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Preference for Intuition and Deliberation in Eating Decision-making: Scale validation and associations with eating behaviour and health

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Objectives. Two distinct lines of research separately regard either deliberately regulated eating or intuitive eating as most beneficial for health. The present research aims to integrate these seemingly contradictory findings by investigating the relationships between Preference for Intuition and Deliberation in Eating Decision-making (E-PID) and subjective and objective health-related parameters using a newly developed scale.

Design. Study 1: online survey; Study 2: cross-sectional community cohort sample.

Methods. Study 1 (N = 699) assessed E-PID, intuitive, restrained, and external eating, motivation to eat healthily, domain-unspecific Preference for Intuition and Deliberation, and general self-control. Study 2 (N = 1,212) assessed E-PID, positive eating, intention to eat healthily, eating behaviour, and objective health risk factors (BMI, waist circumference, blood pressure, fasting serum glucose, HDL cholesterol, triglycerides).

Results. Study 1 confirmed a two-factor structure and provided evidence for construct validity: A higher preference for intuition was positively related to intuitive eating, while a higher preference for deliberation was associated with increased dietary restraint. In Study 2, preference for deliberation was positively related to the intention to eat healthy, healthy eating behaviour, and health parameters. Preference for intuition was generally unrelated to health parameters, although a higher preference for intuition was related to a somewhat unhealthier eating pattern.

Conclusions. Preference for intuition and deliberation when making food choices are two distinct decision-making styles: The former focuses on internal cues, while the latter focuses on cognitive regulation of food intake. Despite these differences, neither decision-making style was shown to be detrimental.

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Statement of contribution

What is already known on this subject?

- According to dual process models, both reflective and impulsive influences guide behavior.
- In one line of research, deliberate regulation of food intake has been related to improved eating behavior and health outcomes, while it is suggested that impulsive influences lead to unhealthy eating behavior.
- However, as deliberate regulation may also have detrimental effects, another line of research suggests to promote intuitive eating to facilitate healthy eating and improve health outcomes.

What does this study add?

- The present research brings together these seemingly contradictory previous findings using the newly developed scale for a preference for intuition and deliberation in eating decision-making.
- The data suggest that the two approaches might rather be two distinct decision-making styles instead of the two ends of one continuum.
- Whereas a high preference for deliberation was associated with healthier eating and lower risk for eating-related chronic diseases, a high preference for intuition was mostly unrelated to health parameters, indicating that eating according to one's intuition does not, per se, increase health risks.

How do you decide what to eat? Based on your gut feeling or rather based on deliberation that leads to plans and goals? To date, most research and dietary recommendations target the latter, that is, a deliberate and regulated approach to eating behaviour, which is mirrored in social-cognitive models of health behaviour (e.g., Theory of Planned Behavior, Ajzen, 1991; Social-Cognitive Theory, Bandura, 2001; Health Action Process Approach, Schwarzer, 2008). Indeed, social-cognitive constructs such as self-efficacy, planning, and goal-setting are predictive for healthier eating and positive health outcomes (e.g., Hagger & Luszczynska, 2014; Zhang, Zhang, Schwarzer, & Hagger, 2019).

However, according to dual process models (e.g., Fazio, 1990; Strack & Deutsch, 2004; Tversky & Kahneman, 1974, 1981), eating and other health behaviours may also be influenced by implicit processes. These implicit processes are primarily automatic and may operate without conscious reflection. They can be triggered by internal states such as emotions or stimuli in the social or physical environment (e.g., de Ridder, Kroese, Evers, Adriaanse, & Gillebaart, 2017; Hollands, Marteau, & Fletcher, 2016; Sheeran, Gollwitzer, & Bargh, 2013) that activate associations or behavioural schemata which instigate subsequent actions (Strack & Deutsch, 2004).

Some studies suggest that deliberate processes lead to beneficial behaviours, while implicit processes lead to harmful behaviours (for a discussion see, e.g., Gigerenzer & Gaissmaier, 2011; Peters, Wyatt, Donahoo, & Hill, 2002). For instance, it is argued that impulses, including basic motivations such as hunger, lead to giving in to unhealthy temptations (e.g., eating potato chips) and that these tendencies need to be counteracted by self-control to avoid health-related problems (Hofmann, Friese, & Wiers, 2008). This view is supported, for example, in a longitudinal study, in which Nederkoorn, Houben, Hofmann, Roefs, and Jansen (2010) showed that an implicit preference for unhealthy snacks and low ability to inhibit responses was related to more weight gained after one year. Accordingly, to facilitate healthy eating and consequently improve health, it is often recommended that individuals implement and develop self-regulation strategies in order to override potentially unhealthy impulses (c.f. Hofmann, Schmeichel, & Baddeley, 2012; Houben & Jansen, 2011).

However, some studies suggest that deliberate regulation of eating behaviour may also have harmful effects such as weight gain (e.g., Lowe, Doshi, Katterman, & Feig, 2013). Several reasons for this relationship are discussed, including a perception of deprivation when food intake is successfully restricted and disinhibition following larger than normal food intake (see Schaumberg, Anderson, Anderson, Reilly, & Gorrell, 2016, for a summary). Therefore, an alternative line of research is exploring beneficial effects of eating according to internal cues. According to the 'wisdom of the body' theory (Birch, 1999), it is assumed that people can intuitively make healthy choices based on an internal biological regulation system. For instance, Davis (1939) showed that young children were able to choose those foods they needed to grow healthy. This concept of intuitive eating, that is, a focus on physiological cues for eating and low preoccupation with food, has been taken up by researchers in the last few decades (e.g., Tribole & Resch, 1995; Tylka, 2006), and several recent studies also support the conclusion that intuitive eating is beneficial for health. For instance, intuitive eating was related to healthier eating (subscales Physical Reasons and Cues; Camilleri, Méjean, Bellisle, Andreeva, Kesse-Guyot, *et al.*, 2016a), a lower Body Mass Index (BMI; e.g., Anderson *et al.*, 2016; Camilleri *et al.*, 2016b), and better health parameters (i.e., lower blood pressure or cholesterol levels) in both observational and intervention studies (Cadena-Schlam & López-Guimerà, 2015; Schaefer & Magnuson, 2014; Van Dyke & Drinkwater, 2014). Based on these findings, it is possible that promoting intuitive eating could facilitate healthy food choices and boost overall health.

