Supplemental Materials

Experiment 1

Procedural Details

Each trial of the video surveillance procedure lasted 1500 ms. For conditioning trials, the CS and US stimuli flashed back and forth, appearing briefly in an alternating fashion. Both appeared simultaneously for 300 ms, then the first stimulus would disappear for 50 ms then reappear. 175 ms later, the second stimulus would disappear for 50 ms then reappear. This sequence repeated; the resulting effect was that the stimuli appeared to flash quickly back and forth. As noted in the text, the flashing promotes eye gaze shifts between the CS and US, which Jones et al. (2009) found to enhance source confusion and encourage implicit misattribution of the evaluation evoked by the US to the CS. Stimulus pairs in filler trials also sporadically flashed, so that the CS-US trials did not stand out in the procedure. Filler trials also sporadically flashed, so that the CS-US trials did not stand out.

Contingency Awareness

After completing the dependent measures, participants answered three questions assessing their contingency awareness. Two independent raters coded participants' free responses to the questions and judged whether they seemed to be correctly aware of systematic food CS-US pairings. Participants were judged to be contingency-aware if both raters agreed that they expressed awareness of the pairings in response to the first and/or second questions ("Did you notice anything out of the ordinary in the way the words and pictures were presented during "surveillance"?" and "Did you notice anything systematic about how particular words and images appeared together?"). Five participants met this criterion (6% of participants assigned to the EC condition). When the criterion was relaxed to even a single coder having made a

judgment of contingency awareness, 9 participants (10%) were excluded. Which criterion was employed was of no consequence with respect to the statistical significance of the results. Excluding the few participants who reported contingency awareness did not change the statistical significance of the key results, with the exception of one finding that achieved only a marginal level of significance following such exclusion (see below).

Results - Additional Details

Eating intention ratings for the 4 healthy and unhealthy foods were subjected to a mixed-design analysis of variance. The ANOVA revealed a significant interaction between CS food type and condition, indicated that preference for unhealthy/tasty CS- over healthy/untasty CS+ was reduced. A simple effects analysis revealed that EC participants rated healthy CS+ (M = 0.70, SD = 1.87) significantly higher than control participants did (M = 0.11, SD = 2.08), $F(1,166) = 3.86$, $MSE = 3.90$, $p = .05$, $\eta_P^2 = .023$. EC participants (M = 2.05, SD = 2.40) also tended to rate unhealthy CS- foods lower than control participants did (M = 2.64, SD = 1.96), $F(1,166) = 3.08$, $MSE = 4.84$, $p = .08$, $\eta_P^2 = .018$.

HLM was employed to examine the extent to which participants were sensitive to the health and taste dimensions in deciding upon their eating intentions. The model predicted a participant's likelihood of eating a serving from dummy-coded condition (control = 0, EC = 1) at level 1 as a fixed effect, and food healthiness and tastiness (entered grand-mean centered) at level 2 as fixed effects. The intercept was entered as a random effect; random effects were kept in the model only if they reached $p < 0.200$ level of significance.[1] Robust standard errors were assumed.

[1] The level 1 and level 2 equations are as follows:

Level 1: $\text{eating likelihood}_{ij} = \beta_{0j} + \beta_{1j}(\text{Condition}) + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Tastiness}) + \gamma_{02}(\text{Healthiness}) + u_{0j}$

$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Tastiness}) + \gamma_{12}(\text{Healthiness})$

The analysis at level 1 (pseudo $R^2 = 0.12$) showed that EC did not have a significant main effect on eating intentions ($\gamma_{10} = 0.05$, $t(5675) = 0.81$, $p = .42$). At level 2 (pseudo $R^2 = 0.78$), participants' eating intentions for the 34 non-CS foods were significantly predicted by both tastiness ($\gamma_{01} = 0.77$, $t(31) = 13.56$, $p < .001$) and healthiness ($\gamma_{02} = 0.10$, $t(31) = 4.65$, $p < .001$), indicating that they were sensitive to both dimensions. EC did not have an overall effect on eating intentions ($\gamma_{10} = 0.05$, $t(5675) = 0.81$, $p = .42$). However, significant cross-level interactions between condition and normative tastiness and between condition and normative healthiness revealed that EC participants' eating intentions corresponded to tastiness less ($\gamma_{11} = -0.12$, $t(5675) = 2.32$, $p = .02$) and healthiness more ($\gamma_{12} = 0.10$, $t(5675) = 2.28$, $p < .001$), compared to control participants (see Supplemental Figure 1). When contingency-aware participants were excluded, the condition x tastiness term attained only a marginal level of statistical significance, $\gamma_{11} = -0.10$, $t(5403) = 1.60$, $p = .11$.

