

The mediating and moderating role of planning on mothers' decisions for early childhood
dietary behaviours

Kyra Hamilton^{1,2}, Emily Jane Kothe³, Barbara Mullan^{2,4}, Teagan Spinks¹

¹School of Applied Psychology and Menzies Health Institute Queensland, Griffith University,
Brisbane, Queensland, Australia.

²School of Psychology and Speech Pathology and Health Psychology and Behavioural
Medicine Research Group, Curtin University, Perth, Western Australia

³School of Psychology, Deakin University, Melbourne, Australia

⁴School of Psychology, University of Sydney, Sydney New South Wales, Australia

Cite as: Hamilton, K., Kothe, E. J., Mullan, B., & Spinks, T. (in press) The mediating and
moderating role of planning on mothers' decisions for early childhood dietary behaviours.

Psychology and Health

Abstract

Objective: Examine the roles of action and coping planning on the intention-behaviour relationship for mothers' decisions for their young children's dietary behaviours. **Design:** Prospective design with two waves of data collection, one week apart. **Main Outcome Measures:** Mothers ($N = 197$, $M_{age} = 34.39$, $SD = 5.65$) of children aged 2-3 years completed a main questionnaire assessing planning constructs and intentions, and a 1-week follow-up of the target behaviours - 'healthy eating' and 'discretionary choices'. **Results:** Intention was the strongest predictor of behaviour for both dietary behaviours. For healthy eating, intention moderated the indirect relationship between intention-behaviour via planning; coping planning was less important when intention was strong. Further, intention was not a direct predictor of behaviour when intention was relatively low. Action planning was not a direct predictor of either behaviour after accounting for intention and coping planning; action planning on behaviour was mediated by coping planning (only for healthy eating). Intention was not a direct predictor of coping planning; intention on coping planning was mediated by action planning. Neither type of planning predicted discretionary choices. **Conclusion:** Current findings contribute novel information on the mechanisms underpinning the effect of action and coping planning on the intention-behaviour relationship.

Key words: Health Action Process Approach, Action Planning, Coping Planning, Mothers, Children, Nutrition

Introduction

Globally, chronic disease is the biggest health challenge of the 21st century, including in Australia, where one in two individuals has a chronic disease (Tolhurst, Lindberg, Calder, Dundar, & de Courten, 2016). Many of these diseases are preventable or capable of significant amelioration through behaviour change and through delivering brief lifestyle interventions (Ball, Lee, Ambrosini, Hamilton, & Tuffaha, 2016). Obesity is a leading risk factor for many chronic diseases. In 2014-2015, an estimated 11.2 million (63%) Australian adults were classified as overweight or obese, representing an increase from 56% in 1995 (AIHW, 2016). Moreover, one in four children aged 5-17 years (27%, 1 million) were classified as overweight or obese (AIHW, 2016). One of the major contributors to maintaining a healthy weight is consumption of a healthy diet and limiting intake of discretionary foods (i.e., energy-rich nutrient-poor food, that which is high in saturated fats, sugars, salt, and /or alcohol) (ABS, 2014; Hill, Wyatt, Reed, & Peters, 2003). In Australia, the vast majority of adults (95%) and children aged 5–14 years (98%) do not eat the recommended daily serves of fruits and vegetables (AIHW, 2016), with just over one third (35%) of total energy consumed reported as coming from discretionary foods (ABS, 2014) and 80% of toddlers reported as consuming sugar levels that exceed recommendations (Olds et al., 2007).

Children have limited capacity for self-regulating their health behaviours; thus, parental guidance is needed, which requires parents to have the motivation and skills to do so (Hamilton, Spinks, White, Kavanagh, & Walsh, 2016; Thomson, White, & Hamilton, 2012). However, even if parents are motivated to ensure their child engages in a healthy lifestyle, corresponding behaviours often do not materialise. Reasons for these failures to act might be because parents are often faced with multiple competing demands that derail attempts to engage in intended behaviours (Hamilton, Cleary, White, & Hawkes, 2016; Spinks &

Hamilton, 2015; Walsh, Hamilton, White, & Hyde, 2015). This inconsistency between intention and behaviour is commonly known as the intention-behaviour gap (Sheeran, 2002). To bridge the intention-behaviour gap, the Health Action Process Approach (HAPA; Schwarzer, 2008) was an attempt to explain behaviour change as consisting of dual processes, proposing a distinction between (a) pre-intentional motivation processes that lead to a behavioural intention and (b) post-intentional volition processes that lead to the actual health behaviour. Planning is a key self-regulatory strategy in the volitional phase that has received empirical support in the literature (Gollwitzer & Sheeran, 2006; Hagger & Luszczynska, 2014).

Planning is conceptualised as comprising *action plans* (i.e., plans that specify when, where, and how an intended behaviour is to be performed) and *coping plans* (i.e., plans that anticipate challenging situations that may obstruct behavioural enactment and mental representation of ways to overcome them; Schwarzer, 2008; Sniehotta, Schwarzer, Scholz, & Schuz, 2005). The two planning strategies are thought to be conceptually distinct; action plans are proposed to connect the individual with good opportunities to act through a task-facilitating strategy, whereas coping plans are proposed to protect good intentions from anticipated obstacles via a distraction-inhibiting strategy (Sniehotta et al., 2005). Plans are thought to increase behavioural engagement through enhanced cue accessibility and automaticity of action initiation mechanisms rather than through increases in people's motivation or intention (Orbell, Hodgkins, & Sheeran, 1998; Webb & Sheeran, 2008). Accordingly, action planning and coping planning are theorized as proximal determinates of behaviour and distinct mediators likely to ensure intentions are translated to behaviour, previously referred to as a *dual mediation model* (Carraro & Gaudreau, 2013).

This proposition is a central tenet of the HAPA (Schwarzer, 2008) and ample prior research has found support for plans mediating the intention-behaviour relationship

(Arnautovska, Fleig, O'Callaghan, & Hamilton, 2017; Chow & Mullan, 2010; Hamilton, Bonham, Bishara, Kroon, & Schwarzer, 2017; Hamilton, Cox, & White, 2012; Reyes Fernández, Knoll, Hamilton, & Schwarzer, 2016; Mullan, Wong, & O'Moore, 2010), including in dietary behaviours (Zhou, Gan, Miao, Hamilton, Knoll, & Schwarzer, 2015), with intervention studies also supporting complementary effects of action planning and coping planning (Kwasnicka, Preece, White, & Sniehotka, 2013; Zhou, Sun, Knoll, Hamilton, & Schwarzer, 2015). Mediation provides important information about the pathways through which a distal predictor (such as intention) may predict an outcome (i.e., through the influence of a more proximal construct).