Two separate lines of research show that deliberate cognitive regulation of food consumption and eating according to one's intuition may both be related to improved eating behaviour and health outcomes, which at first may seem contradictory. In the broader context of dual process models; however, a number of studies suggest that deliberate and impulsive processes might operate as two separate decision-making systems, rather than representing the two ends of a continuum (e.g., Hagger, Trost, Keech, Chan, & Hamilton, 2017; Richetin *et al.*, 2007; see Perugini, 2005, and Sloman, 1996 for discussions). It could thus be hypothesized that some people are more successful when deciding based on reflection, while others may be more successful when deciding based on intuition. This notion is reflected in the development of scales to measure general dispositional (i.e., trait-like) decision-making styles. For instance, the Rational-Experiential Inventory (Epstein, Pacini, Denes-Raj, & Heier, 1996) consists of two orthogonal factors representing need for cognition (i.e., a preference for a deliberate thinking style) and faith in intuition (i.e., a preference for an intuitive thinking style). Building up on this work, Betsch (2004) introduced a measure to assess Preference for Intuition and Deliberation (PID), which indicates whether deliberate cognitive regulation or internal cues are preferred when making decisions. Interestingly, a recent meta-analysis (Phillips, Fletcher, Marks, & Hine, 2016) revealed only small and heterogeneous associations between an individual's preferred decision-making style and performance in a number of basic judgement and decision-making tasks, thus again highlighting that neither a deliberative nor an intuitive decision-making style might be more successful per se.

While the studies included in Phillips *et al.* (2016) focused on decisions concerning likelihood judgements or financial decisions, the relationships between different dispositional decision-making styles and eating behaviour have not received significant attention. Furthermore, scales assessing decision-making style preferences, including the Preference for Intuition and Deliberation inventory developed by Betsch (2004), usually assess general and therefore domain-unspecific preferences. However, as it was suggested

that people might show different preferences depending on the type of behaviour being studied (Pachur & Spaar, 2015), the present work used an adapted version which specifically assessed *Preference for Intuition and Deliberation in Eating Decision-making* (E-PID, see also König, Sproesser, Schupp, & Renner, 2018).

The present research

The overarching intent of this current work was twofold: First, it aimed to establish a newly developed scale for *Preference for Intuition and Deliberation in Eating Decision-making* and to test its psychometric properties. Second, it aimed to test whether a preference for intuition or deliberation when making eating-related decisions is more strongly associated with healthy eating and improved health.

Study 1 sought to confirm the two-factor structure of the scale and to assess the construct validity of its two decision-making style subscales by comparing them against a comprehensive suite of other previously established constructs including self-control (Tangney, Boone, & Baumeister, 2004), intuitive (Tylka, 2006; Tylka & Kroon Van Diest, 2013), and restrained and external eating (Van Strien, Frijters, Bergers, & Defares, 1986). Convergent validity, that is, positive relationships, was expected between the subscale Preference for Intuition and intuitive eating as well as between the subscale Preference for Deliberation and self-regulatory constructs. Divergent validity, that is, no significant relationships, was expected between the two subscales and external eating. Finally, we explored relationships between the two E-PID subscales and the motivation to eat healthy (Renner, Sproesser, Strohbach, & Schupp, 2012).

Extending Study 1, Study 2 aimed to investigate whether both decision-making styles are associated with subjective health-related parameters including a positive relationship with eating (Sproesser *et al.*, 2018) and intentions, as well as with objective health-related risk factors such as overweight and the presence of metabolic syndrome. These objective health-related parameters were assessed as they are related to eating behaviour (e.g., Gao *et al.*, 2008; Malik *et al.*, 2010; Williams, Mesidor, Winters, Dubbert, & Wyatt, 2015) and are major risk factors for non-communicable diseases such as type II diabetes and cardiovascular diseases (Eckel, Grundy, & Zimmet, 2005).

STUDY 1

Methods

Sample

In total, $N = 877$ participants were recruited to take part in an online survey. Links were posted in Facebook groups, distributed via mailing lists and posted in the university's online study pool. In addition, flyers were posted on campus and in local supermarkets. Participants were excluded when they had either missing values on at least 25% of variables ($n = 177$) or implausible entries for height and weight ($n = 1$). A final sample of $N = 699$ participants (79.69% female) was included in the analysis[1]. Mean age was 28.59 years ($SD = 11.43$), and mean BMI was in a normal range ($M = 22.57$, $SD = 3.77$, range 16.59–54.79). Sixty-five per cent of the sample consisted of students with a wide

[1] *There were no differences between dropouts and the final sample in age ($t(839) = 0.31$, $p = .760$), but the final sample had a lower BMI ($t(818) = 4.93$, $p < .001$; $M_{dropout} = 24.49$, $SD_{dropout} = 4.94$) and comprised more females (dropout: 66.20% female; χ^2 ($df = 1$) $= 12.28$, $p < .001$, Cramer V = .12).*

range of academic majors (e.g., Psychology, International Management, Industrial Engineering).

Procedure

Data were collected using Unipark (questback, 2017). The survey commenced with the purpose of the study, the right to withdraw participation at any point, and the compensation in accordance with the ethical guidelines of the German Psychological Society and the Declaration of Helsinki. Also participants were asked to carefully read the questions and items and choose the response option that fits best to them. Afterwards, participants filled in questions assessing demographics and psychological constructs. Finally, participants could choose between receiving 0.25 hr of course credit or taking part in a lottery in which 20 participants received a 10€ online shopping voucher.

Measures

Preference for Intuition and Deliberation in Eating Decision-making

Preference for an intuitive or deliberate style in eating decision-making (E-PID; see also König *et al*., 2018) was measured with a 7-item scale. The E-PID scale was adapted from the German version of the Inventory for Preference for Intuition and Deliberation developed by Betsch (2004) by rephrasing seven items (no. 1, 4, 5, 7, 12, 16, 18 from the original questionnaire, see Table 1) so that they addressed eating-related decisions. Specifically, those items were pre-selected that could be adapted to eating decisions[2]. Preference for intuition was measured with 3 items (e.g., 'When deciding what to eat, I rely on my gut feeling.'). Preference for deliberation was assessed with 4 items (e.g., 'Before I make eating decisions, I usually think about it.')[3]. Participants answered each item on a 5-point Likert scale from (1) I do not agree to (5) I agree.

