

## **Supplemental Online Study**

### **Testing the Impact of Participant Awareness and Lay Theories**

#### **Sample**

Participants were 323 college students (66.6% women;  $M$  age = 20.66 years,  $SD = 2.27$ ) who received course credit as part of the Michigan State University Psychology Subject Pool during the First and Second Summer Sessions of 2014 (12 May 2014 through 14 August 2014). The majority of participants self-identified as white (71.2%). All data were collected online throughout the entire summer session period.

#### **Procedure**

We randomly assigned participants to complete the lifestyle items first ( $n = 156$ ) or the Bargh and Shalev loneliness questions first ( $n = 167$ ). Thus, the first part of the study was a close replication of Study 1a in Bargh and Shalev (2012) using an online platform. Participants also completed the 36-item Experiences in Close Relationships-Revised questionnaire (Fraley, Waller, & Brennan, 2000) with items presented in a random order to each participant. This measure was used to test whether attachment dimensions moderated connections between loneliness and showering in line with recent findings that attachment styles moderate the impact of temperature manipulations on prosocial outcomes in children (e.g., IJzerman, Karremans, Thomsen, & Schubert, 2013; see also Ferrell et al., 2014). However, no interaction model produced a significant overall  $F$  value at  $p < .05$  out of the 12 models we estimated. Given the number of analyses we conducted and the null results of Ferrell et al. (2014), we did not pursue these interactions further

After answering attachment questions, participants completed the UCLA Loneliness scale (Russell, 1996) and demographic items. We included a directed response item embedded in the demographics questionnaire that asked participants to select the “rarely” response option. We also included the “I responded to this survey honestly” item right before the question about the purpose of the study. Only those participants who passed both of these checks were included in these analyses (approximately 85% of the data collected) following procedures in Donnellan et al. (2014).

At the bottom of the demographic questions, participants were asked “What do you think was the purpose of this study?” and presented with a text box to record their answers (34 participants left this box blank). Participants were then presented with a page break and asked three closed ended question with Yes, Maybe, or No response options: “Do you think there is a connection between loneliness and a preference for water temperature?”, “Do think lonely people prefer cold temperatures for baths/showers?”, and “Do you think lonely people prefer warm temperatures for bath/showers?”. Participants were then asked a final open-ended question “Why might there be a connection between showering/bathing habits and loneliness?” and presented with a text box to record their answers (30 participants left this box blank).

### Coding of Awareness

All three authors independently coded responses to the purpose question using a simple three category system (Guessed Purpose; Unsure/Potential Awareness; No). The authors coded these responses using a file stripped of responses to the quantitative questions. No awareness was the most common code for all three raters (MBD: 93.8%, REL: 98.5%; JC: 91.0%). Agreement was formally indexed using kappa across all three pairs (MBD and REL: .389; MBD and JC:

.525; REL and JC: .220). Given that these kappas were not terribly impressive, we adopted the most inclusive approach possible by flagging any participant suspected of awareness by at least one coder (32 participants or 9.1% of the sample).

## Results

There was no evidence for a statistically detectable association between loneliness as assessed with the Bargh and Shalev measure ( $M = 2.02$ ;  $SD = .59$ ,  $\alpha = .89$ ) and the physical warmth index ( $r = -.07$ ,  $p = .234$ ,  $n = 323$ ). This was also the case evaluating the correlation for the UCL A loneliness measure ( $M = 2.06$ ;  $SD = .49$ ,  $\alpha = .93$ ;  $r = -.03$ ,  $p = .640$ ,  $n = 323$ ).

The same null results were obtained when we used all participants with relevant data (Bargh and Shalev measure:  $r = -.10$ ,  $p = .054$ ,  $n = 374$ ; UCLA measure:  $r = -.06$ ,  $p = .251$ ,  $n = 367$ ).

Separate analyses with each shower/bath item also did not support the substitutability predictions (see Supplemental Table 1). Thus, we did not replicate any of the results from Bargh and Shalev (2012) in these data. The correlation between the two loneliness measures was .71 so we created a composite loneliness measure for use in the meta-analysis.

The ordering of survey questions did not moderate the reported association between the extraction index variable for the Bargh and Shalev loneliness measure ( $p = .833$  for the interaction term). Correlations for each condition are reported in Supplemental Table 1. There was no evidence of moderation for any of the specific items (minimum  $p = .068$  for duration) and the same null results were obtained for the UCLA loneliness measure (minimum  $p = .077$  for duration) and the composite loneliness measure (minimum  $p = .052$  for duration). Critical readers may observe that the interaction for duration were close to the alpha of .05. However, an

inspection of Table 1 indicates that although the direction of effect was different for the two conditions, the correlations were not statistically significant in either condition.

### Additional Analyses

We computed correlations for the 291 participants who were not suspected of any awareness by any coder. The same null results for the overall sample were obtained for this sample as show in Supplemental Table 1. The effect size estimates were quite similar to the overall results. Thus, there were no indications that participant awareness distorted conclusions drawn from this study.

