

# Thinking Style as a Predictor of Men's Participation in Cancer Screening

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## Abstract

Men's participation in cancer screening may be influenced by their thinking style. Men's need for cognition (NFC) and faith in intuition were measured to explore whether they varied by demographic variables or predicted screening behavior. Australian males ( $n = 585$ , aged 50–74 years) completed surveys about past screening and were subsequently offered mailed fecal occult blood tests (FOBTs). Demographic predictors included age, socioeconomic status, educational attainment, and language spoken at home. The screening behaviors were self-reported prostate cancer screening (prostate-specific antigen testing and digital rectal examinations [DREs]), and colorectal cancer screening (self-reported FOBT participation and recorded uptake of the FOBT offer). Analysis comprised principal component analysis and structural equation modelling. NFC was positively related to demographic variables education, socioeconomic status, and speaking English at home. Faith in intuition was negatively related to educational attainment. NFC predicted variance in self-reported DRE participation ( $r = .11$ ,  $p = .016$ ). No other relationships with thinking style were statistically significant. The relationship of NFC to DRE participation may reflect the way certain attributes of this screening method are processed, or alternatively, it may reflect willingness to report participation. The relationship of thinking style to a range of healthy behaviors should be further explored.

## Keywords

digital rectal exam, PSA testing, health promotion and disease prevention, social determinants of health, behavioral research

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Health psychology interventions designed to encourage healthy behaviors have traditionally targeted rational processes. For example, they have targeted constructs such as knowledge about severity of a health problem and beliefs about the benefits of action (Rosenstock, 1974), information seeking and evaluation (Prochaska & Velicer, 1997), intentions to act (Ajzen, 1991) and self-efficacy (Bandura, 1998). Some researchers have begun to focus on how processes other than those that are rational might influence health behavior (Friese, Hofmann, & Wiers, 2011; Sheeran, Gollwitzer, & Bargh, 2013). While rational processing is conscious and effortful, involves working memory capacity, and relies on algorithmic thinking, another type—experiential processing—operates at high speed, autonomously (triggered by stimuli), and independently of working memory (Epstein, Pacini, Denes-Raj, & Heier, 1996; Evans & Stanovich, 2013, provide an in-depth

discussion of the broader area of dual-process models of cognition).

People differ in the extent to which they rely on rational processing and experiential processing. These stable individual differences have been labelled *thinking style* (Epstein, 2003). A self-report measure (the

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Rational-Experiential Inventory [REI; Epstein et al., 1996) has been developed to capture the preference for rational processing (need for cognition [NFC]) and preference for experiential processing (faith in intuition [FI]; Epstein et al., 1996). It is possible that stable individual differences in processing preference could influence health behavior. For instance, the personality variable conscientiousness has been linked to increased preventive health behavior (Bogg & Roberts, 2004; Takahashi, Edmonds, Jackson, & Roberts, 2013). With scant research conducted to date on the subject, the purpose of this article is to begin exploring the influence of thinking style on preventive health behavior.

Higher NFC has been associated with constructs of potential benefit to health decision making, including better information recall (Cacioppo, Petty, Feinstein, Blair, & Jarvis, 1996), higher internal locus of control (Fletcher, Danilovics, Fernandez, Peterson, & Reeder, 1986), and better probability judgments under pressure (Pacini & Epstein, 1999). Various studies have reported the effects of thinking style variables on the interpretation of health messages (Covey, 2014; Epstein, 2003; Fletcher et al., 1986; Furnham & Thorne, 2013), and it has been suggested that thinking style may moderate the effectiveness of health psychology interventions (Hofmann, Friese, & Wiers, 2008). Yet few studies have attempted to detect a link between thinking style and health behavior. Smoking, for one, has been linked to higher FI and lower NFC (Brown & Bond, 2015) and appropriate hand hygiene among doctors has been positively linked to FI but not NFC (Sladek, Bond, & Phillips, 2008).

There is some evidence of gender differences in thinking style, with NFC being slightly higher, and FI slightly lower, in men compared with women (Sladek, Bond, & Phillips, 2010). In men, NFC appears linked to identification with stereotypical masculine attributes (Osberg, 1987) that have been credited with both positive (Oster, McGuinness, Duncan, & Turnbull, 2014) and negative (Galdas, Cheater, & Marshall, 2005) implications for health behavior. The relationship of men's thinking style to their health behavior is undoubtedly complex, and may exacerbate or ameliorate the interplay of social, behavioral, and biological factors that drive adverse health outcomes for men. In Australia, the rate of male death from cancer is 1.6 times the rate for females (Australian Institute of Health and Welfare, 2012). The two leading causes of male cancer death are prostate cancer and colorectal cancer (Australian Bureau of Statistics, 2013a) and for both, routine screening tests are widely available (Cancer Council Australia, 2016a, 2016b). There remains much to learn about the factors that influence participation in screening for both cancers.