Measures to examine construct validity

Means, standard deviations, and internal consistencies are listed in Table 2. To examine construct validity, the domain-unspecific preference for intuition and deliberation was assessed using the PID scale developed by Betsch (2004), which showed satisfying construct validity (Betsch, 2004). It consists of the subscales Preference for Intuition (10 items, e.g., 'With most decisions it makes sense to rely on your feelings') and Preference for Deliberation (9 items, e.g., 'I prefer making detailed plans to leaving things to chance.'). The scale used a 5-point Likert scale from (1) I do not agree to (5) I agree.

As previous studies on intuitive eating have used the Intuitive Eating Scale 2 (IES-2; Tylka & Kroon Van Diest, 2013), a German translation of this scale (Van Dyck, Herbert, Happ, Kleveman, & Vögele, 2016) was included in the present study to examine construct validity of E-PID. The IES-2 consists of 23 items and four subscales: Eating for Physical Rather than Emotional Reasons, 8 items, example item 'I find myself eating when I'm feeling emotional (e.g., anxious, depressed, sad), even when I'm not physically hungry'; Unconditional Permission to Eat, 6 items, example item 'I try to avoid certain foods high in

[2] *Hence, items such as 'I am perfectionist' or 'I prefer emotive people' were not adopted from the Inventory for Preference for Intuition and Deliberation (Betsch, 2004).*

[3] *Please note that German items were used in this study and translated into English only for presentation in this article.*

Table 1. Means (*M*), standard deviations (*SD*), standardized factor loadings (a), and corrected item-scale correlations ($r_{i(t\text{-}i)}$), as well as internal consistencies (Cronbach's α) of E-PID subscales ($N = 699$)

	M	*SD*	α *or a*	$r_{i(t\text{ -}i\ )}$
Preference for Intuition in Eating Decision-making	3.34	0.87	.78	
When deciding what to eat, I rely on my gut feeling	3.56	1.03	.81	.65
With most eating decisions, it makes sense to completely rely on your instinct	3.18	1.10	.61	.55
I am a very intuitive eater	3.28	1.01	.79	.66
Preference for Deliberation in Eating Decision-making	3.19	0.93	.81	
Before I make eating decisions, I usually think about it	3.26	1.11	.61	.54
I think more about my plans and goals relating to my eating behaviour than other people	2.87	1.29	.82	.72
I prefer making plans about my eating behaviour instead of leaving it to chance	2.76	1.23	.80	.69
I reflect on my eating behaviour	3.87	1.00	.68	.60

Note. E-PID = Preference for ize-making.

Table 2. Means (*M*), standard deviations (*SD*), and internal consistencies (Cronbach's α) of validation measures as well as their correlations (*r*) with E-PID subscales ($N = 699$)

				Preference for Intuition in Eating Decision-making		Preference for Deliberation in Eating Decision-making	
	M	*SD*	α	*r*	*p*[a]	*r*	*p*[a]
PID: Preference for Intuition	3.45	0.55	.79	.31	<.001	−.02	.610
PID: Preference for Deliberation	3.70	0.61	.82	−.14	<.001	.35	<.001
IES-2 total scale	3.53	0.57	.88	.31	<.001	−.34	<.001
IES-2: Eating for Physical Rather than Emotional Reasons	3.63	0.87	.90	.04	.264	−.15	<.001
IES-2: Unconditional Permission to Eat	3.49	0.75	.75	.48	<.001	−.57	<.001
IES-2: Reliance on Hunger and Satiety Cues	3.46	0.84	.89	.33	<.001	−.27	< .001
IES-2: Body-Food Choice Congruence	3.47	0.70	.72	.00	.970	.22	<.001
BSCS	3.13	0.57	.83	−.10	.007	.03	.477
DEBQ: external eating	3.24	0.50	.73	.08	.035	.05	.216
DEBQ: restrained eating	2.61	0.83	.91	−.34	<.001	.52	<.001
TEMS: health motive	4.79	1.11	.89	−.20	<.001	.35	<.001

Note. E-PID = Preference for Intuition and Deliberation in Eating Decision-making; PID = Preference for Intuition and Deliberation; IES-2 = Intuitive Eating Scale 2; BSCS = Brief Self-Control Scale; DEBQ = Dutch Eating Behavior Questionnaire; TEMS = The Eating Motivation Survey.
[a]According to Bonferroni's correction, *p* values should be interpreted as significant when < .004.

fat, carbohydrates, or calories'; Reliance on Hunger and Satiety Cues, 6 items, example item 'I trust my body to tell me when to eat'; Body-Food Choice Congruence, 3 items, example item 'Most of the time, I desire to eat nutritious foods'. It uses a 5-point Likert scale from (1) strongly disagree to (5) strongly agree and has demonstrated good construct validity (Tylka & Kroon Van Diest, 2013).

Furthermore, general self-control was assessed using a German translation (Sproesser, Strohbach, Schupp, & Renner, 2011) of the Brief Self-Control Scale (BSCS), which demonstrated good validity (Tangney *et al*., 2004). The scale consists of 13 items such as 'I am good at resisting temptation' answered with a 5-point Likert scale from (1) not at all like me to (5) very much like me.

Moreover, external and restrained eating were assessed using the respective subscales of the Dutch Eating Behavior Questionnaire (DEBQ, Van Strien *et al*., 1986; German translation: Grunert, 1989). The scales showed good validity (Nagl, Hilbert, De Zwaan, Braehler & Kersting, 2016), and each consists of ten items with a 5-point Likert scale ranging from (1) never to (5) very often. For example, external eating was assessed with items such as 'If food tastes good to you, do you eat more than usual?', restrained eating with items such as 'When you have put on weight, do you eat less than you usually do?'.

Lastly, the motivation to eat healthy was assessed using The Eating Motivation Survey (TEMS; Renner, Sproesser, Strohbach, *et al*., 2012). TEMS has been shown to be a reliable and valid measure of eating motives (Renner *et al*., 2012; Sproesser, Ruby, *et al*., 2018; Sproesser *et al*., 2019). The health motive was assessed using three items such as 'I eat what I eat because it is healthy' and answered with a 7-point Likert scale ranging from (1) never to (7) always.