Participants completed the health, weight control, and sensory appeal subscales of the Food Choice Questionnaire (FCQ), which assesses importance of various factors in everyday food choice. Although no effects were observed on the weight control and sensory appeal subscales, EC did increase scores on the FCQ health subscale. EC led participants to endorse the importance of health considerations in their food choices more strongly ($M = 2.95$, $SD = 0.71$) than control participants did ($M = 2.74$, $SD = 0.67$), $t(166) = 2.01$, $p < .05$; $d = 0.30$.

Experiment 2

Results - Additional Details

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r_{ij} represents the error associated with level 1, u_{0j} represents the intercept error, γ_{00} is the average intercept, and γ_{10} is the effect of condition on intentions at mean levels of tastiness and healthiness. Coefficients γ_{01} and γ_{02} represent main effects of normative tastiness and healthiness on food ratings. Coefficients γ_{11} and γ_{12} represent the interactions between normative tastiness with condition and normative healthiness with condition.

An ANOVA examining ratings of the CS foods revealed a marginally significant 3-way interaction among food type, task type, and EC; $F(1,88) = 2.86$, $MSE = 5.25$, $p = .10$, $\eta_G^2 = .018$. The difference in eating intentions between unhealthy CS over healthy CS was significantly smaller for EC participants (compared to control participants) if they had been induced to categorize foods by health, but not if they had been induced to categorize foods by mealtime (see Supplemental Figure 2). A simple effects analysis showed that participants in the EC/health task condition had significantly lower eating intentions for unhealthy CS foods ($M = 1.19$, $SD = 2.77$) than those in the control/ health task condition ($M = 2.50$, $SD = 1.83$), $F(1,88) = 4.25$, $MSE = 4.58$, $p = .04$, $\eta_P^2 = .046$. Also, participants in the EC/health task condition had significantly lower eating intentions ($M = 1.19$, $SD = 2.77$) for unhealthy CS foods compared to those in the EC/mealtime task condition ($M = 2.43$, $SD = 1.88$), $F(1,88) = 3.96$, $MSE = 4.58$, $p = .05$, $\eta_P^2 = .043$. All other simple effect comparisons of intentions between conditions were nonsignificant, $p > .05$.

Again, two independent raters coded participants' free responses to the questions and judged whether they seemed to be correctly aware of systematic food CS-US pairings. Participants were judged to be contingency-aware if both raters agreed that they expressed awareness of the pairings in response to the first and/or second questions ("Did you notice anything out of the ordinary in the way the words and pictures were presented during "surveillance"?" and "Did you notice anything systematic about how particular words and images appeared together?"). Only three participants met this criterion (6% of participants assigned to the EC condition). Using a less conservative cutoff of at least one coder judging a participant to be aware, a total of 5 participants met this criterion (11%). Excluding these participants resulted in the same pattern of results; the 3-way food type x task type x EC

interaction was significant, $F(1,82) = 3.85$, $MSE = 16.34$, $p = .05$, $\eta^2 = .045$. The HLM effects summarized in the text and detailed below remained unchanged in their statistical significance when these participants were excluded.

HLM was used to examine the extent to which eating intentions regarding the 34 non-CS foods related to the normative perceptions of each food's tastiness and healthiness. The two-level HLM analyses involved 3128 observations (based on 92 participants) nested in 34 foods.