The efficacy of available screening tests differs between prostate cancer and colorectal cancer. For colorectal cancer screening, a test known as a fecal occult blood test (FOBT)

detects minute amounts of blood in stool and has been reported to achieve a 15% relative risk reduction for colorectal cancer-specific mortality when used every 2 years (Hewitson, Glasziou, Irwig, Towler, & Watson, 2007). The case is less straightforward for prostate screening—whether via the prostate-specific antigen (PSA) test (which measures blood levels of a protein that may be elevated in the presence of prostate cancer) or digital rectal examination (DRE; in which a doctor manually checks for prostate abnormalities by inserting a gloved finger into the rectum; Cancer Council Australia, 2016a). Large randomized controlled trials have failed to identify any reduction of prostate cancer-specific mortality among men screened by PSA (relative risk: 1.00, confidence interval [CI] [0.86, 1.17]) despite the higher rate of detection among those screened (Ilic, Neuberger, Djulbegovic, & Dahm, 2013). Many cases of prostate cancer detected by PSA test or DRE never affect the man's health and would have gone unnoticed without screening (Australian Institute of Health and Welfare, 2013). Owing to concerns about overdiagnosis, a lack of evidence of reductions in mortality, potential harms of testing, and side effects of unnecessary treatment, screening at a population level is not recommended in Australia (National Health and Medical Research Council, 2013).

Despite the proven effectiveness of FOBT screening, only 34% of people who receive a free FOBT complete and return the kit—and although men have an overall higher risk of this disease, the participation rate for males (31.1%) is significantly and consistently lower than for females (35.7%; Australian Institute of Health and Welfare, 2014). Counterintuitively, screening participation rates appear higher for prostate cancer. In the United States, approximately 45% of men aged 64 to 79 years report receiving a PSA test in the past year (Drazer, Huo, Schonberg, Razmaria, & Eggen, 2011) and rates of participation are similar in Australia (Medicare Australia, 2015; Trevena, Rogers, Jorm, Churches, & Armstrong, 2013). While there is an evident need to increase participation in colorectal cancer screening, in regards to prostate cancer screening the objective is to facilitate men's decision making, preferably in concert with their general practitioner (GP; i.e., family doctor). After becoming thoroughly informed about PSA screening, men may indeed have less intention to participate than before (Thomas et al., 2014).

Nonetheless, in both cases, it is of great value to identify the factors that affect screening participation. The differing pathways to participating in these three cancer screening modalities provide a range of behaviors on which to explore the effects of thinking style. FOBTs may be purchased, provided by a doctor, or received in the mail via organized screening programs, but require the screener to complete several steps. On the other hand,

PSA tests and DRE must be provided by a health professional and may be offered opportunistically or at the man's request.

It is also of value to know the contexts in which thinking style is of relevance; for instance, if it is known that certain demographic groups are less likely to prefer rational processing, then health campaigns can be targeted accordingly. The aims of the present study were firstly to determine whether there was an association between demographic factors and thinking style in men, and second, to test for a link between thinking style and participation in colorectal and prostate cancer screening. The variance in NFC and FI was analyzed using the demographic variables age, educational attainment, speaking a language other than English at home, and socioeconomic status (SES). The behavioral outcomes of interest were self-reported participation in three tests (FOBT, PSA, DRE), and for FOBT screening (which can be offered to participants via the mail), the actual completion and return of a mailed FOBT kit was also recorded.

## Method

A subgroup of participants in a larger research trial (Duncan et al., 2013) formed the sample for this study. The parent study was a randomized controlled trial (Australian New Zealand Clinical Trials Registry: ACTRN12612001122842) using a  $2 \times 2$  factorial design to assess the effectiveness of modified letters (targeted and nontargeted versions of advance notification and invitation to screen letters) in encouraging the use of a mailed FOBT. The research received approval from the Human Research Ethics Committee at The University of Adelaide, and the inclusion criteria were being male, aged between 50 and 74 years inclusive, and living at a standard residential address in the urban areas of five Australian states (New South Wales, Queensland, South Australia, Victoria, and Western Australia).

For the parent study, individuals randomly selected from the Australian Electoral Roll ( $N = 9,216$ ) were randomly assigned to one of four trial arms (for further information, see Duncan et al., 2013). Random assignment was used once again to select 600 participants from each arm for inclusion in a subgroup that would be sent surveys before and after the intervention. This survey subgroup (of whom  $n = 585$  remained in the final sample) is the focus of the present study. Although effects related to the targeted letters were observed in the rest of the parent study's sample, in the group considered herein, who completed surveys in advance of the screening offer, the intervention had no effect (Zajac et al., 2016) and so for the present study, the four trial arms are collapsed together.

The baseline survey was sent in October 2012. It was completed by 926 of the 2,400 men who were contacted

(a 38.6% response rate) and eligible respondents (i.e., those who had not subsequently withdrawn or indicated screening was inappropriate) were mailed an FOBT screening kit in March 2013. In June 2013, a total of 854 endpoint surveys were sent to participants, of which 590 were completed (a 69.1% response rate). Participants indicated their consent to participate in the study by completing and mailing back the two surveys. Five cases with more than 50% of responses missing were deleted, leaving  $n = 585$  participants with data available for analysis (Figure 1). Remaining missing REI responses were imputed using expectation maximization (Dempster, Laird, & Rubin, 1977).