Statistical analysis

Missing data were imputed using the Expectation–Maximization algorithm in IBM SPSS Statistics (Version 25) (Gold & Bentler, 2000). Missing values were below 5% for all imputed variables. Confirmatory factor analyses were computed in MPlus 7.4 to investigate the psychometric properties of E-PID. Based on Betsch (2004), a two-factor structure was assumed. Model fit was assessed by the comparative fit index (CFI), the standardized root mean squared residual (SRMR), and the root-mean-square error of approximation (RMSEA) (c.f. Hu & Bentler, 1999) using a latent structural equation model in MPlus. A reasonable fit is indicated by a CFI $\geq .90$, an SRMR value $\leq .10$, and an RMSEA value $\leq .08$ (Kline, 2011). Because the χ^2 statistic is sample size-dependent, the χ^2/df ratio was additionally calculated with a χ^2 not larger than 2–5 times the degrees of freedom indicating a good fit (Bollen & Long, 1993). Construct validity and how people with an intuitive and deliberate eating style eat were examined using a series of bivariate correlations in SPSS. Bonferroni's correction was used to adjust p values (Curtin & Schulz, 1998).

Results

Psychometrics of E-PID

Means, standard deviations, standardized factor loadings, and corrected item-scale correlations of all items are listed in Table 1. All items showed statistically significant factor loadings (ps $< .001$), indicating convergent validity. Internal consistency of the two E-PID subscales was $\alpha = .78$ (Preference for Intuition) and $\alpha = .81$ (Preference for Deliberation). The comparative fit index (CFI = .960), root mean square error of approximation (RMSEA = .053, 90% CI [0.042; 0.065]), and the standardized root mean square residual (SRMR = .042) indicated a good model fit (Hu & Bentler, 1999). Correlation between the two subscales was $r = -.48$ (see also Figure 1).

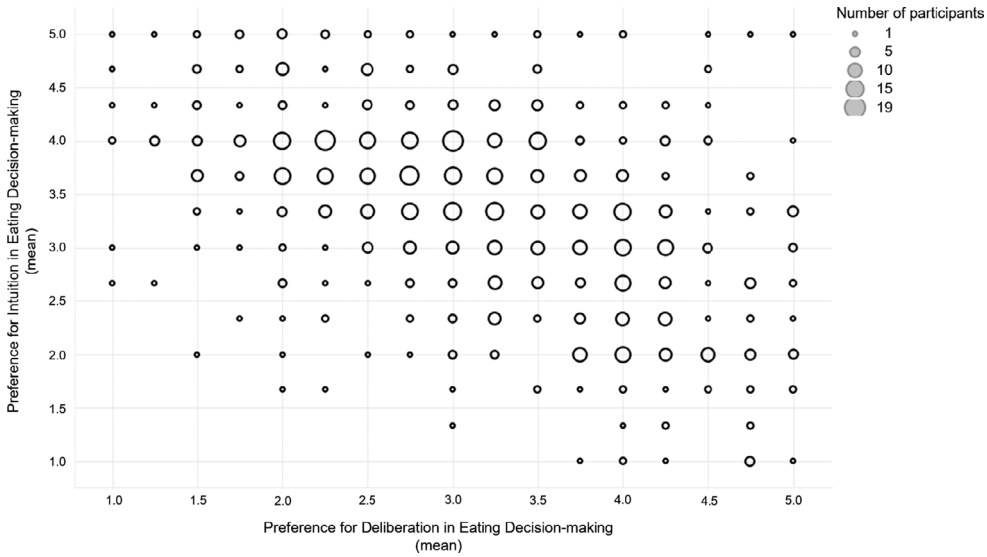

Figure 1. Scatter plot of means for E-PID subscales. The size of the circles indicates the number of participants with the respective combination of scale means.

To test the two dimensionality of the E-PID as opposed to the possibility that a preference for intuition and deliberation rather reflect the two ends of a continuum, a second confirmatory factor analysis was conducted with a one-factor structure (CFI = .781; RMSEA = .123, 90% CI [0.113; 0.134]; SRMR = .072). However, this indicated a worse model fit than the two-factor solution, which was thus preferred.

Construct validity of Preference for Intuition and Deliberation in Eating Decision-making

Overall, relationships between the two E-PID subscales Preference for Intuition in Eating Decision-making and Preference for Deliberation in Eating Decision-making and the validation constructs were as expected and in line with our hypotheses (see Table 2 for all correlations). Significant positive correlations emerged for each E-PID subscale with the respective PID subscale. These correlations indicate a medium effect (Cohen, 1992), suggesting that there is substantial convergence between eating-specific and general preference for intuition and deliberation, but that the two scales represent two distinct domains and levels of generalization. Moreover, Preference for Intuition in Eating Decision-making was positively correlated with intuitive eating, indicating that people with a high preference for intuition are more likely to decide what to eat based on bodily signals such as hunger and satiety. People with a strong Preference for Deliberation in Eating Decision-making, on the other hand, tend to rely on cognitive regulation of eating behaviour, as demonstrated by a high correlation with restrained eating. In contrast to our hypothesis, however, a Preference for Deliberation in Eating Decision-making was unrelated to general self-control as assessed with the Brief Self-Control Scale. Last, a Preference for Intuition in Eating Decision-making was negatively related to the motive to eat and choose food for health reasons, whereas a Preference for Deliberation in Eating Decision-making was positively related to this motive.

STUDY 2

Using the newly developed and validated scale, Study 2 aimed to investigate whether the two E-PID subscales are associated with eating-related cognitions, a positive relationship with eating, eating behaviour, and objective eating-related health risk factors. Specifically, we included having a positive relationship with eating (Sproesser *et al*., 2018), intention to eat healthy and healthy eating (Winkler & Döring, 1995). In addition, overweight and the presence of metabolic syndrome were assessed as eating-related objective health risk factors.

Methods

Design and procedure

This section presents data collected in the fourth point of measurement (spring 2016) of the Konstanz Life-Study, a longitudinal cohort study launched in spring 2012 with 1,321 participants recruited in Konstanz, Germany (König *et al*., 2018; Renner, Sproesser, Klusmann & Schupp, 2012). For each point of measurement, participants were recruited via flyers, posters, and newspaper articles. Additionally, participants of the preceding points of measurement were re-invited via email and phone calls. The collected data include fasting blood samples, questionnaire responses, and a standardized check-up consisting of anthropometric measures, cognitive, and physical fitness tests. As compensation for participation, participants received feedback about their objective health status relative to current norms.

