) E (4) K
1872	
1873	4. What vitamin can be added to milk to prevent rickets?
1874	(1) A (2) B (3) C (4) D
1875	
1876	5. Which nutrient helps heal wounds and scar tissue?
1877	(1) Vitamin A (2) Vitamin C (3) Zink (4) Calcium
1878	
1879	6. Your friend believes that consuming eggs is not healthy; how would you reply?
1880	(1) Yes, eggs can provide good quality protein. (2) No, eggs contain high-cholesterol. (3) No, it causes
1881	heart disease. (4) Eggs can be healthy or unhealthy, depending on the individual's daily diet.
1882	
1883	7. Which statement presents the healthiest way to judge food in daily diets?
1884	
1885	(1) To judge from the viewpoint of whether or not that food can reduce the incidence of diseases (2) Just
1886	read the nutritional content to decide whether or not the food is good (3) Listen to most people's comments
1887	on that food (4) Understand its role in all sorts of balanced meals and understand how foods are paired well
1888	with each other
1889	
1890	
1891	8. Which of the following oils contains the richness of omega-3 fatty acid?
1892	
1893	(1) Olive oil (2) Sun-flower seed oil (3) Fish oil (4) Corn oil
1894	
1895	9. Which food is an alkaline?
1896	(1) Plum (2) Lemon (3) Pork (4) Lamb
1897	
1898	10. A hamburger meal special (Hamburger, coke, fries, and apple pie) is low in what nutrient?
1899	(1) Calcium (2) Sodium (3) Iron (4) Phosphorus
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11. Which is not a good source of calcium?
(1) Fresh milk (2) Yogurt (3) Skimmed milk (4) Butter
12. Which of the following menus contains the least amount of Vitamin C?
(1) One barbecued steak, carrots, noodles and Coke (2) One hot dog, lettuce salad, fries and milk (3) One spaghetti with meat and tomato sauce, garlic bread and wine (4) One barbecued steak, broccoli, noodles and green tea
13. Vitamin K is found chiefly in:
(1) Leafy green vegetables (2) Beef (3) Oats (4) Skimmed milk
14. Which oil is not conducive to the prevention of cardiovascular diseases?
(1) Peanut oil (2) Coconut oil (3) Soybean oil (4) Sunflower oil
15. Which nutrients are related to the maintenance of a person's basic taste?
(1) Magnesium (2) Chromium (3) Copper (4) Zinc
16. Which of these is not the main function of protein in human body?
(1) Acts as an acid-base equilibrium (2) Provides energy (3) Promotes growth and repairs the tissues (4) Maintains the balance between water and electrolytes
17. Which of the following factors is not a criterion taken into account by DRI (Dietary Reference Intake)?
(1) Age (2) Gender (3) Body weight (4) Have special diseases
18. Vitamin C can help body to absorb what mineral?
(1) Copper (2) Zinc (3) Iron (4) Magnesium
19. The material that cannot be decomposed by human digestive organs is known as:
(1) Crude fiber (2) Fiber (3) Dietary fiber (4) Residue
20. When the body needs energy, which carbohydrates are known as the fastest source of energy?
(1) Glycogen (2) Fructose (3) Sucrose (4) Glucose
21. Which group is the best source for calcium intake?
(1) Icy milk, butter, cheese (2) Milk, cheese, yoghurt (3) Sardines, spinach, cabbage (4) Chocolate milk, dried fish, butter