However, as discussed above, not all individuals who form an intention will go on to perform the intended behaviour. A recent meta-analysis on healthy eating found positive and overall medium sized effects for implementation intentions (a strategy for making plans) to the promotion of healthy eating behaviours, with less convincing evidence found for reducing unhealthy eating behaviours (Adriaanse, Vinkers, De Ridder, Hox, & Wit, 2011). In addition, planning has been shown to have both simultaneous (multiple mediation) and interactive (moderation) effects on fruit and vegetable intake (Wiedemann, Lippke, Reuter, Ziegelmann, & Schwarzer, 2011). Specifically, as strong intentions are considered essential for entering into the violation phase to act (Heckhausen & Gollwitzer, 1987), the effectiveness of planning on behaviour is proposed to be dependent on the strength of intentions; the stronger the intention the more effective planning will be on behaviour (Sheeran, Webb, & Gollwitzer, 2005). The evidence, however, is not consistent as some studies have shown low intenders to benefit from planning (Rutter, Steadman, & Quine, 2006; Sheeran & Orbell, 2000). Thus, although the inclusion of planning variables does provide important information about the process through which intention is translated to behaviour, examination of the boundary conditions related to these mediation pathways may

provide valuable information about the circumstances under which mediation does not occur and intention is not translated to behaviour.

The Current Study and Hypotheses

Inconsistent findings in the empirical literature of the effects of planning on behaviour, and more specifically on healthy and unhealthy eating behaviours (Adriaanse et al., 2011; Hagger, Trost, Keech, Chan, & Hamilton, 2017), suggests further investigation into the role of planning on health behaviour is warranted (Hagger & Luszczynska, 2014). Given the demands of parenthood, planning for healthy meals and obstacles that arise (e.g., child resistance, child food preferences) which may interrupt these plans has been identified as important to increasing healthful food consumption in young children (Spinks & Hamilton, 2015; Fulkerson et al., 2011). What is yet to be provided is an explanation of the mechanisms through which planning affects parents' healthy food choices for their young children. Examining the role of plans in this context therefore seems especially timely.

The current study explores the extent to which both action planning and coping planning mediate the intention behaviour relationship for two dietary behaviours, and examines the extent to which the indirect effect of intention on behaviour via planning constructs is conditional on baseline intention. In line with theories and models that propose a volitional process that operates in a post-decisional manner to facilitate the enactment of goal intentions (Schwarzer, 2008) and consistent with empirical research supporting the simultaneous effects of action and coping planning on dietary behaviours (Wiedemann et al., 2011), it is expected that action planning and coping planning would be dual mediators of the relationship between intention and behaviour. It is further proposed that planning would moderate the intention-behaviour relationship consistent with the model of action phases (Gollwitzer, 1999). This is based on the premise that individuals adopting planning strategies are more likely to convert their good intentions into action, and has been empirically

supported in a number of studies (Gollwitzer & Sheeran, 2006; Hagger & Luszczynska, 2014; Wiedemann et al., 2009).

Methods

Participants and Procedure

Participants ($N=197$) comprised Australian mothers ranging in age from 18 to 46 years ($M_{age} = 34.39$, $SD = 5.65$), with at least one child aged 2 or 3 years. The majority of mothers were in a partnered relationship ($n = 188$, 95%) and just over half held a university qualification ($n = 113$, 57%). Of the mothers who completed the main questionnaire, 161 (81.7%) completed the follow-up questionnaire one-week later.

The University Human Research Ethics Committee approved the study. Results reported are part of a larger study investigating beliefs and psycho-social processes of mothers' decisions for their child's eating behaviours (Spinks & Hamilton, 2015, 2016). This paper focuses solely on the role of planning resources and how they relate to (i.e., moderate and mediate) mothers' intentions and behaviour. A prospective-correlational design with two waves of data collection, spaced one week apart, was adopted (main questionnaire Time 1 [T1] and behaviour questionnaire Time 2 [T2], with a code identifier used to match responses). At T1, mothers completed a paper-based ($n = 151$, 76.6%) or online ($n = 46$, 23.4%) version of the questionnaire which assessed their intention and planning (action planning and coping planning) for their child's healthy eating and discretionary food choices (e.g. lollies, chips) behaviours. At T2 (one week later), a follow-up phone call was used to assess behaviour in the previous week. Participants were recruited via two methods: face-to-face at childcare facilities and one swim school; and on-line via social networking sites (e.g. Facebook; Australia's Mothers Group). As an incentive to participate, individuals were provided the opportunity to go into a prize draw to win one of three double-pass movie vouchers (valued at AUD36 each).

Measures

Target behaviour. Two target behaviours as outlined in the Australian Dietary Guidelines (NHMRC, 2013) were investigated: (1) *Healthy Eating*: ‘ensure that my child eats a wide variety of foods from the five food groups according to the recommended serves’ and (2) *Discretionary Food Choices*: ‘ensure that my child’s consumption of discretionary choices is limited to 0-1 serves’. Discretionary food choices refer to foods “... high in kilojoules, saturated fat, added sugars, added salt, or alcohol” (NHMRC, 2013, p.5). A table of the relevant guidelines was presented at the beginning of each survey section and included examples of what constituted a serving from each food group and the recommended serves for children aged 2-3 years.

Intention. Three items measured the strength of behavioural intention to perform the target behaviours (e.g. “I intend to [target behaviour] every day in the next week”, scored [1] *strongly disagree* to [7] *strongly agree*). The scale was reliable with a Cronbach's alpha of .88 for healthy eating and .92 for discretionary food choices.

Action planning and coping planning. The action planning and coping planning scales were each measured by four items based on Sniehotta et al. (2005) and assessed the extent to which one has made a plan in relation to the target behaviours. For action planning, these items included, “When to [target behaviour]”, “Where to [target behaviour]”, “How to [target behaviour]”, and “How often to [target behaviour]”. For coping planning, these items included, “What to do if something interferes with my plans”, “How to cope with possible setbacks”, “What to do in difficult situations in order to stick to my intentions”, and “When I have to pay extra attention to prevent lapses”. The scales were reliable with a Cronbach's alpha for action planning of .95 for healthy eating and .97 for discretionary food choices, and for coping planning of .92 for healthy eating and .96 for discretionary food choices.

Reported Behaviour. Three items measured behaviour in the past week (e.g. “In the previous week, to what extent did you [target behaviour] every day?”, scored [1] *not at all* to [7] *a large extent*). The measure was reliable with a Cronbach's alpha coefficient of .94 for healthy eating and .96 for discretionary food choices.

Results

Means, standard deviations, and Pearson's correlation coefficients between the variables of the study are presented in Table 1. Mothers ensured that their child engaged in healthy eating and limited consumption of discretionary food choices to a moderate degree, with a mean score 5.61 ($SD=1.27$) and 5.73 ($SD=1.21$), respectively. As displayed in Table 1, intention was the strongest correlate to both behaviours. The sample size within this study exceeded the median sample size observed within a review of sample size in mediation studies and that in smaller samples, and the bias-corrected bootstrap CI (used here) tends to be more powerful than other methods (Hayes & Scharkow, 2013; Preacher, Rucker, & Hayes, 2007).