Ethics

For data processing and security, a register of processing operations was developed in cooperation with and approved by the Center for Data Protection of the Universities in Baden-Württemberg (ZENDAS) in 2012 and 2016, and subsequently reviewed by the Commissioner for Data Protection in Baden-Württemberg. All participants gave written informed consent prior to participation. The study adhered to the guidelines of the German Psychological Society and the Declaration of Helsinki and was conducted in compliance with relevant laws and institutional guidelines. The study protocol was approved by the University of Konstanz ethics committee.

Sample

In total, $N = 1{,}236$ participants were recruited for the fourth point of measurement. Of these, $n = 24$ participants filled in < 75% of the questionnaires and were therefore excluded. The remaining $N = 1{,}212$ participants had a mean age of 41.04 years ($SD = 17.51$) and 64.60% were female. BMI ranged from 16.77 to 42.45 kg/m^2 ($M = 24.20$, $SD = 3.63$). The majority of participants had a university entrance diploma (71.30%), and 53.20% had a university degree.

Measures

Preference for Intuition and Deliberation in Eating Eecision-making

Preference for an intuitive or deliberate style in eating decision-making (E-PID) was measured with the same seven items as in Study 1. The subscale preference for an intuitive

style had a mean of 3.34 (SD = 0.83; α = .78) and the subscale preference for a deliberate style a mean of 3.19 (SD = 0.95; α = .84).

Positive relationship with eating

Participants' positive relationship with eating was assessed with the Positive Eating Scale (PES; Sproesser *et al.*, 2018), which has demonstrated satisfying construct validity (Sproesser *et al.*, 2018). The PES includes eight items such as 'Overall, I am satisfied with my eating behaviour' with a 4-point scale from 1 'strongly disagree' to 4 'strongly agree' (M = 3.40; SD = 0.52; α = .89).

Intention for healthy eating

The intention for healthy eating was measured by the single item 'I intend to eat healthy and in a balanced way in the future' on a 7-point scale with 1 = not at all (0%) and 7 = absolutely (100%) (M = 5.53; SD = 1.14; c.f. Schwarzer, 2008; Schwarzer & Renner, 2000). This item was shown to be a valid predictor of eating behaviour (Klusmann, Sproesser, Wolff, & Renner, 2017).

Healthy eating behaviour

Eating behaviour was assessed with a validated food frequency questionnaire (Winkler & Döring, 1995, 1998; see also Sproesser, Klusmann, Schupp, & Renner, 2017). Participants were asked how often, on average, they eat food items from 15 different selected food categories (e.g., whole grain products, vegetables, fruits, chocolate, cake, meat, and salty snacks), ranging from 1 'nearly once a day' to 6 'never'. These 15 food categories were accumulated into a food frequency index reflecting healthy eating that had a possible range of 0–30, with higher values indicating healthier eating (M = 15.06; SD = 3.28).

Objective health risk factors

Height, weight, waist circumference, and blood pressure were measured by trained research staff following standardized procedures. Participants wore light indoor clothing and were asked to take off their shoes. Height was determined to the nearest 0.1 cm using a wall-mounted stadiometer. Weight was measured using a digital scale (Omron Body Composition Monitor, BF511) to the nearest 0.1 kg. BMI was calculated as weight in kilograms divided by height in metres squared (cf., World Health Organization, 2008). Waist circumference was assessed midway between the lowest rib and the iliac crest with a flexible anthropometric tape (cf., Hara *et al.*, 2006). Moreover, blood pressure was measured two times at the left arm after resting with an automatic oscillometric device (Aponorm Basis Plus) and the second measurement was analysed.

Fasting blood samples were collected in the morning after a minimum of 8-hour fast. Fasting serum glucose, triglycerides, and high-density lipoprotein (HDL) cholesterol were determined by a certified local laboratory.

The presence or absence of overweight and risk factors for metabolic syndrome were determined using the criteria outlined by the World Health Organization (2008) and the International Diabetes Federation (2006). Overweight was defined as having a BMI of 25 kg/m^2 or above. Risk factors for metabolic syndrome were (1) abdominal obesity (waist circumference > 94 cm for men, > 80 cm for women); (2) systolic blood

pressure ≥ 130 mmHg or diastolic blood pressure ≥ 85 mmHg or use of anti-hypertensive medications; (3) fasting serum glucose ≥ 100 mg/dl or use of diabetic medications; (4) fasting serum triglycerides ≥ 150 mg/dl or use of lipid-lowering medications; and (5) low fasting serum HDL cholesterol (< 40 mg/dl in men, < 50 mg/dl in women). Individuals were considered to have metabolic syndrome if they displayed abdominal obesity and at least two additional risk factors.

Analytical procedure

Statistical analyses were conducted using IBM SPSS statistics software (Version 25.0 for Windows). Missing data in questionnaire variables were imputed using the Expectation–Maximization algorithm (Gold & Bentler, 2000), while data in demographics, anthropometric data, and blood parameters were not imputed. The prevalence of missing values was below 5% for all study variables. To examine whether the two E-PID subscales Preference for Intuition and Preference for Deliberation in Eating Decision-making were normally distributed, normal quantile–quantile plots for standardized residuals were inspected (Judd, McClelland, & Ryan, 2011).

Hierarchical multiple regressions with dummy coded categorical variables and z-standardized continuous variables were performed to investigate the relationship between the two E-PID subscales, as well as a positive relationship with eating, intention, and healthy eating. As control variables, gender and age were included in the first step. In the second step, the two E-PID subscales were included. Since independent variables did not correlate above .70, no marked collinearity restrictions existed. As control analyses, regressions were repeated excluding outliers. Moreover, regressions were repeated including years of education as additional control variable. As these control analyses revealed highly comparable results compared to analyses including all participants and solely age and gender as control variables, results from the latter analyses, that is, all participants and only controlled for age and gender, are reported.

Moreover, logistic regressions with dummy coded categorical variables and z-standardized continuous variables were performed to investigate the relationship between the two E-PID subscales and health risk factors. Dependent variables were the probability of displaying a health risk parameter (0 = does not show the risk factor; 1 = shows the risk factor), that is, metabolic syndrome, overweight, enhanced waist circumference, enhanced blood pressure, enhanced triglycerides, enhanced glucose, and low HDL cholesterol, with all models being adjusted for age and gender. As control analyses, models were additionally adjusted for years of education. As these revealed highly comparable results, regressions without adjustment for years of education are reported.