## Materials

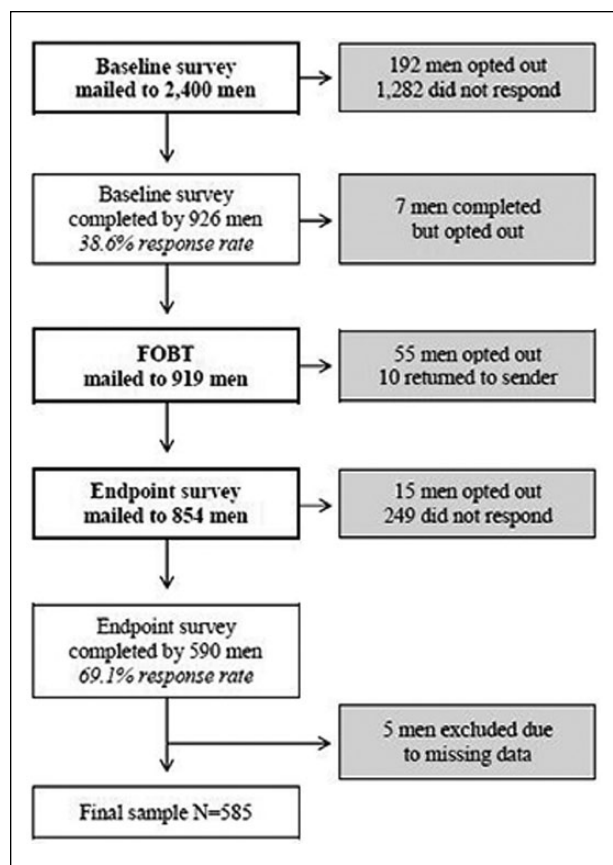
The baseline survey contained questions about demographics and past screening. It was sent with an introductory letter (containing information about the research, researcher contact details, and complaints procedures) and a return envelope. Reminder letters were sent to men who had not responded after 3 weeks, and a second reminder with a replacement survey was sent after 6 weeks. Data collection ceased 16 weeks after the baseline survey was mailed out.

The bowel cancer screening kit contained an introductory letter, an FOBT (OC-Sensor by Eiken Chemical Co., Tokyo, Japan), an instruction sheet, a screening information booklet, a participation form, and a reply-paid padded envelope for sending the samples to a laboratory for processing. The FOBT is an immunochemical kit that requires collection of two stool samples and does not necessitate dietary changes. Reminders were sent to men who did not complete the FOBT 6 weeks following the mailing, and data collection ceased after 15 weeks.

The endpoint survey, which contained the REI, was sent to men who had completed the baseline survey and not withdrawn from the study, regardless of whether they had completed their FOBT. Reminder letters were sent to men who had not responded after 3 weeks, and a second reminder with a replacement survey was sent after 6 weeks. Data collection ceased 13 weeks after the endpoint survey was mailed out.

## Data Analysis

To describe the sample, frequencies were reported as well as percentages, and means and standard deviations were calculated. Before addressing the research questions using structural equation models, it was necessary to check (and prudent to report) the structure of the REI. This was done by subjecting the items to principal component analysis (PCA) to detect the presence of the underlying factors predicted by the scale's theoretical



**Figure 1.** Participant flow.

Note. FOBT = fecal occult blood test.

background (i.e., NFC and FI). Structural equation modelling in AMOS was then used to explore the relationships of thinking style to demographic variables and screening behavior. Statistics were computed using IBM SPSS version 20, and structural equation models were run using the AMOS plugin.

## Measures

**Demographic Items (Baseline Survey).** Participants were asked for their date of birth, highest education level and whether they spoke a language other than English at home (coded as 1 for “no” and 2 for “yes”). Participants’ postcodes (obtained from the Electoral Roll) were used to indicate their SES, which was quantified by the Index of Relative Socioeconomic Advantage and Disadvantage. This indicator of socioeconomic advantage and disadvantage is compiled by the Australian Bureau of Statistics (2013b) using information on income, education, employment, occupations, and dwelling characteristics from the 2011 Australian Census. Each participant was assigned a score from 1 to 10 based on the decile of the Index of

Relative Socioeconomic Advantage and Disadvantage distribution in which the postcode fell. Decile 1 represents the 10% of areas that are most disadvantaged and least advantaged, while Decile 10 represents the 10% of areas that are most advantaged and least disadvantaged. For example, postcodes in the 10th decile have the largest proportion of residents with above-average incomes, who are making high mortgage or rent payments, who are classified as professionals or managers, who have higher educational attainment, and who are living in houses with four or more bedrooms. Postcodes in the first decile have higher proportions of residents with low incomes, whose residences have no Internet connection, who have long-term health conditions or disabilities, who have completed less education, who are unemployed, or who are classified as laborers, machinery operators or drivers (Australian Bureau of Statistics, 2013b).

**Frequency of GP Visits (Baseline Survey).** As PSA tests and DREs are generally provided by a GP (i.e., family doctor) and men who visit their GP more frequently have greater chance of being offered or requesting them (Crowe, Wootten, & Howard, 2015), it was sensible to control for frequency of GP visits. An indicator of habitual GP attendance frequency was obtained by asking participants how many times they had visited their GP in the past year, with five response options from “not at all” to “four or more times.”

**Self-Reported Screening Data (Baseline Survey).** Self-reported data regarding PSA tests (srPSA), DRE (srDRE), and FOBT (srFOBT) were collected via three survey questions asking men if they had ever used the screening method in question. Response options were “yes” (coded as 1), “no” (coded as 0), and “unsure/do not know” (participants choosing this response for a screening behavior were excluded from analyses for that behavior). The sensitivity of self-reported screening participation has been reported as 78% for FOBT, 71% for PSA test, and 74% for DRE participation, while specificity was 77%, 73%, and 60%, respectively (Rauscher, Johnson, Cho, & Walk, 2008). Recent results suggest self-reports of FOBT screening are an acceptably accurate representation of actual behavior (Lo, Waller, Vrinten, Wardle, & von Wagner, 2016).