Healthy Eating

Indirect effects. A series of path analyses models were constructed to examine the indirect effect of (healthy eating) intention on healthy eating via action planning and coping planning using AMOS Version 22. The sequence of estimated models ranged from a more constrained model, where only intention predicted behaviour (Model 1), to two less constrained models; Model 2 where the two planning components were tested as multiple mediators between intention and behaviour and Model 3 where action planning and coping planning were specified as sequential mediators between intention and behaviour such that action planning was fully mediated by coping planning. Paths not displayed in models, and each model was constrained to 0. Model fit statistics are shown in Table 2.

Table 1. Means, standard deviations, and correlations for study constructs for mothers' decisions for their children's healthy eating and discretionary food choices

	Intention - Healthy Eating	Action Planning - Healthy Eating	Coping Planning - Healthy Eating	Healthy Eating Behaviour	Intention - Discretionary Choices	Action Planning - Discretionary Choices	Coping Planning - Discretionary Choices	Discretionary Choices Behaviour
Intention - Healthy Eating	1	.249**	.188*	.448**	.258**	.216**	.195*	.165*
Action Planning - Healthy Eating		1	.683**	.268**	.268**	.577**	.438**	.179*
Coping Planning - Healthy Eating			1	.313**	.237**	.440**	.614**	.209**
Healthy Eating Behaviour				1	.201**	.188*	.276**	.302**
Intention - Discretionary Choices					1	.337**	.295**	.427**
Action Planning - Discretionary Choices						1	.724**	.200*
Coping Planning - Discretionary Choices							1	.211**
Discretionary Choices Behaviour								1
Mean	6.03	4.97	4.18	5.61	6.11	5.17	4.44	5.73
SD	0.99	1.40	1.42	1.27	0.95	1.49	1.56	1.21