Results

Associations with intention, a positive relationship with eating, and eating behaviour

Results of hierarchical multiple regressions are displayed in Table 3. A higher Preference for Deliberation in Eating Decision-making was related to a more positive relationship with eating, a stronger intention to eat healthy, and a healthier eating behaviour.

A Preference for Intuition in Eating Decision-making was unrelated to the intention to eat healthy, but people with a higher preference for intuition also had a more positive relationship with eating. Moreover, a higher preference for intuition was related to a somewhat unhealthier eating behaviour.

Table 3. Results from hierarchical multiple regressions (N = 1,209; controlled for age and gender)

	B	*SE*	β	*t*	*p*	R^2	*F*(4, 1,204)	*p*
Intention								
Constant	5.63	0.04		152.75	<.001	.19	72.44	<.001
Gender	−0.26	0.06	−.11	−4.24	<.001			
Age	−0.05	0.03	−.04	−1.61	.108			
Preference for Deliberation in Eating Decision-making	0.46	0.03	.40	14.60	<.001			
Preference for Intuition in Eating Decision-making	−0.02	0.03	−.02	−0.60	.551			
Positive eating								
Constant	3.38	0.02		183.25	<.001	.03	9.72	<.001
Gender	0.06	0.03	.06	2.04	.042			
Age	0.00	0.01	−.01	−0.32	.748			
Preference for Deliberation in Eating Decision-making	0.05	0.02	.09	2.99	.003			
Preference for Intuition in Eating Decision-making	0.09	0.02	.18	5.95	<.001			
Healthy eating behaviour								
Constant	15.36	0.11		135.66	<.001	.08	26.99	<.001
Gender	−0.85	0.19	−.12	−4.47	<.001			
Age	0.69	0.09	.21	7.53	<.001			
Preference for Deliberation in Eating Decision-making	0.34	0.10	.10	3.50	<.001			
Preference for Intuition in Eating Decision-making	−0.39	0.10	−.12	−4.03	<.001			

Associations with objective health risk factors

Results of logistic regressions are displayed in Table 4. A preference for deliberation was associated with lower risk of an enhanced waist circumference. Moreover, participants with a high preference for deliberation had a lower risk of enhanced blood glucose levels. For participants with a high preference for intuition, no significant relationships were found with any objective health risk factor. Hence, although participants with a higher preference for intuition ate slightly less healthy than people with a lower preference for intuition, this negative effect was not mirrored in a higher BMI, elevated blood pressure, or blood parameters.

Discussion

In the present studies, Preference for Intuition and Deliberation in Eating Decision-making was introduced as a trait-like measure for eating-related decision-making style preferences. In Study 1, the proposed two-factor structure was confirmed. Moreover, as expected, a Preference for Intuition and a Preference for Deliberation showed differential relationships with the included validation constructs, indicating that preferences for intuition and deliberation in eating decision-making might involve two distinct decision-making styles with distinct patterns of how people make food choices.

As positive correlations with the IES-2 total scale and especially with the subscale Reliance on Hunger and Satiety Cues suggest, a high preference for intuition indicates a certain focus on bodily signals indicating when (not) to eat. Moreover, both concepts

Table 4. Results from logistic regressions (controlled for age and gender)

	B	*SE*	Wald	*df*	*p*	OR	Lower CI	Upper CI
Overweight (BMI ≥ 25; n^a = 424 of N^b = 1,206)								
Constant	−0.98	0.08	138.93	1	<.001	0.37		
Gender	0.86	0.13	43.21	1	<.001	2.37	1.83	3.07
Age	0.57	0.06	76.11	1	<.001	1.76	1.55	2.00
Preference for Deliberation in Eating Decision-making	−0.11	0.07	2.67	1	.102	0.89	0.78	1.02
Preference for Intuition in Eating Decision-making	−0.07	0.07	0.97	1	.323	0.94	0.82	1.07
Waist circumference > 94/80 cm (*n* = 600 of *N* = 1,206)								
Constant	0.33	0.08	17.62	1	<.001	1.40		
Gender	−0.92	0.14	44.84	1	<.001	0.40	0.30	0.52
Age	0.87	0.07	157.69	1	<.001	2.38	2.08	2.73
Preference for Deliberation in Eating Decision-making	−0.16	0.07	5.19	1	.023	0.86	0.75	0.98
Preference for Intuition in Eating Decision-making	−0.06	0.07	0.86	1	.355	0.94	0.82	1.07
Blood pressure ≥ 130/85 mmHg (*n* = 361 of *N* = 1,199)								
Constant	−1.50	0.10	224.47	1	<.001	0.22		
Gender	1.26	0.15	74.09	1	<.001	3.53	2.65	4.71
Age	0.93	0.08	153.03	1	<.001	2.54	2.19	2.95
Preference for Deliberation in Eating Decision-making	−0.13	0.08	2.78	1	.095	0.88	0.76	1.02
Preference for Intuition in Eating Decision-making	−0.13	0.08	2.85	1	.091	0.88	0.76	1.02
Blood cholesterol: HDL < 40/50 mg/dl (*n* = 48 of *N* = 1,189)								
Constant	−3.22	0.19	288.16	1	<.001	0.04		
Gender	0.03	0.31	0.01	1	.921	1.03	0.56	1.90
Age	−0.21	0.16	1.74	1	.187	0.81	0.59	1.11
Preference for Deliberation in Eating Decision-making	0.04	0.16	0.07	1	.795	1.04	0.76	1.43
Preference for Intuition in Eating Decision-making	−0.17	0.15	1.23	1	.267	0.84	0.62	1.14
Blood cholesterol: Triglycerides ≥ 150 mg/dl (*n* = 149 of *N* = 1,189)								
Constant	−2.44	0.13	333.06	1	<.001	0.09		
Gender	1.00	0.18	30.25	1	<.001	2.72	1.90	3.88
Age	0.34	0.09	15.47	1	<.001	1.40	1.19	1.66
Preference for Deliberation in Eating Decision-making	0.03	0.10	0.08	1	.772	1.03	0.85	1.24
Preference for Intuition in Eating Decision-making	0.09	0.10	0.90	1	.342	1.10	0.91	1.32
Blood glucose ≥ 100 mg/dl (*n* = 79 of *N* = 1,190)								
Constant	−3.26	0.19	284.21	1	<.001	0.04		
Gender	0.54	0.24	4.87	1	.027	1.72	1.06	2.78
Age	0.86	0.12	47.85	1	<.001	2.37	1.86	3.03
Preference for Deliberation in Eating Decision-making	−0.28	0.13	4.78	1	.029	0.76	0.59	0.97
Preference for Intuition in Eating Decision-making	−0.06	0.13	0.20	1	.655	0.94	0.74	1.21