HLM analyses demonstrated that in terms of main effects at level 1 (pseudo $R^2 = .11$), neither task type nor EC significantly changed eating intentions on average (both $\gamma < 0.01$, $t(3085) < 0.01$, $p > .05$. Task types did not significantly differ in the relationship between normative healthiness and eating intentions ($\gamma_{12} = -0.06$, $t(3085) = 1.31$, $p = .19$). Neither EC, task type, nor their interaction significantly affected the relationship between tastiness and eating intentions (all $p > .05$). At level 2 (pseudo $R^2 = 0.68$), participants' eating intentions were significantly predicted by tastiness ($\gamma_{01} = 0.65$, $t(31) = 10.44$, $p < .001$) and marginally predicted by healthiness ($\gamma_{02} = 0.06$, $t(31) = 1.98$, $p = .06$). However, most importantly, and as predicted, there was a significant 3-way task x EC x healthiness interaction ($\gamma_{32} = 0.44$, $t(3085) = 7.20$, $p < .001$; see Figure 1b in main text). To break down this interaction, health task and mealtime task participants were analyzed in two separate HLM equations, each with only EC as a level 1 variable (as in Experiment 1). As predicted, EC accentuated correspondence between eating intentions and healthiness, relative to the control condition, among participants who had undergone the health categorization task ($\gamma_{12} = 0.30$, $t(1493) = 7.66$, $p < .001$). No such effect of EC was apparent for in the mealtime categorization condition; in fact, EC unexpectedly reduced correspondence somewhat between intentions and healthiness compared to the control condition ($\gamma_{12} = -0.14$, $t(1561) = 3.71$, $p < .001$). Careful examination of the specific CS and DV foods

suggests that this reversal in the mealtime control condition may have stemmed from a covariation between the foods' typical mealtime and healthiness. The healthy CS included two breakfast foods, whereas the unhealthy included only dinner foods. Thus, EC may have led some participants to generalize positivity to breakfast foods and negativity to dinnertime foods. Given that many of the healthiest foods in the stimulus set were vegetables, any such tendencies that could have led to the expression of eating intentions that showed less sensitivity to health.

Also of interest was whether task, EC, and their interaction affected the extent to which participants explicitly reported health to be important in their food choices. For the FCQ health subscale, a 2 (task type) x 2 (EC) between-subjects ANOVA found no main effects of task nor EC, Fs < 0.50, $p > .05$, $\eta^2 < .010$. There was, however, a significant interaction between task type and EC, $F(1,88) = 5.69$, $MSE = .62$, $p = .02$, $\eta_G^2 = .061$. There was a nonsignificant trend of less health importance for control participants who performed the health task ($M = 2.58$, $SD = 0.86$) compared to control participants who had performed the mealtime task ($M = 2.96$, $SD = .70$), $F(1,88) = 2.63$, $MSE = 0.621$, $p = .11$, $\eta_P^2 = .029$. Participants in the EC/health condition reported marginally higher health importance, $M = 2.86$, $SD = 0.86$, compared to those in the EC/mealtime condition, $M = 2.45$, $SD = 0.72$, $F(1,88) = 3.08$, $MSE = 0.621$, $p = .08$, $\eta_P^2 = .034$.

General Discussion

Health Importance

In both Experiment 1 and Experiment 2, the extent to which health considerations were regarded as important for food choices was influenced by EC. An internal analysis focused on the within-subject correlation between eating intentions for each non-CS food and its corresponding normative healthiness ratings. This score, representing how sensitive participants were to healthiness, significantly correlated with FCQ health scores in both Experiment 1, $r(168)$

= .33, $p < .001$, and Experiment 2, $r(92) = .59$, $p < .001$. This could have occurred as a result of participants' self-perception of their preferences during the eating intentions task, through direct generalization processes from the pairings of "healthy food" with US+ and "unhealthy food" with US-, or likely a combination of both processes. Additional research will be necessary to elucidate this precise mechanism.