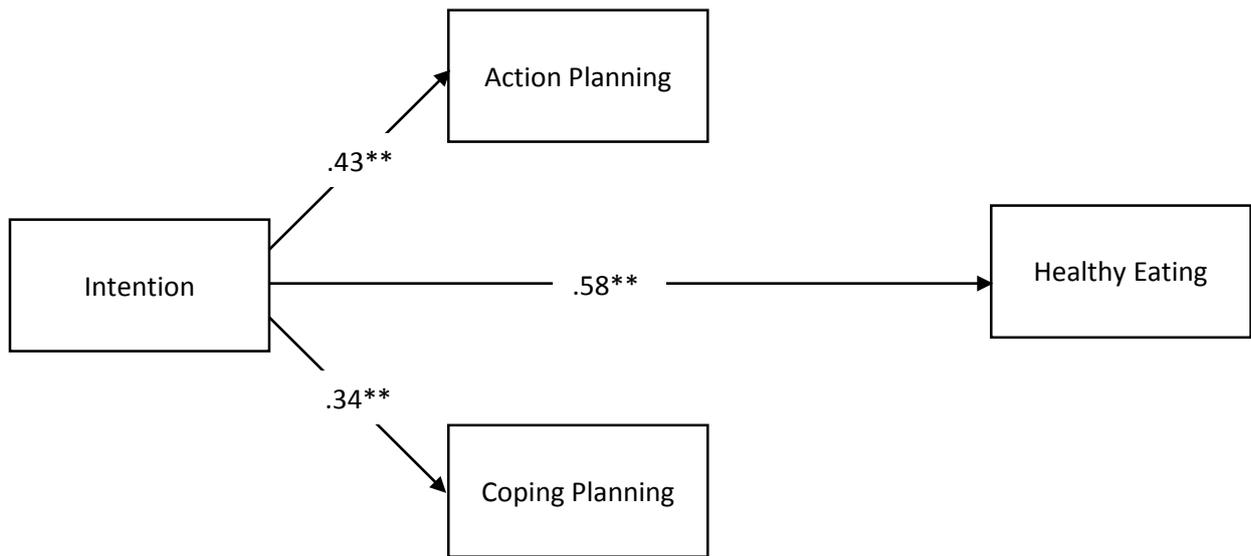


Figure 1. Model 1 for mothers' decisions for their children's health eating

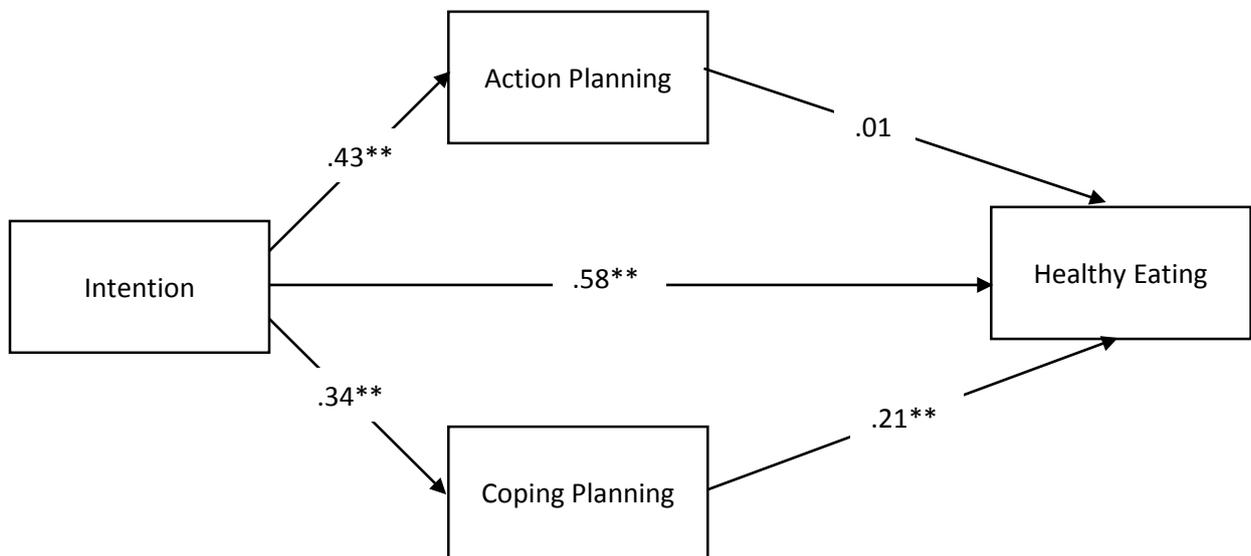


Figure 2. Model 2 for mothers' decisions for their children's healthy eating

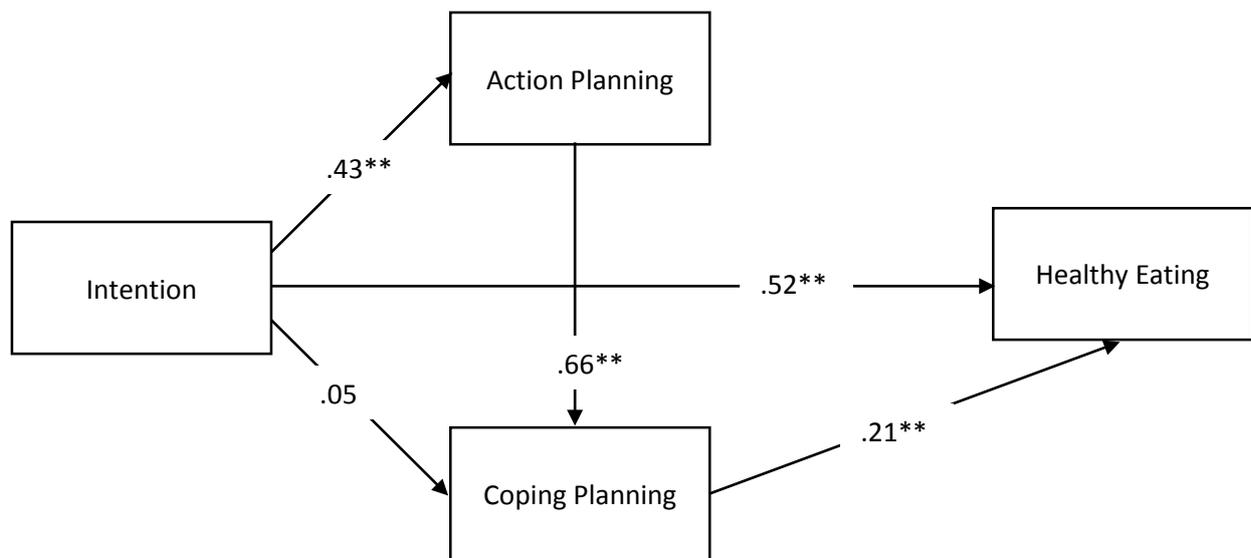


Figure 3. Model 3 for mothers' decisions for their children's healthy eating

Table 2. Model fit characteristics for mothers' decisions for their children's healthy eating:
models 1-3

	χ^2/df	CFI	TLI	RMSEA 95% CI	AIC
Model 1	47.251	.297	-1.343	.419 - .556	163.753
Model 2	130.360	.345	-5.553	.698 - .933	156.360
Model 3	.013	1.000	1.050	.000 - .079	26.013

As shown in Table 2, Model 3 provided the best fit to the available data and was substantially more parsimonious than the other models. Intention was a significant predictor of behaviour. Intention was also a predictor of action planning. In turn, action planning predicted coping planning. Intention was not a direct predictor of coping planning. Coping planning was a significant predictor of behaviour. Overall, Model 3 accounted for 25.5% of the variance in healthy eating behaviour.

Conditional effects. A fourth model was then constructed to examine the extent to which the indirect effect of intention on healthy eating through coping planning was moderated by baseline intention scores (i.e. the extent to which this pathway was conditional on the value of intention). Analyses were conducted using the MODMED macro for SPSS (Preacher et al., 2007). Regions of significance were estimated using the Johnson-Neyman technique (Preacher et al., 2007).

Intention was a significant moderator of the relationship between coping planning and healthy eating ($p=.0013$). The indirect effect of intention on healthy eating through coping planning was weaker among individuals with relatively strong intentions. The Johnson-Neyman analysis indicated that this indirect effect was not significant when intention scores exceeded 5.9268. The majority (71%) of the sample had healthy eating intention scores above this score. Supplementary File shows a graph of the relationship between strength of the conditional effect and intention scores along with bootstrapped 95% confidence intervals.

Given the moderating effect of intention on the indirect relationship between intention and healthy eating through coping planning, follow-up analyses were conducted to determine model fit and path estimates for individuals at lower (intention < .592; Model 4a; Figure 4a) and higher (intention > .592; Model 4b; Figure 4b) intention scores.

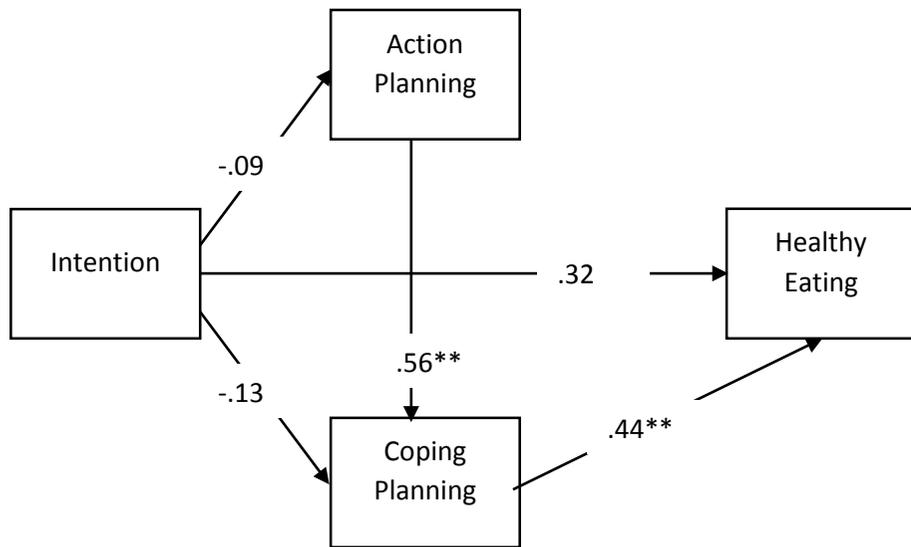


Figure 4a. Model 4a for mothers' decisions for their children's healthy eating (low intention)

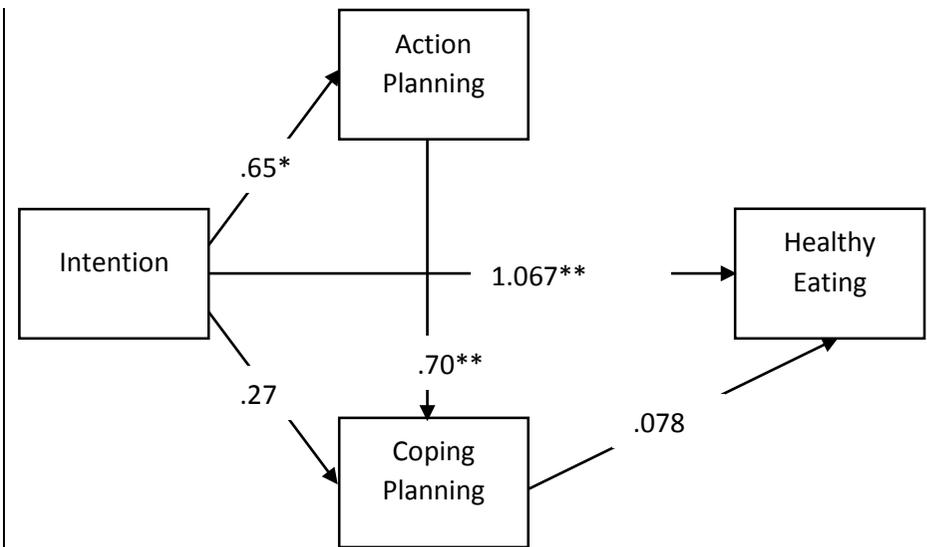


Figure 4b. Model 4b for mothers' decisions for their children's healthy eating (high intention)

