

## Chapter 10: Comparing two means

### Labcoat Leni's Real Research

#### Bladder control

##### Problem

Tuk, M. A., et al. (2011). *Psychological Science*, 22(5), 627–633.



Visceral factors that require us to engage in self-control (such as a filling bladder) can affect our inhibitory abilities in unrelated domains. In a fascinating study by Tuk, Trampe, and Warlop (2011) participants were given five cups of water: one group was asked to drink them all, whereas another was asked to take a sip from each. This manipulation led one group to have full bladders and the other group relatively empty bladders (**Drink\_Group**). Later on, these participants were given eight trials on which they had to choose between a small financial reward that they would receive soon (SS) or a large financial reward for which they would wait longer (LL). They counted how many trials participants choose the LL reward as an indicator of inhibitory control (**LL\_Sum**). Do a *t*-test to see whether people with full bladders inhibited more than those without (**Tuk et al. (2011).sav**).

##### Solution

We will conduct an independent samples *t*-test on these data because there were different participants in each of the two groups (independent design). Looking at the means in the Group Statistics table below, we can see that on average more participants in the High Urgency group ( $M = 4.5$ ) chose the large financial reward for which they would wait longer than participants in the Low Urgency group ( $M = 3.8$ ). Looking at the Independent Samples Test table, we can see that this difference was significant,  $p = .03$ .

**Group Statistics**

Drink Condition		N	Mean	Std. Deviation	Std. Error Mean
Number of LL Rewards chosen (out of 8)	High Urgency (Drink everything)	50	4.5000	1.59399	.22542
	Low Urgency (Take Sips from the Water)	52	3.8269	1.49143	.20682

**Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Number of LL Rewards chosen (out of 8)	Equal variances assumed	2.025	.158	2.203	100	.030	.67308	.30553	.06692	1.27923
	Equal variances not assumed			2.200	98.890	.030	.67308	.30593	.06604	1.28011

To calculate the effect size  $r$ , all we need is the value of  $t$  and the  $df$  from the Independent Samples Test table:

$$r = \sqrt{\frac{2.203^2}{2.203^2 + 100}} = \sqrt{\frac{4.853}{104.853}} = .215$$

If you think back to our benchmarks for effect sizes, this represents a small to medium effect (it is between .1 (small effect) and .3 (a medium effect)).

In this example the Independent Samples Test table tells us that the value of  $t$  was 2.20, that this was based on 100 degrees of freedom, and that it was significant at  $p = .03$ . We can also see the means for each group. We could write this as:

- ✓ On average, participants who had full bladders ( $M = 4.5$ ,  $SD = 1.59$ ) were more likely to choose the large financial reward for which they would wait longer than participants who had relatively empty bladders ( $M = 3.8$ ,  $SD = 1.49$ ),  $t(100) = 2.20$ ,  $p < .05$ .