**Observed Screening Data.** Observed FOBT screening data (oFOBT) was recorded by monitoring whether participants returned a completed FOBT to the laboratory for processing by the end of the intervention phase of the study (13 weeks after the screening kits were mailed out). Participation was coded as 1 and nonparticipation was coded as 0.

**Table 1.** Descriptive Statistics.

Group	n	Screening behavior: Participating percentage and count				Thinking style <sup>a</sup> : M (SD)	
		srPSA	srDRE	srFOBT	oFOBT	NFC	FI
Total sample	585	71.7, 411	59.9, 343	62.3, 345	80.3, 465	3.61 (0.74)	3.63 (0.69)
Age (years)							
50-54	111	59.1, 65	40.0, 44	63.9, 69	79.3, 88	3.71 (0.72)	3.56 (0.63)
55-59	131	70.0, 91	55.8, 72	73.2, 93	77.9, 102	3.63 (0.73)	3.65 (0.66)
60-64	137	72.1, 98	64.7, 88	37.4, 49	81.0, 111	3.61 (0.73)	3.64 (0.71)
65-69	116	80.9, 93	69.6, 80	74.3, 81	77.6, 90	3.50 (0.77)	3.70 (0.73)
70-75	84	78.0, 64	71.1, 59	67.1, 53	88.1, 74	3.64 (0.79)	3.55 (0.80)
Education							
School	175	65.5, 114	58.4, 101	57.4, 97	72.6, 127	3.37 (0.75)	3.77 (0.67)
Tertiary	253	73.0, 184	60.7, 153	68.0, 166	85.4, 216	3.61 (0.68)	3.57 (0.72)
Postgraduate	121	78.5, 95	59.5, 72	56.9, 66	75.2, 91	3.99 (0.72)	3.53 (0.68)
Language <sup>b</sup>							
Yes	96	56.3, 54	38.5, 37	54.9, 50	84.4, 81	3.31 (0.69)	3.51 (0.66)
No	464	74.7, 345	63.2, 292	63.5, 284	78.7, 365	3.68 (0.74)	3.65 (0.71)
SES decile <sup>c</sup>							
Lowest (1-3)	47	66.0, 31	53.2, 25	59.1, 26	89.4, 42	3.49 (0.70)	3.69 (0.64)
Middle (4-7)	147	66.0, 97	45.9, 67	58.9, 83	80.3, 118	3.43 (0.73)	3.69 (0.60)
Highest (8-10)	391	74.3, 286	65.5, 253	63.7, 239	78.5, 307	3.69 (0.74)	3.60 (0.72)

Note. srPSA = self-reported PSA participation; srDRE = self-reported DRE participation; srFOBT = self-reported FOBT participation; oFOBT = observed FOBT participation; NFC = need for cognition; FI = faith in intuition.

<sup>a</sup>Average response across five subscale questions after reverse coding three NFC items (reported in Table 2). <sup>b</sup>Language other than English spoken at home. <sup>c</sup>Decile 1 represents the 10% of suburbs with the lowest SES; Decile 10 represents the 10% of suburbs with the highest SES. Sample  $n = 585$ ,  $n$  missing per cell varies; maximum = 56 (9.6% of respondents with postgraduate education did not respond to srFOBT question).

*Rational-Experiential Inventory (Endpoint Survey)*. The REI (Epstein et al., 1996) measures thinking style as two independent variables, NFC (preference for rational processing) and FI (preference for experiential processing). A short-form questionnaire was used that included a five-question NFC scale (e.g., "I prefer complex to simple problems") and a five-question FI scale (e.g., "I trust my initial feelings about people"). Responses to each REI statement were indicated on a 5-point Likert-type scale from 1 (*completely false*) to 5 (*completely true*). Higher scores for a statement therefore represented higher identification with that attribute. Three NFC items were reverse phrased (e.g., "I do not like to have to do a lot of thinking") and required reverse-coding. The reliability of this short scale in Australian samples has been reported elsewhere (NFC  $\alpha = .75$  and FI  $\alpha = .86$  in a study by Golley, Corsini, Topping, Morell, & Mohr, 2015). In the present study, the NFC ( $\alpha = .66$ ) and FI ( $\alpha = .87$ ) scales both displayed acceptable internal reliability.

Because the baseline survey was already lengthy, and because the measurement of thinking style was not central to the parent study, the REI was administered in the endpoint survey. As NFC and FI are proposed to be stable processing preferences (Cacioppo et al., 1996; Epstein, 2003), the preceding survey and intervention materials

received by participants would be unlikely to influence their responses on this measure.

## Results

The eight response items of the educational attainment measure were combined into three roughly even groups: school, tertiary, and postgraduate attainment. The mean age of participants was 61.4 ( $SD = 6.7$ ) years, most men had tertiary education or greater (175 school, 253 tertiary, 121 postgraduate attainment) and the majority ( $n = 464$ , 79.3%) did not speak a language other than English at home. Over half the sample ( $n = 312$ , 53.3%) resided in suburbs classified among the highest 20% in terms of SES. Responses to the REI and screening items for the sample and for demographic groups are reported in Table 1.