Table 3. Model fit characteristics for mothers' decisions for their children's healthy eating: models 4a and 4b

	χ^2/df	CFI	TLI	RMSEA 95% CI	AIC
Model 4a	1.870	.982	.821	.000 - .389	27.870
Model 4b	.405	1.000	1.054	.000 - .195	26.405

Discretionary Choices

Indirect effects. A series of path analyses models were constructed to examine the indirect effect of (discretionary choices) intention on discretionary choices via action and coping planning (for discretionary choices). As with healthy eating, the sequence of estimated models ranged from a more constrained model, where only intention predicted behaviour (Model 1; Figure 5), to two less constrained models, Model 2 (Figure 6) where the two planning components were tested as multiple mediators between intention and behaviour and Model 3 (Figure 7) where action and coping planning were specified as sequential mediators between intention and behaviour such that action planning was full mediated by coping planning. Paths not displayed in models each model were constrained to 0. Fit statistics are reported in Table 4.

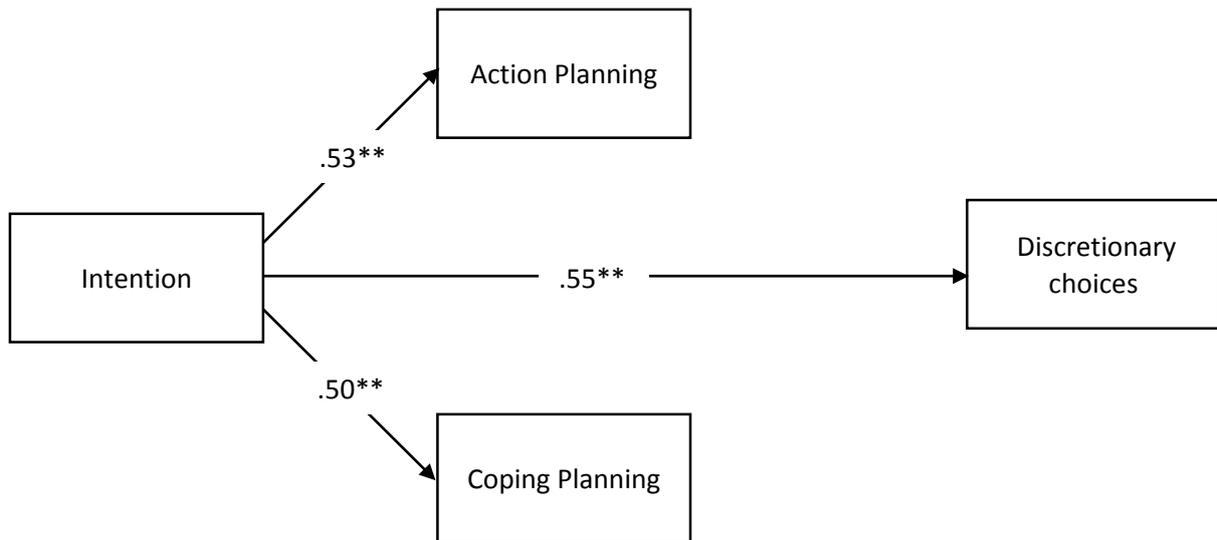


Figure 5. Model 1 for mothers' decisions for their children's discretionary food choices

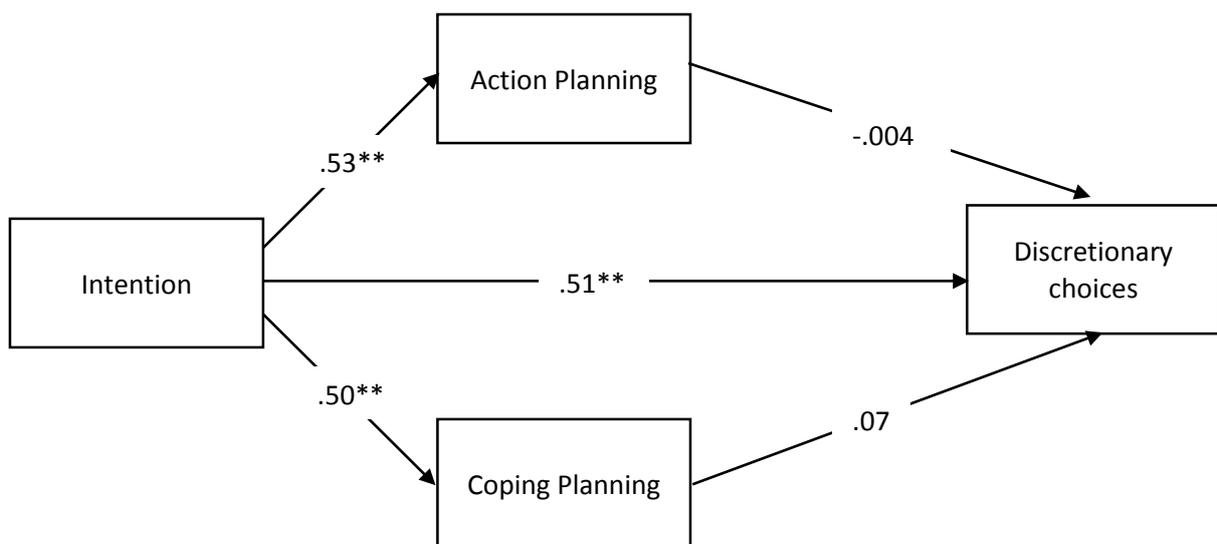


Figure 6. Model 2 for mothers' decisions for their children's discretionary food choices