Contingency Awareness

In the EC literature, some contend that contingency awareness is necessary for EC effects (e.g. Pleyers, Corneille, Luminet, & Yzerbyt, 2007) and others argue that it is not (e.g. Hütter et al., 2012; Jones et al., 2010). Although the debate remains unresolved, it is clear that the role of contingency awareness varies as a function of the conditioning procedure and its underlying mechanism (Sweldens, Corneille, & Yzerbyt, 2014). While some (e.g., Pleyers et al., 2007) have criticized the funneled debriefing method used to identify contingency-aware participants in the present experiment, others have shown the measure to correspond well with recognition memory for the CS-US pairings (see Jones et al., 2009, footnote 4), which is yet another standard. Moreover, the use of a sophisticated multinomial processing model to analyze recognition memory data has yielded very clear evidence of EC effects in a simultaneous CS-US presentation paradigm in the absence of contingency awareness (Hütter, Sweldens, Stahl, Unkelbach, & Klauer, 2012; Hütter & Sweldens, 2013). Simultaneous pairing promotes implicit misattribution and is fundamental to the EC procedure employed presently. Indeed, a contingency awareness account for the results of Experiment 2 would have to argue that health task participants would have higher rates of contingency awareness than those who had completed the mealtime task. However, the few reports of contingency awareness were not more numerous in the health task condition. For EC participants, 3 out of 24 (13%) mealtime task

participants and 2 out of 21 (10%) health task participants were coded as contingency aware by at least one rater.

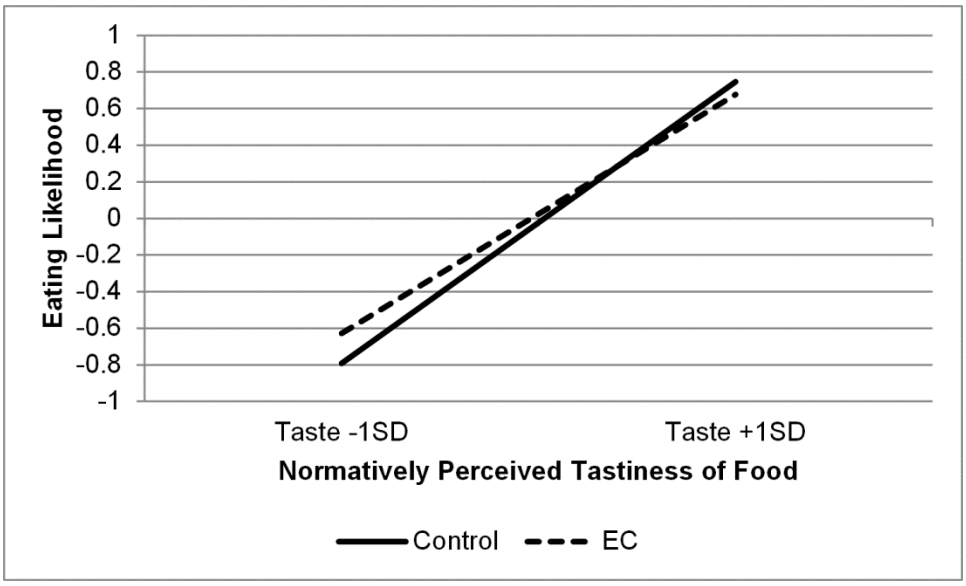
Additional References

Hütter, M., & Sweldens, S. (2013). Implicit misattribution of evaluative responses: contingency-unaware conditioning requires simultaneous stimulus presentations. *Journal of Experimental Psychology: General, 142*(3), 638-643. doi: 10.1037/a0029989