### Structure of the REI

In the present study, the five NFC items (Cronbach's  $\alpha = .66$ ) and five FI items (Cronbach's  $\alpha = .87$ ) of the REI displayed acceptable internal reliability. To check the proposed REI structure in the study population, a PCA was performed with Oblimin rotation and Kaiser

**Table 2.** Pattern Matrix for REI Items.

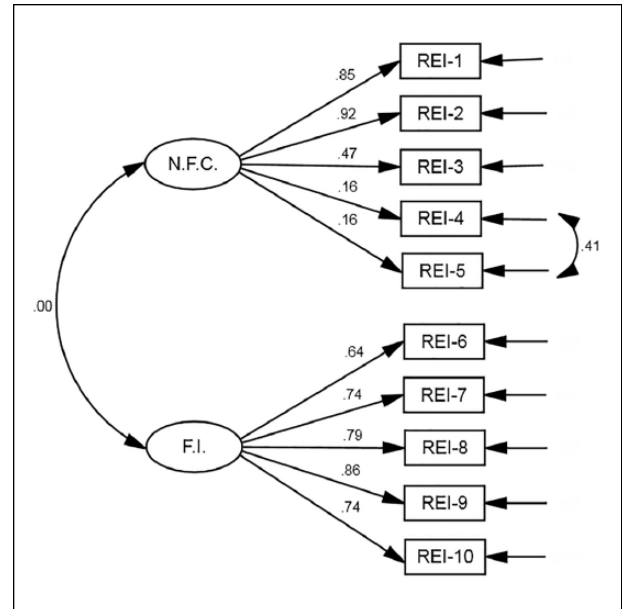
REI item	Component <sup>a</sup>		
	FI	NFC+	NFC-
1. I do not like to have to do a lot of thinking. <sup>b</sup>			.877
2. I try to avoid situations that require thinking in depth about something. <sup>b</sup>			.893
3. Thinking hard and for a long time about something gives me little satisfaction. <sup>b</sup>			.692
4. I prefer to do something that challenges my thinking abilities rather than something that requires little thought.		.811	
5. I prefer complex to simple problems.		.866	
6. I trust my initial feelings about people.	.721		
7. I believe in trusting my hunches.	.804		
8. My initial impressions of people are almost always right.	.850		
9. When it comes to trusting people, I can usually rely on my “gut feelings.”	.878		
10. I can usually feel when a person is right or wrong even if I cannot explain how I know.	.784		
<b>Factor correlations</b>			
NFC+	.15***	—	
NFC-	-.04	.17***	—

Note. *n* = 585. REI = Rational-Experiential Inventory; NFC = need for cognition; FI = faith in intuition.

<sup>a</sup>Extraction method: Principal component analysis. Rotation method: Oblimin with Kaiser Normalization. <sup>b</sup>Reverse coded.

\*\*\**p* > .001, two-tailed.

Normalization. This analysis suggested the presence of three components with eigenvalues greater than 1, which together explained 68.40% of the variance in the REI items. Results of this analysis are reported in Table 2. As can be seen, the five FI questions clustered on the one component, aptly named Faith in Intuition. However, for the NFC items, two separate components emerged. One of the components loaded on the reverse-phrased items, reinforcing previous suggestions that item polarity interferes with the measurement of NFC (Bors, Vigneau, & Lalande, 2006). Small correlations existed between the NFC+ (positively phrased NFC items) and NFC- (negatively phrased NFC items) components and between FI and NFC+ (Table 2).



**Figure 2.** Latent structure of thinking style.

Note. *n* = 585. CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; NFC = need for cognition; FI = faith in intuition; REI = Rational-Experiential Inventory.  $\chi^2(33) = 171.28, p < .001, CFI = .94, RMSEA = .09, 90\% CI [.07, .10]$  (significant at *p* < .001).

In preparation for the behavioral outcome models, the REI structure was generated using structural equation modelling. In an effort to retain the theoretical two-factor model, the residuals of the positively phrased NFC items which separated from other NFC items in the PCA were correlated. The fit of this two-factor model was considered reasonable and the model is shown as Figure 2,  $\chi^2(33) = 171.28, p < .001$ , comparative fit index (CFI) = .94, root mean square error of approximation (RMSEA) = .09, 90% CI [.07, .10]. Guided by cognitive-experiential self-theory (Epstein, 2003), the previous documentation of a methodological factor related to item valence (Bors et al., 2006), and the fact that the model provided a reasonable fit, the intended two-factor structure of the REI was adhered to. In line with original theory, the two factors NFC and FI were unrelated.

### Association Between Thinking Style and Demographic Variables

To explore whether demographic variables accounted for unique variance in REI constructs, NFC and FI were regressed onto the demographic variables age, language, education, and SES. The fit of the initial model was acceptable,  $\chi^2(72) = 271.58, p < .001, CFI = .92, RMSEA = .07, 90\% CI [.06, .08]$ . Given that SES and education levels are linked (Australian Bureau of Statistics, 2013b, 2013c), the

model was further refined by allowing these to covary. Furthermore, paths that were not statistically significant were removed and this involved removing Age altogether as it did not predict either REI construct. These adjustments resulted in a significant improvement in fit,  $\Delta\chi^2(10) = 46.75, p < .01$  and the final model had acceptable fit and is provided as Figure 3,  $\chi^2(62) = 224.83, p < .001, CFI = .93, RMSEA = .07, 90\% CI [.06, .08]$ . Demographic variables were more strongly related to NFC, accounting for 11.6% of the variance, compared with FI, accounting for only 1.4% of the variance.