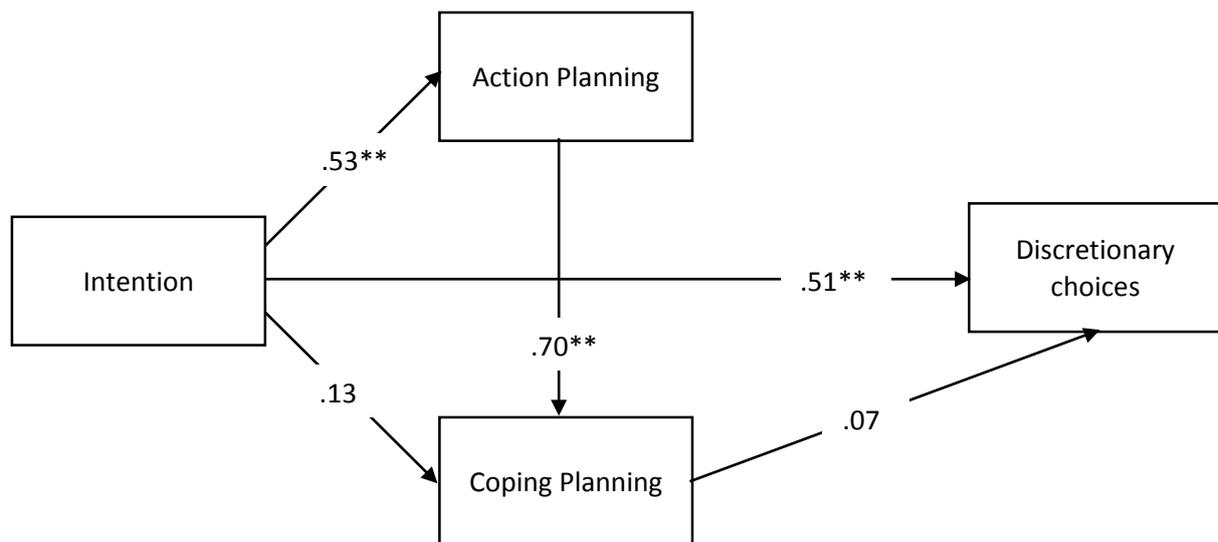


Figure 7. Model 3 for mothers' decisions for their children's discretionary food choices

Table 4. Model fit characteristics for mothers' decisions for their children's discretionary food choices: models 1-3

	χ^2/df	CFI	TLI	RMSEA 95% CI	AIC
Model 1	41.988	.370	-1.099	.391 - .527	147.964
Model 2	124.395	.368	-5.319	.679 - .914	150.395
Model 3	.002	1.000	1.051	.000 - .000.	26.002

As shown in Table 4, Model 3 provided the best fit to the available data and was substantially more parsimonious than the other models. Intention was a significant predictor of behaviour. Intention was also a predictor of action planning but did not predict coping planning. In turn, action planning predicted coping planning. However, coping planning was not a significant predictor of behaviour. Overall, Model 3 accounted for 19.1% of the variance in discretionary choices.

Discussion

The aim of the current study was to examine the role of planning on mothers' decisions for their young children's dietary behaviours. Overall, we were able to account for a larger proportion of variance in healthy eating than in discretionary choices; approximately 26% and 19%, respectively. This is in keeping with previous literature that has shown the predictive ability of intention differs dependent on whether it has immediate or distal rewards (Collins & Mullan, 2011). Further, the confirmation of mothers' intention as a significant predictor affecting their dietary behaviours for their children is consistent with the social cognitive components that comprise the deliberative/reasoned component of prominent psychological models such as the Theory of Planned Behaviour (Ajzen, 1991). However, it seems that planning, at least for healthy eating behaviours, both mediates and moderates the intention-behaviour relationship, but effects are conditional on baseline intention scores.

The finding that intention moderated the indirect relationship between intention-behaviour via coping planning, indicating that enacting such plans may be less important when intentions are relatively strong, is inconsistent with Wiedemann et al. (2009) who found that people with high intentions are more likely to enact their plans. It may be the case that mothers who have strong intentions to ensure their child eats a healthy diet, and thus make coping plans to ensure their intentions are acted on, are those who encounter more barriers to those plans. A question for future research then is whether this type of planning (i.e., plans that anticipate challenging situations and ways to overcome them to protect good intentions) is prompted by initial difficulty in achieving intended behaviour?

This hypothesis could, in part, be supported by the finding that the influence of action planning on behaviour is mediated by coping planning, at least for healthy eating behaviours. It has been proposed that action planning may temporally precede coping planning, exerting its influence earlier in the behaviour change process by facilitating the initiation of action; whereas coping planning exerts its influence later in the behaviour change process, once

individuals have gained sufficient experience to identify relevant barriers (Sniehotta, 2009; Sniehotta et al., 2005). Based on this reasoning, the intention-behaviour relationship would be mediated by a temporal sequence in which intention initially facilitates the formation of action plans, which subsequently leads to the creation of coping plans likely to influence behaviour. Indeed, a recent meta-analysis supports this proposed *sequential mediation model* – a sequence from intention to action planning to coping planning to behaviour (Carraro & Gaudreau, 2013). Thus, current results, rather than providing support for a dual mediation model (Carraro & Gaudreau, 2013) as proposed by the HAPA (Schwarzer, 2008), provide support for a sequential mediation model and the idea that planning may be important at various points in the goal pursuit process (Carraro & Gaudreau, 2013; Godinho et al., 2014; Shüz et al., 2009). It may also be the case, then, that once mothers have created action plans to support their intentions to ensure their child consumes a healthy diet, they create additional coping plans to support not only their intentions but also their action plans (Sniehotta, 2009; Sniehotta et al., 2005), most likely based on experiencing difficulties (e.g., child resistance, child food preferences) of providing their child with nutrient rich foods that have previously interrupted such plans (Spinks & Hamilton, 2015).

It is noteworthy that neither type of planning predicted discretionary choices. This lack of effect, and perhaps also the inconsistent moderation effect of planning found on the intention-behaviour relationship for healthy eating, may be explained by the idea of a quadratic relationship, similar to that recently identified between experience and behaviour whereby experience can both strengthen and weaken the intention-behaviour relationship (Sheeran et al. 2017). In this context, planning may serve to initially strengthen the intention-behaviour relation but, after time, the action sequence of those plans becomes a cue to habit and, thus, there is less need for conscious planning to guide behaviour. Engagement in high levels of planning beyond that threshold may instead signal individuals who experience

additional challenges that weaken their ability to translate their plans into action. That is, high levels of planning may be a proxy for high *need* to plan (similar to the manner in which perceived behavioural control can be considered a proxy for actual behavioural control, c.f. Fishbein & Ajzen, 2010). Alternatively, given the beneficial effect of planning for subsequent intended behaviour may be dependent on the skill of the planner and the quality of the plan (Allan, Sniehotta, & Johnston, 2013), more detailed plans may be needed for behaviours that are more difficult to initiate and maintain, such as limiting the discretionary food intake of young children. To ensure planning is effective, a structured plan for task completion, also known as an ‘implementation intention’ (Gollwitzer, 1999), as opposed to more general plans may be needed for this specific dietary behaviour. It would be useful for future research to continue to explore these possible ideas.

In the current study, intention was not a direct predictor of coping planning but rather the influence of intention on coping planning was mediated by action planning. Further, although our findings do not support a dual mediation model (Carraro & Gaudreau, 2013) as proposed by HAPA (Schwarzer, 2008), results showed that intention was not a direct predictor of behaviour when intention was relatively low. These findings may provide evidence in support of a discontinuity effect and therefore consistent with HAPA as a stage model (Schwarzer, 2008). However, it should be noted that the effects may have been influenced by range restriction caused by the splitting of the data files for this analysis where more variability was observed in the lower intention group than in the higher intention group.

