

I pledge my honor I have
abided by the Stevens Honor System

Matt Sirota HW 6

(12.41) pg. 685

$\mu_1, \mu_2, \mu_3, \mu_4$ mean scores for blue, brown, gaze down, and green

a)
$$\Psi = \mu_2 - \left(\frac{\mu_1 + \mu_4}{2} \right)$$

b)
$$\Psi = \left(\frac{\mu_1 + \mu_2 + \mu_4}{3} \right) - \mu_3$$

(12.42) pg. 685

a) contrast 1: $H_0: \Psi_1 = 0$

$H_A: \Psi_1 \neq 0$

contrast 2: $H_0: \Psi_2 = 0$

$H_A: \Psi_2 \neq 0$

b)
$$C_1 = \bar{X}_2 - \left(\frac{\bar{X}_1 + \bar{X}_4}{2} \right) = 3.724 - \left(\frac{3.194 + 3.860}{2} \right) = 0.197$$

$$C_1 = 0.197$$

$$C_2 = \left(\frac{\bar{X}_1 + \bar{X}_2 + \bar{X}_4}{3} \right) - \bar{X}_3 = \frac{3.194 + 3.724 + 3.860}{3} - 3.107 = 0.486$$

$$C_2 = 0.486$$

$$S_P = \sqrt{\frac{\sum_{i=1}^{n-1} (n_i - 1) s_i^2}{\sum_{i=1}^{n-1} (n_i - 1)}}$$

$$S_P = 1.68$$

c)
$$SE_{C1} = S_P \sqrt{\sum \frac{a_i^2}{n_i}} = 1.68 \sqrt{\frac{(1)^2}{37} + \frac{(-0.5)^2}{67} + \frac{(-0.5)^2}{77}} = 0.3098$$

$$SE_{C1} = 0.3098$$

$$SE_{C2} = S_P \sqrt{\sum \frac{a_i^2}{n_i}} = 1.68 \sqrt{\frac{(\frac{1}{3})^2}{67} + \frac{(\frac{1}{3})^2}{37} + \frac{(\frac{1}{3})^2}{77} + \frac{(-1)^2}{41}} = 0.2933$$

$$SE_{C2} = 0.2933$$

$$d) \quad t = \frac{c_1}{SE_{c1}} = \frac{0.197}{0.3098} = 0.64$$

$$df_n = 4 - 1 = 3 \quad df_d = 222 - 4 = 218$$

$$p\text{-value} = 0.523$$

The p -value is greater than 0.05 so don't reject H_0
 conclusion: there is not sufficient evidence to support that
 the average of brown eyes is different from blue and green

$$t = \frac{c_2}{SE_{c2}} = \frac{0.486}{0.2933} = 1.66$$

$$df_n = 4 - 1 = 3 \quad df_d = 222 - 4 = 218$$

$$p\text{-value} = 0.0983$$

The p -value is greater than 0.05 so don't reject H_0
 conclusion: there is not sufficient evidence to support that
 the average of gaze down is different from directly
 at you.

$$e) \quad df = 222 - 1 = 221 \quad t = 1.9707 \text{ for } \alpha = 0.05 \text{ and } df = 221$$