### Association Between Thinking Style and Prostate Cancer Screening

To explore the influence of thinking style on prostate cancer screening behavior, screening variables (srPSA and srDRE) were regressed onto NFC and FI. In this model, demographic predictors of screening and number of GP visits in the past year were controlled for, given a plausible link between this and prostate screening behavior. The initial model—which allowed thinking style, demographics, and GP visit variables to covary freely with srPSA and srDRE—had acceptable fit,  $\chi^2(96) = 285.70, p > .001, CFI = .92, RMSEA = .06, 90\% CI [.05, .07]$ . However, the model was refined by the removal of paths which were not statistically significant. This resulted in a slight decrease in fit but the change was not statistically significant,  $\Delta\chi^2(14) = 12.37, ns$ . The refined model had acceptable fit and is shown as Figure 4,  $\chi^2(110) = 298.07, p > .001, CFI = .92, RMSEA = .06, 90\% CI [.05, .06]$ . As can be seen, NFC accounted for 1.2% of the variance in srDRE but did not relate to srPSA; FI was not related to either screening variable.

### Association Between Thinking Style and Colorectal Cancer Screening

In a similar fashion to the model for prostate screening above, colorectal cancer screening variables (srFOBT and oFOBT) was regressed onto the thinking style variables. The initial model had acceptable fit,  $\chi^2(92) = 250.76, p > .001, CFI = .93, RMSEA = .06, 90\% CI [.05, .06]$ . However, thinking style variables and demographic variables failed to predict any variance in self-reported or observed FOBT screening. Thus, the model is not shown herein.

## Discussion

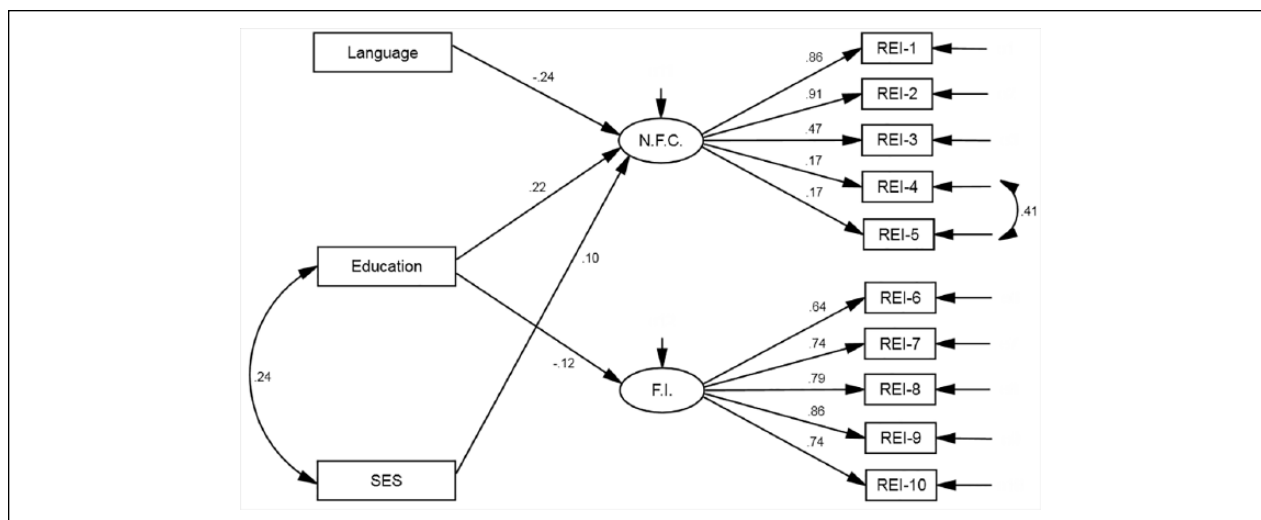
This study sought to determine the relationships between thinking style, demographics, and cancer screening behaviors in men. The analyses indicated that NFC was

positively related to educational attainment and SES and negatively related to speaking English at home. Education's positive relationship with NFC (Cacioppo et al., 1996) has been documented elsewhere and the positive link with SES is unsurprising given that education is an indicator of socioeconomic advantage (Australian Bureau of Statistics, 2013b). The slight negative relationship identified between education and FI has not been explored in detail; however, a previous study reported a weak negative association between FI and performance on Raven's Advanced Progressive Matrices (Liberali, Reyna, Furlan, Stein, & Pardo, 2012). These results suggest that health campaigns and interventions aimed at men with lower educational attainment or SES, or whose first language is not English, should allow for a lower preference for rational processing. This could include providing emotion-focused health information (Vidrine, Simmons, & Brandon, 2007), refining information so that it is less detailed, or incorporating advocacy by well-known individuals (Williams-Pichota, Schneider, Pizarro, Mowad, & Salovey, 2003).

Thinking style did not predict men's screening behavior in this sample, with one exception. NFC explained a very small amount of variance in self-reported DRE screening, even after controlling for frequency of doctor visits. FI, however, explained no variance. In other words, these results indicate that men who identified as tending to think effortfully were slightly more likely to report undergoing a DRE than men who disliked thinking hard, while it did not make a difference whether men trusted or distrusted their intuitions. An effect of thinking style on DRE participation has not been reported before.