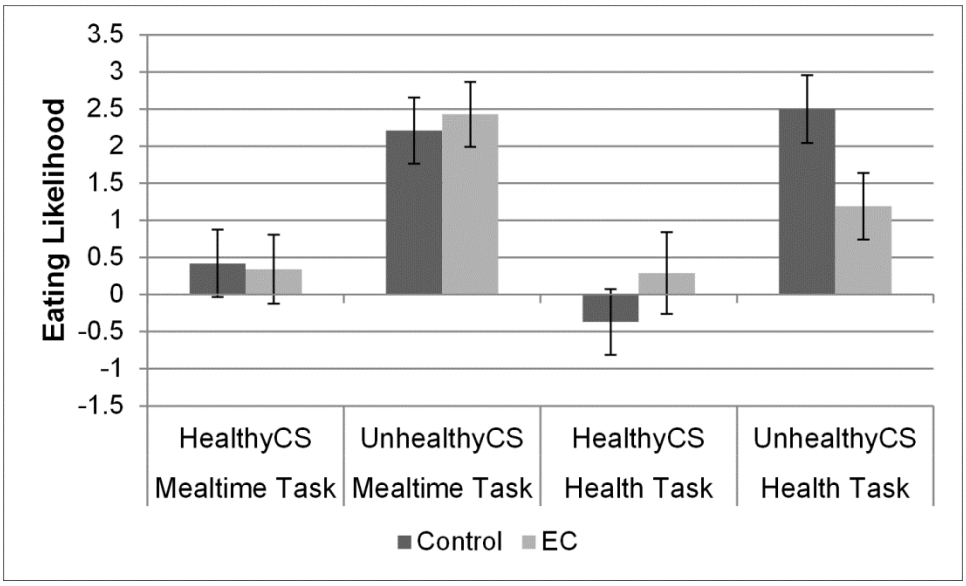
Hütter, M., Sweldens, S., Stahl, C., Unkelbach, C. & Klauer, K. C. (2012). Dissociating contingency awareness and conditioned attitudes: Evidence of contingency-unaware evaluative conditioning. *Journal of Experimental Psychology: General, 141*(3), 539-557. doi: 10.1037/a0026477

Pleyers, G., Corneille, O., Luminet, O., & Yzerbyt, V. (2007). Aware and (dis)liking: item-based-analyses reveal that valence acquisition via evaluative conditioning emergences only when there is contingency awareness. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33*(10, 130-144. doi: 10.1037/0278-7393.33.1.130

Sweldens, S. Corneille, O., & Yzerbyt, V. (2014). The role of awareness in attitude formation through evaluative conditioning. *Personality and Social Psychology Review, 18*(2), 187-209. doi: 10.1177/1088868314527832



Supplemental Figure 1. Predicted eating intentions regarding foods of varying tastiness among participants in Experiment 1, based on HLM coefficient terms. Eating likelihood scores are participant-centered.



Supplemental Figure 2. Eating intentions for CS foods in Experiment 2. Error bars indicate standard errors.

Supplemental Table 1

HLM regression coefficients for Experiment 1

Predictor	Coefficient		*t*-ratio	Significance
Main effects				
Intercept (γ_{00})	-0.02	(0.06)	-0.35	
Perceived Tastiness (γ_{01})	0.77	(0.06)	13.56	***
Perceived Healthiness (γ_{02})	0.10	(0.02)	4.65	***
Condition (γ_{10})	0.05	(0.06)	0.81	
Cross-level interactions				
Condition x Tastiness (γ_{11})	-0.12	(0.05)	-2.32	*
Condition x Healthiness (γ_{11})	0.10	(0.02)	5.28	***

Significance: * $p < 0.05$, ** $p < 0.01$, *** $p < .001$ (two-tailed test). Standard errors in parentheses.

Supplemental Table 2

HLM regression coefficients for Experiment 2

Predictor	Coefficient		*t*-ratio	Significance
Main effects				
Intercept (γ_{00})	0.00	(0.07)	0.00	
Tastiness (γ_{01})	0.65	(0.06)	10.44	***
Healthiness (γ_{02})	0.06	(0.03)	1.98	+
Task Type (γ_{10})	0.00	(0.14)	0.01	
EC (γ_{20})	0.00	(0.10)	0.00	
Task Type x EC (γ_{30})	0.00	(0.17)	-0.01	
Cross-level interactions				
Task x Tastiness (γ_{11})	0.04	(0.09)	0.46	
Task x Healthiness (γ_{12})	-0.06	(0.04)	-1.32	
EC x Tastiness (γ_{21})	-0.01	(0.05)	-0.23	
EC x Healthiness (γ_{22})	-0.14	(0.04)	-3.71	***
Task x EC x Tastiness (γ_{31})	-0.01	(0.10)	-0.13	
Task x EC x Healthiness (γ_{32})	0.44	(0.06)	7.20	***

Significance: + $p < .10$, * $p < 0.05$, ** $p < 0.01$, *** $p < .001$ (two-tailed test). Standard errors in parentheses.