$$c_1 \pm t(SE_{c1}) = 0.486 \pm (1.9707)(0.2933) = -0.41 \text{ and } 0.81$$

the confidence interval for ψ_1 is between -0.41 and 0.81

$$df = 222 - 1 = 221 \quad t = 1.9707$$

$$c_2 \pm t(SE_{c2}) = 0.486 \pm (1.9707)(0.2933) = -0.09 \text{ and } 1.06$$

the confidence interval for ψ_2 is between -0.09 and 1.06

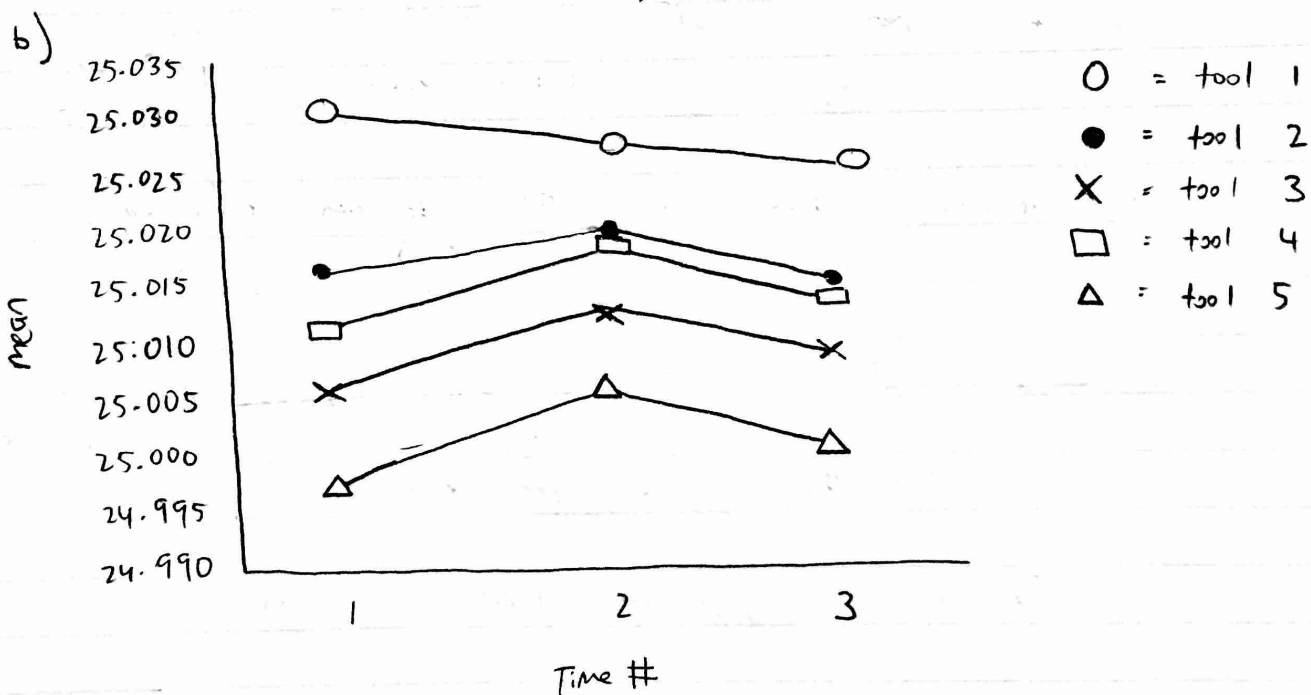
13.39

pg. 716

a)

| Tool | Time | | |
|------|------------------|--------------------|--------------------|
| | 1 | 2 | 3 |
| 1 | 25.031, 0.0015 | 25.028, 0 | 25.026, 0 |
| 2 | 25.017, 0.0015 | 25.02, 0.002 | 25.016, 0 |
| 3 | 25.0063, 0.0015 | 25.013, 0.00116 | 25.0093, 0.0011552 |
| 4 | 25.012, 0 | 25.0193, 0.0011552 | 25.0140, 0.004 |
| 5 | 24.9973, 0.00115 | 25.006, 0 | 25.0003, 0.00153 |

* listed as \bar{X} , s *



The mean is highest at time 2 with the exception of tool 1. Tool 1 had the largest means, then tool 2, 4, 3, and 5 in that order.

c)

| Source | df | S | MS | F | P |
|--------------|----|----------|-----------|--------|------------------------|
| tools | 4 | 0.0036 | 0.001 | 412.94 | 9.21×10^{-26} |
| time | 2 | 0.0019 | 0.000095 | 43.6 | 1.33×10^{-9} |
| tools x time | 8 | 0.00013 | 0.0000167 | 7.65 | 0.000155 |
| error | 30 | 0.000653 | 0.0000218 | | |
| total | 44 | 0.003986 | | | |

d) $H_{0 \text{ tools}}$: there is no difference between means for tools
reject H_0 $P \lll 0.05$

$H_{0 \text{ time}}$: there is no difference between means for times
reject H_0 $P \lll 0.05$

$H_{0 \text{ tools x time}}$: there is no difference between means for tools and times
reject H_0 $P \lll 0.05$

conclusion: there is strong evidence to suggest that there is a large difference between the mean diameters for the tools and for the times.

the TS, F is largest for tools, then time, then interaction.