Given that intentional processes are key to mothers’ behaviour to ensure their children consume a healthy diet and limit intake of discretionary foods, future interventions could draw on specific behaviour change techniques (BCTs; Abraham & Michie, 2008), thus developing interventions that are based on theory and provide a scientific base for effective design and implementation (see Spinks & Hamilton, 2015). For example, setting goals for

children's food intake, obtaining support from others to ensure behavioural consistency and healthy food choices are the norm, and rethinking barriers to healthy food intake (e.g., child food preferences). This is especially important given results, for healthy eating in particular, revealed that intentions did not directly predict behaviour when intention was relatively low. Moreover, there was an interaction for healthy eating; intention moderated the indirect relationship between intention-behaviour via coping planning. Specifically, if mothers have strong intentions to ensure their child consumes a healthy diet then enacting coping plans may not be so important to ensure intentions are acted on. Although this finding adds to the body of literature around planning, caution needs to be taken in interpreting the findings for practical implications, especially given the limited timeframe in follow-up of the current study and the majority of literature that supports the effectiveness of planning techniques.

Some limitations of the current study need to be mentioned. The sample comprised mothers who were mostly in partnered relationship; thus, results require validation and extension to other primary carers who have been found to play a significant role in young children's healthy eating (e.g., fathers; Khandpur, Blaine, Fisher, & Davison, 2014) and to a broader population of mothers including those in rural areas, single mothers, and those with less education; all factors known to be linked with poorer quality diets (Pearson, Biddle, & Gorely, 2009). Further, the non-experimental research design does not allow for causal inferences. To further elucidate the mechanisms of behaviour change, intervention designs that manipulate intentional and volitional mediators are recommended (Michie, Rothman, & Sheeran, 2007). There may also have been a social desirability bias in the behaviour measure as it was assessed by means of a telephone call. Future research could explore alternative ways of limiting this bias such as controlling for social desirability trait at baseline (Beresford et al., 1997). Finally, behavioural measures were self-reported and comprised all possible practices for healthy eating and discretionary food choices in the one item for each of the

target behaviours. As intentions and volitional processes may vary for different dietary behaviour, future research should look at decomposing the range of healthy eating behaviours so that each can be investigated individually. Despite these limitations, future research can build on current findings to further investigate the complex mechanisms underpinning the role of planning on health behaviour and overcome the bulk of bivariate findings in the literature.

References

- Abraham, C., & Michie, S. (2008). A taxonomy of behaviour change techniques used in interventions. *Health Psychology, 27*, 379-387. doi:10.1037/0278-6133.27.3.379
- Adriaanse, M. A., Vinkers, C. D. W., De Ridder, D. T. D., Hox, J. J., & Wit, J. B. F. (2011). Do implementation intentions help to eat a healthy diet? A systematic review and meta-analysis of empirical evidence. *Appetite, 56*, 183-193.
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes, 50*, 179-211. doi:10.1016/0749-5978(91)90020-T
- Allan, J. L., Sniehotta, F. F., & Johnston, M. (2013). The best laid plans: planning skill determines the effectiveness of action plans and implementation intentions. *Annals of Behavioral Medicine, 46*, 114-20.
- Arnautovska, U., Fleig, L., O'Callaghan, F., & Hamilton, K. (2017). A longitudinal investigation of older adults' physical activity: testing an integrated dual-process model. *Psychology & Health, 32*, 166-185. doi:10.1080/08870446.2016.1250273
- Australian Bureau of Statistics (ABS). (2014). *Australian Health Survey: Nutrition First Results - Food and Nutrients, 2011-12*. No. 4364.0.55.007. Canberra: Author.
- Australian Institute of Health and Welfare (AIHW) (2016). *Australia's Health 2016*. Australia's health series no. 15. Cat. no. AUS 199. Canberra: AIHW.
- Ball, L., Lee, P., Ambrosini, G. L., Hamilton, K., & Tuffaha, H. (2016). How often should General Practitioners provide nutrition care to patients? A forecasting activity to determine the target frequency for chronic disease management in Australia. *Australian Journal of Primary Health, 22*, 383-387. doi:10.1071/PY16060.
- Beresford, S. A., Curry, S. J., Kristal, A. R., Lazovich, D., Feng, Z., & Wagner, E. H. (1997). A dietary intervention in primary care practice: the Eating Patterns Study. *American Journal of Public Health, 87*, 610-616.

- Carraro, N., & Gaudreau, P. (2013). Spontaneous and experimentally induced action planning and coping planning for physical activity. *Psychology of Sport and Exercise, 14*, 228-248.
- Collins, A., & Mullan, B. (2011). An extension of the theory of planned behavior to predict immediate hedonic behaviors and distal benefit behaviors. *Food Quality and Preference, 22*, 638-646.
- Chow, S., & Mullan, B. (2010). Predicting food hygiene. An investigation of social factors and past behaviour in an extended model of the Health Action Process Approach. *Appetite, 54*, 126-133.
- Fulkerson, J. A., Kubik, M. Y., Rydell, S., Boutelle, K. N., Garwick, A., Story, M.,... Dudovitz, B. (2011). Focus groups with working parents of school-aged children: what's needed to improve family meals? *Journal of Nutrition Education and Behavior, 43*, 189-193.
- Gollwitzer, P.M. (1999). The strong effect of simple plans. *American Psychologist, 54*, 493-503.
- Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology, 38*, 69-119.
- Hagger, M. S., & Luszczynska, A. (2014). Implementation intention and action planning interventions in health contexts: State of the research and proposals for the way forward. *Applied Psychology: Health and Well-Being, 6*, 1-47. doi: 10.1111/aphw.12017
- Hagger, M. S., Trost, N., Keech, J., Chan, D. K. C., & Hamilton, K. (2017). Predicting sugar consumption: application of an integrated dual-process, dual-phase model. *Appetite*. Advanced online publication. doi: 10.1016/j.appet.2017.04.032.

- Hamilton, K., Bonham, M., Bishara, J., Kroon, J., & Schwarzer, R. (2017). Translating dental flossing intentions into behavior: a longitudinal investigation of the mediating effect of planning and self-efficacy on young adults. *International Journal of Behavioral Medicine, 24*, 420-427. doi:10.1007/s12529-016-9605-4.
- Hamilton, K., Cox, S. & White, K.M., (2012). Testing a model of physical activity among mothers and fathers of young children: integrating self-determined motivation, planning, and theory of planned behavior. *Journal of Sport & Exercise Psychology, 34*, 124-145
- Hamilton, K., Cleary, C., White, K.M., & Hawkes, A. (2016). Keeping kids sun safe: exploring parents' beliefs about their young child's sun-protective behaviours. *Psycho-Oncology, 25*, 158-163. doi:10.1002/pon.3888.
- Hamilton, K., Spinks, T., White, K.M., Kavanagh, D.J., & Walsh, A.M. (2016). A psychosocial analysis of parents' decisions for limiting their young child's screen time: an examination of attitudes, social norms and roles, and control perceptions. *British Journal of Health Psychology, 21*, 285-301. doi:10.1111/bjhp.12168.
- Hamilton, K., Thomson, C., & White, K.M. (2013). Promoting active lifestyles in young children: investigating mothers' decisions about their child's physical activity and screen time behaviour. *Maternal and Child Health Journal, 17*, 968-976. doi:10.1007/s10995-012-1081-0.
- Hayes, A. F., & Scharkow, M. (2013). The relative trustworthiness of inferential tests of the indirect effect in statistical mediation analysis does method really matter? *Psychological Science, 24*, 1918-1927.
- Heckhausen, H., & Gollwitzer, P. M. (1987). Thought contents and cognitive functioning in motivational and volitional states of mind. *Motivation and Emotion, 11*, 101-120.