Supplemental Table 3

HLM regression coefficients for Experiment 2, Health Task Participants Only

Predictor	Coefficient		*t*-ratio	Significance
Main effects				
Intercept (γ_{00})	0.00	(0.13)	0.01	
Perceived Tastiness (γ_{01})	0.69	(0.07)	9.28	***
Perceived Healthiness (γ_{02})	0.002	(0.04)	0.04	
Condition (γ_{10})	0.00	(0.12)	-0.01	
Cross-level interactions				
Condition x Tastiness (γ_{11})	-0.03	(0.08)	-0.33	
Condition x Healthiness (γ_{11})	0.30	(0.04)	7.66	***

Significance: * $p < 0.05$, ** $p < 0.01$, *** $p < .001$ (two-tailed test). Standard errors in parentheses.

Supplemental Table 4

HLM regression coefficients for Experiment 2, Mealtime Task Participants Only

Predictor	Coefficient		*t*-ratio	Significance
Main effects				
Intercept (γ_{00})	0.00	(0.07)	0.00	
Perceived Tastiness (γ_{01})	0.65	(0.06)	10.44	***
Perceived Healthiness (γ_{02})	0.06	(0.03)	1.98	+
Condition (γ_{10})	0.00	(0.10)	0.00	
Cross-level interactions				
Condition x Tastiness (γ_{11})	-0.01	(0.05)	-0.225	
Condition x Healthiness (γ_{11})	-0.14	(0.04)	-3.71	***

Significance: + $p < .10$, * $p < 0.05$, ** $p < 0.01$, *** $p < .001$ (two-tailed test). Standard errors in parentheses.

Supplemental Table 5

Eating Intention Food Items and Corresponding Normatively Rated Tastiness and Healthiness

Food	Perceived Tastiness (1-11)	Perceived Healthiness (1-11)
crackers	7.00	5.38
puffed wheat	5.19	6.68
angel food cake	8.00	3.02
grapefruit	5.95	8.80
grapes	9.00	8.92
peach	8.43	8.71
carrot	7.19	8.96
celery	5.71	8.57
zucchini	6.00	8.41
orange	8.43	8.84
spinach	5.38	9.09
cauliflower	4.71	8.45
apple	8.48	9.02
shredded wheat	5.00	7.71
Skim milk	5.90	7.79
fruit salad	8.52	8.65
salad	8.10	8.47
granola bar	7.95	6.80
cottage cheese	2.48	6.10
yogurt	7.24	7.88
cheerios	7.19	6.86
milkshake	9.29	2.49
cheeseburger	7.48	2.34
taco	8.10	3.47
French fries	8.62	1.40
chicken pot pie	7.62	4.32
pecan pie	5.62	2.76
apple pie	7.95	3.17
cheesecake	7.52	1.88
potato salad	6.10	4.79
bacon	7.05	2.37
Big Mac	6.62	1.03
potato chips	8.71	1.71
pepperoni pizza	7.76	2.51
sausage	6.81	3.46
steak	8.57	5.59
fried chicken	8.10	1.86
fudge	7.76	1.65
hotdog	7.14	2.65
burrito	8.52	2.76
nachos	8.24	2.15
donuts	7.76	1.27

Supplemental Table 6

Positive and Negative US Used in Video Surveillance

Positive US Images	Positive US Words	Negative US Images	Negative US Words
waterfall	useful	bees	inferior
sailboat	calming	contamination suit	harmful
camping	worthwhile	dirty dishes	offensive
diploma	appealing	dirty water pipe	troublesome
happy couple	commendable	junk cars	upsetting
astronaut	terrific	man with toilet	terrifying
woman & baby	valuable	smokestacks	unhealthy
mountain	beneficial	trash in sand	useless
boy & ice cream	relaxing	trash on street	undesirable
chipmunk	desirable	worms	dislikeable