Continued

Table 4. (*Continued*)

	B	*SE*	Wald	*df*	*p*	OR	Lower CI	Upper CI
Metabolic syndrome (*n* = 104 of *N* = 1,189)								
Constant	−3.05	0.18	301.89	1	<.001	0.05		
Gender	0.72	0.22	10.67	1	.001	2.05	1.33	3.15
Age	0.93	0.11	69.36	1	<.001	2.54	2.04	3.16
Preference for Deliberation in Eating Decision-making	−0.16	0.12	1.86	1	.172	0.85	0.68	1.07
Preference for Intuition in Eating Decision-making	−0.08	0.11	0.47	1	.495	0.93	0.74	1.16

Note. BMI = Body Mass Index; CI = Confidence Interval.
[a]Number of participants who displayed the risk factor; [b]As missings in anthropometric data and blood parameters were not imputed, the *N* varies between the different logistic regressions.

share an Unconditional Permission to Eat, again shown by positive correlations, which indicates that both intuitive eaters and people with a high preference for intuition do not avoid stereotypical 'unhealthy' foods. However, albeit conceptual overlap, a preference for intuition is distinct from the construct of intuitive eating, as indicated by the negligible correlations with the subscales Eating for Physical Rather than Emotional Reasons and Body-Food Choice Congruence (c.f. Cohen, 1992). Moreover, people with a higher preference for intuition were less likely to choose foods because they are healthy, whereas Tribole and Resch (2012) assert that intuitive eaters often choose foods for the purpose of health (c.f. Tylka, Calogero, & Daníelsdóttir, 2015). Thus, people with a high preference for intuition might focus less on the provision of nutrients or energy to their body.

Preference for Deliberation in Eating Decision-making, on the other hand, correlated positively with restrained eating, indicating that people with a preference for deliberation cognitively regulate their eating behaviour. It is, however, important to note that preference for deliberation is broader than dietary restraint, as preference for deliberation also was positively correlated with eating for health reasons, thus going beyond a focus on weight loss or maintenance (Stunkard & Messick, 1985; Van Strien *et al.*, 1986). Given the cognitively regulated nature of a preference for deliberation, it is interesting to note that people with a higher preference for deliberation were found to eat more often for emotional reasons compared to physical reasons, although this effect was relatively small. It could be hypothesized that cognitive regulation is necessary because people with a high preference for deliberation might be somewhat prone to emotional eating and thus need to counteract these tendencies in order to fulfil their desire to eat healthy.

In addition, Study 2 showed that a preference for deliberation is associated with healthier eating and a reduced risk for certain objective health risk factors, which is in line with previous research on planning and goal-setting (e.g., Hagger & Luszczynska, 2014; Mann, de Ridder & Fujita, 2013; Strecher *et al.*, 1995). In contrast, a preference for intuition was generally unrelated to objective health risks, although people with a higher preference for intuition showed a slightly unhealthier eating behaviour. Thus, a preference for deliberation appeared to be beneficial, but a preference for intuition did not appear to be detrimental.

We found that a higher preference for intuition was related to a somewhat unhealthier eating behaviour. In contrast, previous research found that intuitive eating, as assessed with the two subscales 'Eating for Physical rather than Emotional Reasons' and 'Reliance on Hunger and Satiety Cues' of the IES-2, was associated with healthier eating (Camilleri,

Méjean, Bellisle, Andreeva, Kesse-Guyot, *et al*., 2016a). Interestingly, however, Camilleri *et al*. (2016a) also found that the subscale 'Unconditional Permission to Eat' of the IES-2 was related to unhealthier eating behaviour. Moreover, our results revealed that a preference for intuition showed the highest association with this IES-2 subscale compared to other subscales. Hence, the concept of a preference for intuition in eating decision-making seems to overlap most with the IES-2 concept of an unconditional permission to eat in comparison with the other concepts included into the IES-2.

Importantly, although people with a higher preference for intuition showed slightly less healthy eating, there were no significant relationships between preference for intuition and objective health risks, suggesting that the slightly unhealthier eating behaviour might not translate into long-term health consequences. In the context of intuitive eating, Schaefer and Magnuson (2014) noted that interventions which promote eating based on internal cues often also report improvements in physical activity levels, which is also related to improved physiological health parameters and reduced mortality (e.g., Arem *et al*., 2015; Bamman *et al*., 2014; Dunn *et al*., 1999; McKinney *et al*., 2016). This spillover effect might be attributed to a general focus on internal cues, through which participants might also notice positive outcomes of physical activity, such as feeling energized, which again may motivate to increase physical activity (c.f. Tribole & Resch, 1995). As intuitive eating and Preference for Intuition in Eating Decision-making share a certain focus on internal cues for deciding whether to eat, it could be hypothesized that similar results may also be observed for people with a high preference for intuition. Thus, higher physical activity in participants with a high preference for intuition might explain the seemingly contradictory finding of being associated with a somewhat unhealthier eating behaviour, but not with more unfavourable health parameters. These assumptions, however, need to be tested in future research.