- Hill, J. O., Wyatt, H. R., Reed, G. W., & Peters, J. C. (2003). Obesity and the environment: where do we go from here? *Science*, *299*, 853-855.
- Khandpur, N., Blaine, R. E., Fisher, J. O., & Davison, K. K. (2014). Fathers' child feeding practices: a review of the evidence. *Appetite*, *78*, 110-121.
- Kwasnicka, D., Penseu, J., White, M., & Sniehotta, F. F. (2013). Does planning how to cope with anticipated barriers facilitate health-related behaviour change? A systematic review. *Health Psychology Review*, *7*, 129-145.
- National Health and Medical Research Council (NHMRC). (2013). *Australian Dietary Guidelines*. Canberra: Author.
- Michie, S., Rothman, A. J., & Sheeran, P. (2007). Advancing the science of behaviour change. *Psychology & Health*, *22*, 249-253. doi:10.1080/14768320701233582
- Mullan, B. A., Wong, C. L., & O'Moore, K. (2010). Predicting hygienic food handling behaviour: modelling the health action process approach. *British Food Journal*, *112*, 1216-1229.
- Olds, T., Dollman, J., Kupke, T., Cobiac, L., Bowen, J., Burnett, J., . . . Wilson, C. (2007). *Australian National Children's Nutrition and Physical Activity Survey*. Canberra: Australian Government, Department of Health and Ageing.
- Orbell, S., Hodgkins, S., & Sheeran, P. (1998). Implementation intentions and the theory of planned behavior. *Personality and Social Psychology Bulletin*, *23*, 945-954.
- Pearson, N., Biddle, S. J., & Gorely, T. (2009). Family correlates of fruit and vegetable consumption in children and adolescents: a systematic review. *Public Health Nutrition*, *12*, 267-283.
- Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research*, *42*, 185-227.

- Reyes Fernández, B., Knoll, N., Hamilton, K., & Schwarzer, R. (2016). Social-cognitive antecedents of hand washing: action control bridges the planning-behavior gap. *Psychology & Health, 31*, 993-1004. doi:10.1080/08870446.2016.1174236.
- Rutter, D. R., Steadman, L., & Quine, L. (2006). An implementation intentions intervention to increase uptake of mammography. *Annals of Behavioral Medicine, 32*, 127-134.
- Scholz, U., Schüz, B., Ziegelmann, J. P., Lippke, S., & Schwarzer, R. (2008). Beyond behavioural intentions: Planning mediates between intentions and physical activity. *British Journal of Health Psychology, 13*, 479-494.
- Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology, 57*, 1-29.
- Sheeran, P. (2002). Intention—behavior relations: A conceptual and empirical review. *European Review of Social Psychology, 12*, 1-36.
- Sheeran, P., & Orbell, S. (2000). Using implementation intentions to increase attendance for cervical cancer screening. *Health Psychology, 19*, 283-289.
- Sheeran, P., Webb, T. L., & Gollwitzer, P. M. (2005). The interplay between goal intentions and implementation intentions. *Personality and Social Psychology Bulletin, 31*, 87-98.
- Sheeran, P., Godin, G., Conner, M., & Germain, G. (in press). Paradoxical effects of experience: Past behavior both strengthens and weakens the intention–behavior relationship. *Journal of the Association for Consumer Behavior*.
- Shüz, B., Sniehotta, F. F., Mallach, N., Wiedemann, A. U., & Schwarzer, R. (2009). Predicating transitions from preintentional, intentional, and actional phases of change. *Health Education Research, 24*, 64-75.
- Sniehotta, F. F. (2009). Towards a theory of intentional behaviour change: plans, planning, and self-regulation. *British Journal of Health Psychology, 14*, 261-273.

- Sniehotta, F. F., Schwarzer, R., Scholz, U., & Schuz, B. (2005). Action planning and coping planning for long-term lifestyle change: Theory and assessment. *European Journal of Social Psychology, 35*, 565-576.
- Spinks, T., & Hamilton, K. (2016). Investigating mothers' decisions to give their 2-3 year old a nutritionally balanced diet. *Journal of Nutrition Education and Behavior, 48*, 250-257. doi:10.1016/j.jneb.2016.02.002
- Spinks, T., & Hamilton, K. (2015). Investigating key beliefs guiding mothers' dietary decisions for their 2-3 year old. *Appetite, 89*, 167-174. doi: 10.1016/j.appet.2015.02.004.
- Thomson, C.E., White, K.M., Hamilton, K. (2012). Investigating mothers' decisions about their child's sun-protective behaviour using an extended Theory of Planned Behaviour. *Journal of Health Psychology, 17*, 1001-1010. doi:10.1177/1359105311433905.
- Tolhurst, P., Lindberg, R., Calder, R., Dundar, J., & de Courten, M. (2016). *Australia's Health Tracker*. Melbourne: The Australian Health Policy Collaboration.
- Walsh, A., Hamilton, K., White, K. M., & Hyde, M. (2015). Use of online health information to manage children's health care: a prospective study investigating parental decisions. *BMC Health Services Research, 15*:131. doi:10.1186/s12913-015-0793-4.
- Webb, T. L., & Sheeran, P. (2008). Mechanisms of implementation intention effects: The role of goal intentions, self-efficacy, and accessibility of plan components. *British Journal of Social Psychology, 48*, 507-523.
- Wiedemann, A. U., Lippke, S., Reuter, T., Ziegelmann, J. P., & Schwarzer, R. (2011). How planning facilitates behaviour change: Additive and interactive effects of a randomised controlled trial. *European Journal of Social Psychology, 41*, 42-51.

Wiedemann, A. U., Schüz, B., Sniehotta, F., Scholz, U., & Schwarzer, R. (2009).

Disentangling the relation between intentions, planning, and behaviour: a moderated mediation analysis. *Psychology & Health, 24*, 67-79.

Zhou, G., Gan, Y., Miao, M., Hamilton, K., Knoll, N., & Schwarzer, R. (2015). The role of action control and action planning on fruit and vegetable consumption. *Appetite, 91*, 64-68. doi:10.1016/j.appet.2015.03.022.

Zhou, G., Sun, C., Knoll, N., Hamilton, K., & Schwarzer, R. (2015). Self-efficacy, planning, and action control in an oral self-care intervention. *Health Education Research, 30*, 671-681. doi:10.1093/her/cyv032.