Health behaviors toward which rational processes may be positive and experiential processes may be negative have been termed "hard to sustain" behaviors (Borland, 2014) and DRE appears to fit this categorization. Specifically, its positive consequences (such as prevention of harm from prostate cancer) are long term and best understood through rational processing, but the immediate and experientially processed aspects (such as shame, Naccarato, Reis, Matheus, Ferreira, & Denardi, 2011) are potentially negative. In this framework, it makes sense that a preference for rational processing would share variance with the decision to have a DRE, while a negative relationship with FI might be expected. The lack of any relationship with FI could indicate that factors evaluated by experiential processes were not uniformly negative (e.g., one may hold a positive implicit attitude toward following doctors' advice).

The other two screening behaviors would also be classed as hard to sustain, having long-term preventive health benefits and immediately aversive aspects of participation (needles and fecal matter). However, no effects were detected for PSA tests or FOBT. This leads us to consider



**Figure 3.** Demographic predictors of thinking style.

Note.  $n = 553$ . CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; NFC = need for cognition; FI = faith in intuition; REI = Rational-Experiential Inventory.  $\chi^2(62) = 224.83, p < .001$ , CFI = .93, RMSEA = .07, 90% CI [.06, .08]. All paths shown are significant at the  $p < .001$  level, except for  $NFC \leftarrow SES$  and  $FI \leftarrow Education$  (significant at  $p < .05$ ).

the level of involvement men have in their screening decisions: in order for thinking style to affect participation, a man must be making his own decision to undertake screening. The fact that men may be only minimally involved in the choice to have a PSA test (Slevin, Donnelly, Clarkson, English, & Ward, 1999) and may even be unaware one was carried out after blood was given (Chan, Vernon, Ahn, & Greisinger, 2004) suggests that thinking style cannot affect the screening decision-making process in some cases. Effects may be detectable for DRE participation because this is the most invasive, and arguably most volitional, of the two prostate screening methods.

Low involvement in the screening decision does not explain the lack of effects for FOBT, for which self-administration cannot occur without some effort. Although mailing kits, free of charge, to men’s homes (in this study and the NBCSP) removes the need to purchase or request a kit, their completion remains highly volitional. This hard-to-sustain behavior would be expected to show influence from thinking style in a similar manner to DRE; indeed, effects may be detected in samples that are less homogenous in their FOBT screening participation.

Finally, an alternative explanation for the finding should also be considered, given the possibility of feelings such as shame regarding DRE (Naccarato et al., 2011). Men higher in NFC may simply have been more willing to report that they had been given a DRE.

### Implications

It has previously been pointed out that health information should be structured so as to appropriately engage both

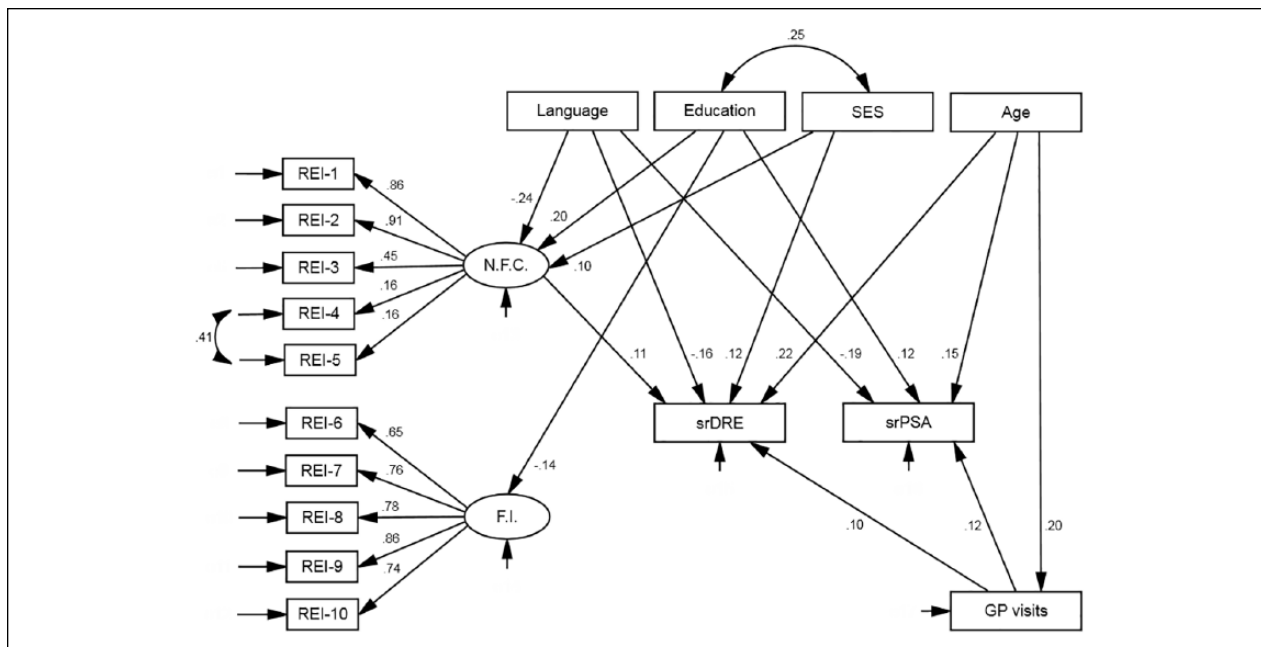
forms of processing to capitalize on their strengths and counter their weaknesses (de Vries, Fagerlin, Witteman, & Scherer, 2013). The finding in this study that higher NFC in men tended to be linked to higher levels of education, higher SES, and English as a first language—but that little variance in FI was linked to demographic variables—reinforces this recommendation. Specifically, it suggests that health communications with elements geared toward experiential processing may be more equitable, because unlike rationally processed information, these elements would be expected to perform just as well with groups of lower SES, education, and whose first language is not English.