We also considered the distributions for questions about participant intuitions regarding connections between water temperature and loneliness. These are displayed in Supplemental Table 2. Approximately 12% of these participants answered “Yes” to the question about a connection between loneliness and a preference for water temperatures. Perhaps the most informative distribution occurred for responses to the question about whether lonely people prefer warm temperatures for showers/baths. This distribution was not significantly different from a distribution that would be expected if participants responded at random to this question (i.e., a data generating process whereby each category had a 1/3 chance of being endorsed; chi-square value = 3.981,  $df = 2$ ,  $p = .137$ ). This is consistent with the idea that college students are largely unaware of an explicit connection between warm water and loneliness as argued in Bargh and Shalev (2012).

A critical question was whether intuitions about the underlying research topic would impact the correlational findings. Accordingly, we examined the correlations between the

aggregate loneliness measure and the frequency, temperature, duration, and index variables separately by responses to the intuition questions. (We used the aggregate measure to reduce the number of comparisons as a way to curb Type I errors.) For example, we computed the correlation between the composite loneliness measure and the physical warmth index separately for those who indicated “yes” to the question about a connection between loneliness and a preference for water temperature ( $n = 38$ ), those who indicated “maybe” ( $n = 154$ ), and those who indicated “no” ( $n = 131$ ). Across all comparisons, there were two positive correlations that reached statistical significance. Duration and loneliness were positively correlated ( $r = .65, p = .002$ ) within the sample of 21 people who answered yes to the question about whether lonely people prefer cold temperatures. Likewise, duration and loneliness were positively correlated ( $r = .22, p = .015$ ) within the sample of 121 people who answered maybe to the question about whether lonely people prefer warm temperatures. Both of these results are consistent with the meta-analytic results albeit with exaggerated effect sizes. Accordingly, we concluded there was little reason to worry that participant intuitions were a major confound. An excel file with these correlations is available upon request.

*Supplemental Table 1: Correlations between Trait Loneliness and Bathing/Showering Items – MSU Summer Session 2014 Study*

	Frequency	Temperature	Duration	Index
<b>Overall Sample (n = 323)</b>				
Bargh and Shalev	-.034	-.054	-.023	-.066
UCLA	-.017	-.067	.041	-.026
Composite	-.028	-.066	.010	-.050
<b>Lifestyle First (n = 156)</b>				
Bargh and Shalev	-.082	-.111	.090	-.064
UCLA	.008	-.087	.151	.046
Composite	-.039	-.106	.130	-.009
<b>Bargh and Shalev Loneliness First (n = 167)</b>				
Bargh and Shalev	-.015	-.022	-.108	-.083
UCLA	-.061	-.061	-.053	-.101
Composite	-.041	-.045	-.088	-.100
<b>No Awareness (n = 291)</b>				
Bargh and Shalev	-.049	-.037	-.021	-.064
UCLA	-.039	-.040	.056	-.013
Composite	-.042	-.042	.019	-.042

Note: Bargh and Shalev refers to the loneliness measure created by Bargh and Shalev and UCLA refers to the Russell (1996) loneliness measure. \*  $p < .05$ .

*Supplemental Table 2**Intuitions about Water Temperatures and Loneliness*

	<b>Connection</b>	<b>Cold</b>	<b>Warm</b>
Yes	11.8%	6.5%	28.5%
Maybe	47.7%	31.9%	37.5%
No	40.6%	61.6%	34.1%

Note: N = 323

Connection: Do you think there is a connection between loneliness and a preference for water temperatures?

Cold: Do you think lonely people prefer cold temperatures for baths/showers?

Warm: Do you think lonely people prefer warm temperatures for baths/showers?

*Distributions of Showering/Bathing Items**How often do you usually take a bath/shower?*

<b>Value</b>	<b>Response</b>	<b>Attentive</b>	<b>All</b>
1	More than 3 times a day	0.0%	0.3%
2	3 times a day	0.3%	1.1%
3	2 times a day	9.6%	10.7%
4	Once a day	68.1%	66.6%
5	Once every other day	18.6%	17.9%
6	2-3 times a week	3.1%	3.2%
7	Once a week	0.3%	0.3%
8	Less than once a week	-	-
	Sample Size	323	374

*What temperature do you use for the water when you take a bath/shower?*

<b>Value</b>	<b>Response</b>	<b>Attentive</b>	<b>All</b>
1	Very hot	7.4%	8.3%
2	Hot	50.8%	47.3%
3	Warm	36.2%	38.8%
4	Lukewarm	5.0%	5.1%
5	Cold	0.6%	0.5%
6	Very Cold	0.0%	0.0%
	Sample Size	323	374



*About how much time do you spend in the bath/shower?*

Value	Response	Attentive	All
1	Less than 2 minutes	0.0%	0.3%
2	2-5 minutes	1.9%	1.9%
3	5-10 minutes	23.2%	23.0%
4	10-15 minutes	38.7%	39.6%
5	15-20 minutes	25.1%	23.8%
6	20-30 minutes	8.4%	8.0%
7	Over 30 minutes	2.8%	3.5%
	Sample Size	323	374