The present research supports the claim that a preference for deliberation or intuition when making eating-related decisions might rather be described as two distinct decision-making styles as opposed to two ends of one continuum (c.f. Betsch, 2004; Hagger *et al*., 2017; Perugini, 2005; Sloman, 1996). As the data presented in Study 1 shows, the subscales were negatively correlated; however, only few participants were located on opposite ends of the two subscales, that is, low scores on one subscale and high scores on the other. This indicates that at least some people may prefer to rely on their intuition when deciding what to eat in some situations, while relying on deliberation in others. As Phillips *et al*. (2016) noted, depending on the choice situation, either a deliberate or intuitive decision-making approach will be more beneficial. Being able to respond to context and flexibly switch between the two decision styles may be key to achieving favourable outcomes. For instance, as the literature on self-control (e.g., Baumeister & Heatherton, 1996; Baumeister & Vohs, 2007; Hagger, Wood, Stiff, & Chatzisarantis, 2010) suggests, deliberately controlling eating behaviour might be more successful if cognitive resources are available. These resources can be taxed, however, by boundary conditions such as additional behavioural demands (e.g., cognitive load, Hofmann, Friese, & Roefs, 2009) or situational conditions (e.g., assortment size, König, Giese, Schupp, & Renner, 2016). Under such circumstances, one might need to rely more strongly on intuition. As recent research showed that healthy foods are perceived to be tasty and enjoyable and thus might satisfy a need for pleasure (Wahl *et al*., 2017), relying on internal cues such as appetite or liking can also lead to making healthy food choices. However, if, for instance, internal satiety cues cannot be clearly perceived because the individual is distracted, for example, by watching television (Hetherington, Anderson, Norton, & Newson, 2006), an intuitive approach could also lead to less favourable outcomes. Thus, whether a particular

decision-making style leads to healthy food choices might strongly depend on the context (Wahl *et al.*, 2020), and interactions between decision-making styles and contextual factors should be explored in future research. In addition, future research may explore the relationship between Preference for Intuition and Deliberation in Eating Decision-making and the concept of flexible control (Westenhoefer, Stunkard, & Pudel, 1999). The latter describes a 'graduated approach to eating, dieting, and weight, in which 'fattening' foods are eaten in limited amounts without feelings of guilt' (p. 54), and thus, it could be hypothesized that people who do not show a strong preference of one decision-making style over the other might show more flexible control.

The observed association between stronger preferences for deliberation and better health is in line with the conclusions from most of the intervention studies that have included a deliberate approach. For instance, many behaviour change techniques are based on self-regulation (Abraham & Michie, 2008). Also, König *et al.* (2018) noted that in the context of mHealth apps many available interventions might target a deliberative decision-making style (see also Villinger, Wahl, Boeing, Schupp, & Renner, 2019). However, as other studies reported that deliberate regulation of eating behaviour may also have negative consequences (Lowe *et al.*, 2013), the question arises whether deciding based on intuition should also be promoted. The present research indicates that there might be no need to counteract a preference for intuition, as a preference for intuition was not associated with poorer physical health measures, yet was related to less restrained eating and a more positive relationship with eating, which might be regarded as markers for mental health. In a similar vein, other studies (e.g., Bush, Rossy, Mintz, & Schopp, 2014) find that intuitive eating interventions decrease restrained and disordered eating and increase body appreciation and quality of life (Bacon, Stern, Van Loan, & Keim, 2005; Bush *et al.*, 2014; Mensinger, Calorego, Stranges, & Tylka, 2016; Wilson, Marshall, Murakami, & Latner, 2020), for example, by specifically increasing sensitivity to internal cues for hunger and satiety (Bacon *et al.*, 2005). However, as the present research was cross-sectional and thus precludes conclusions about causality, experimental research is needed investigating in which situations a preference for intuition may have health-promoting effects.

According to dual process models such as the Reflective Impulsive Model (Strack & Deutsch, 2004), behaviour is determined by two distinct systems that differ in information representation and processing. Both systems operate in parallel, and which system finally drives behaviour depends on certain boundary conditions. Similarly, dispositional decision-making style preferences differ in the processing of information (Epstein *et al.*, 1996). However, the preferred decision-making style may influence which of the two systems drives behaviour more frequently (Phillips *et al.*, 2016), thus acting as a boundary condition itself. In the context of health behaviours and health behaviour change, it could be assumed that interventions using self-regulatory behaviour change techniques might be more frequently and successfully applied by people with a stronger preference for deliberation and that people with a strong preference for intuition might be more prone to implicit influences. However, further research is necessary to test these assumptions, especially since the overlap between preference for intuition and the wide range of implicit processes discussed in the literature still needs to be explored.

A methodological strength of the present research is its comparably large sample size and the inclusion of objective health parameters. Specifically, the observation that a high preference for intuition when making eating decisions may have a somewhat negative impact on immediate food choices, but that these choices do not translate into more distal objective health risks, underlines the importance of taking objective health

parameters into account when evaluating the success of certain decision-making strategies or preferences. However, our conclusions are limited due to the cross-sectional design. To investigate how preference for intuition and deliberation relate to eating behaviour change and how they impact the success of interventions, longitudinal studies and randomized controlled trials are highly recommended for future research. Moreover, the samples of both studies were comparably healthy, as indicated by a mean BMI below the German population average (Statistisches Bundesamt, 2018). This might be explained by the fact that both studies were specifically advertised as studies on health and eating behaviour, and Study 2 specifically offered health feedback. Both studies might thus have attracted participants with a comparably strong interest in these topics. Furthermore, both samples comprised considerably more females than males, and the majority of participants in Study 1 were students. Generalization of the findings might thus be limited.

Furthermore, in the present research, only the frequency of consuming different food groups was assessed, but not the quantity of consumption (Cade, Burley, Warm, Thompson, & Margetts, 2004; Winkler & Döring, 1998). This might constitute an explanation for the lacking associations between preference for intuition and objective health parameters despite a negative relationship between preference for intuition and healthy eating behaviour: Although people with a higher preference for intuition show a somewhat unhealthier pattern of consumption frequency, they might consume less unhealthy foods, or more healthy foods, per eating occasion. Therefore, future research should also take quantity of consumption into account to provide more detailed insights into participants' food consumption patterns and their relationships with decision-making styles.

Conclusion

The present research brings together seemingly contradictory previous findings that both a deliberative and an intuitive approach in eating decision-making can be related to improved health outcomes. Specifically, data suggest that the two approaches might rather be two different decision-making styles instead of the two ends of one continuum. They employ different strategies, yet both decision-making styles have advantages.

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Author contributions

Laura M. König: Conceptualization; Formal analysis; Project administration; Visualization; Writing – original draft, Gudrun Sproesser: Conceptualization; Formal analysis; Funding acquisition; Project administration; Writing – original draft, Harald T. Schupp: Conceptualization; Funding acquisition; Supervision; Writing – review & editing, Britta Renner: Conceptualization; Funding acquisition; Supervision; Writing – review & editing.

Conflicts of interest

All authors declare no conflict of interest.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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