### Strengths and Limitations

The research obtained a large sample of adults from the general population, and investigated the relationship between thinking style and cancer screening—an area about which little is known. Limitations of the study relate largely to issues with the REI and attributes of the sample. The presence in the original NFC scale (Cacioppo & Petty, 1982) of a second factor differentiated by reverse phrasing of questions, which places greater demand on verbal ability, has been documented in previous studies (Bors et al., 2006; Furnham & Thorne, 2013), and complicates the scale’s construct validity. The possibility that the NFC scale is measuring something in addition to NFC reduces confidence in the relationships, or lack of, between NFC and the demographic and screening variables.

The current sample reported higher NFC and lower FI than participants in a large survey of Australian males and





**Figure 4.** Demographic and thinking style predictors of self-reported prostate cancer screening by PSA and DRE. Note.  $n = 548$ . CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval; NFC = need for cognition; FI = faith in intuition; REI = Rational-Experiential Inventory; PSA = prostate-specific antigen; DRE = digital rectal examinations; srDRE = self-reported DRE participation; srPSA = self-reported PSA participation.  $\chi^2(110) = 298.07, p > .001$ , CFI = .92, RMSEA = .06, 90% CI [.05, .06]. All paths shown are significant at the  $p < .001$  level, except for NFC ← SES, srDRE ← NFC and srDRE ← GP visits (significant at the  $p < .05$  level) and FI ← Education, srPSA ← GP visits, srDRE ← SES and srPSA ← Education (significant at the  $p < .01$  level).

females chosen at random from the Electoral Roll (in which mean NFC was 3.51 [0.82] and mean FI was 3.77 [0.74]; Golley et al., 2015). NFC has been reported to correlate with education level (Cacioppo et al., 1996) and given this sample had roughly four times the postgraduate education attainment rate of the same-aged Australian male population (Australian Bureau of Statistics, 2011), it is likely that the sample was also higher in NFC than the general population. Relatedly, NFC is positively related to participation in cognitively effortful activities (von Stumm, 2012) and thus, participants in this sample (who voluntarily completed two surveys) may have been more likely to do so because of their higher NFC. Additionally, the sample overrepresented individuals of high SES, and this is known to predict colorectal cancer screening participation (Singh et al., 2004).

A methodological limitation was that only men who responded to the baseline survey were provided with a mailed FOBT and the endpoint survey. Accordingly, the rate of observed FOBT return (80.3%) was roughly double the rate of participation by the nonsurvey group in the parent study (attributed to selection effects insofar as men who return surveys are likely to participate in screening; Zajac et al., 2016) and double the rate of male participation in the NBCSP (Australian Institute of Health and Welfare, 2014). A large study in which FOBT kits were mailed to Danish participants (without any preceding letter or

survey) displayed uptake much closer to the parent study and the NBCSP than to the subgroup used for the present research, with 43.6% uptake among males (Frederiksen, Jorgensen, Brasso, Holten, & Osler, 2010). Thus, the sample is highly biased toward FOBT screening. High levels of NFC coupled with high screening participation estimates may have limited the effects detected herein, but the presence of any effect in such a sample indicates that investigation in broader samples is worthwhile. Notwithstanding these issues, the fact that NFC influences DRE participation is an interesting contribution.

### Future Directions

The types of information men drew on in rational or experiential decision making about screening has been speculated about above, but these results can tell us nothing about the types of information drawn on by men with different thinking styles. For instance, experiential processing of attitudes toward prostate screening may have an antiscreening influence (e.g., “PSA tests are uncomfortable”) or a proscreening influence (e.g., “PSA tests are effective”), or both. Following work suggesting that indicators of rational processing moderate the influence of rationally processed attitudes over behavior (and likewise for experiential processing and experientially processed attitudes; Conner, Perugini, O’Gorman, Ayres, &

Prestwich, 2007), future research should explore the relationship between thinking style and screening behavior in a manner that can account for rationally and experientially processed attitudes.

Factors not measured, such as context, affect, and features of the health behavior may privilege one form of processing over the other when making a decision. For instance, it is reasonable to accept that an individual may answer a general statement such as “I do not like to do a lot of thinking” as “completely true,” when in fact they thought very hard about taking their last PSA test, perhaps due to personal experience or a recently viewed news story. This state versus trait distinction in relation to rational and experiential processing requires further exploration if processing types are to be targeted in future research or interventions. A measure of thinking style that is specific to health-related thinking would be useful for promoting screening and other healthy behaviors, and would add to the understanding of NFC and FI. Finally, although modest, the effects found lead us to suggest that it is worthwhile replicating these results and extending investigations to other health behaviors. Studying a range of health behaviors varying in frequency, difficulty, and level of individual control may provide a more nuanced understanding of the relationships between thinking style and health behavior.

## Conclusions

NFC explained a small amount of variance in self-reported DRE participation. While the effect was very small, it is interesting given the lack of existing knowledge in this area, and suggests possibilities for further research. These findings form a springboard for future work, suggesting that research that is conducted with more diverse samples, and which includes other behaviors, is warranted to shed light on the relationship of thinking style to healthy behavior.

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