Auld, H.L. and J.-G.J. Godin. Courtship behaviour influences social partner choice in male guppies

**ELECTRONIC SUPPLEMENTARY MATERIALS**

**ESM 2: R codes for linear models and their resultant outputs**

***Phase 1 (Viewing Phase)***

1. *Testing whether there is a difference in the proportion of time the focal male spent near either of the stimulus males during the Viewing Phase. These results are presented in the text and in Figure 2 (a).*
2. **Control treatment**

**> t.test(asin(viewerproptime1), mu=0.5, alternative="two.sided")**

 One-sample t-test

data: asin(viewerproptime1)

t = 2.2939, df = 17, p-value = 0.03481

alternative hypothesis: true mean is not equal to 0.5

95 percent confidence interval: 0.5137903 0.8299682

sample estimates: mean of x 0.6718792

**> shapiro.test(asin(viewerproptime1))**

 Shapiro-Wilk normality test

data: asin(viewerproptime1)

W = 0.97703, p-value = 0.9143

1. **No courtship displays treatment**

**> t.test(viewerproptime1, mu=0.5, alternative="two.sided")**

One-sample t-test

data: viewerproptime1

t = -0.21658, df = 17, p-value = 0.8311

alternative hypothesis: true mean is not equal to 0.5

95 percent confidence interval: 0.3440057 0.6269492

sample estimates: mean of x 0.4854775

**> shapiro.test(viewerproptime1)**

Shapiro-Wilk normality test

data: viewerproptime1

W = 0.96091, p-value = 0.6193

1. **Courtship displays treatment**

**> t.test(viewerproptime1, mu=0.5, alternative="two.sided")**

One-sample t-test

data: viewerproptime1

t = 0.90137, df = 14, p-value = 0.3826

alternative hypothesis: true mean is not equal to 0.5

95 percent confidence interval: 0.4296400 0.6723696

sample estimates: mean of x 0.5510048

**> shapiro.test(viewerproptime1)**

Shapiro-Wilk normality test

data: viewerproptime1

W = 0.97677, p-value = 0.9426

1. *Testing whether the proportion of time the focal male spent near the viewing male was influenced by treatment and/or any length or colour differences between the viewing and non-viewing males.*

*##Calculation of colour and length differences between stimulus males*

**>Dif\_Colour<- (viewer\_propcolour1 - nonviewer\_propcolour1)/viewer\_propcolour1**

**>Dif\_Length<- (viewer\_length1 -nonviewer\_length1)/viewer\_length1**

**>model<-lm(viewerproptime1~treatment+Dif\_Colour+Dif\_Length, data= data)**

**>anova(model)**

Analysis of Variance Table

Response: viewerproptime1

 Df Sum Sq Mean Sq F value Pr(>F)

treatment 2 0.10765 0.053827 0.8318 0.4417

Dif\_Colour 1 0.00311 0.003108 0.0480 0.8275

Dif\_Length 1 0.12225 0.122253 1.8892 0.1760

Residuals 46 2.97675 0.064712

**> shapiro.test(residuals(model))**

Shapiro-Wilk normality test

data: residuals(model)

W = 0.98383, p-value = 0.7092

1. *Testing whether the proportion of time the focal male spent near the viewing male during the Viewing Phase was correlated to the amount of time he spent near the viewing male in the Partner Choice phase.*

**> model<-lm(Propviewer~viewerproptime1, data = data)**

**> summary(model)**

Call:

lm(formula = Propviewer ~ viewerproptime1, data = data)

Residuals:

 Min 1Q Median 3Q Max

-0.5181 -0.1533 -0.0407 0.1342 0.5823

Coefficients:

Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.2658 0.0788 3.373 0.00146 \*\*

viewerproptime1 0.2731 0.1317 2.074 0.04339 \*

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.236 on 49 degrees of freedom

Multiple R-squared: 0.08068, Adjusted R-squared: 0.06192

F-statistic: 4.3 on 1 and 49 DF, p-value: 0.04339

**> shapiro.test(residuals(model))**

Shapiro-Wilk normality test

data: residuals(model)

W = 0.97752, p-value = 0.43

1. *Testing whether there is a significant difference in the time the paired stimulus males (viewer and non-viewer) spent within 5 cm of the central container, which held either a female or male depending on the treatment, during the Viewing Phase of the experiment. These results are presented in Figure S1.*
2. **Control treatment**

**> t.test(viewerNearCenter, nonviewerNearCenter, data = treatmentC, paired = TRUE)**

 Paired t-test

data: viewerNearCenter and nonviewerNearCenter

t = 7.6838, df = 16, p-value = 9.32e-07

alternative hypothesis: true difference in means is not equal to 0

95 percent confidence interval:

230.2658 405.7342

sample estimates:

mean of the differences 318

**> shapiro.test(Time)**

**> shapiro.test(differences)**

Shapiro-Wilk normality test

data: differences

W = 0.93997, p-value = 0.3178

1. **Courtship displays treatment

> t.test(viewerNearCenter, nonviewerNearCenter, paired = TRUE)**

Paired t-test

data: viewerNearCenter and nonviewerNearCenter

t = 7.2635, df = 10, p-value = 2.715e-05

alternative hypothesis: true difference in means is not equal to 0

95 percent confidence interval:

256.9404 484.3323

sample estimates:

mean of the differences 370.6364

**> differences<- viewerNearCenter-nonviewerNearCenter**

**> shapiro.test(differences)**

Shapiro-Wilk normality test

data: differences

W = 0.92302, p-value = 0.3446

1. **No courtship displays treatment**

**> t.test(viewerNearCenter, nonviewerNearCenter, paired = TRUE)**

 Paired t-test

data: viewerNearCenter and nonviewerNearCenter

t = 3.9613, df = 13, p-value = 0.001627

alternative hypothesis: true difference in means is not equal to 0

95 percent confidence interval:

90.8935 308.9636

sample estimates:

mean of the differences 199.9286

**> differences<- viewerNearCenter-nonviewerNearCenter**

**> shapiro.test(differences)**

Shapiro-Wilk normality test

data: differences

W = 0.90702, p-value = 0.1426

***Phase 2 (Social Partner-Choice phase)***

1. *(a) Testing whether treatment affected the proportion of time the focal male spent with the Viewing male.*

**> model<-lm(PropViewer~treatment+Dif\_Colour+Dif\_Length, data =data)**

**> anova(model)**

Analysis of Variance Table

Response: PropViewer

 Df Sum Sq Mean Sq F value Pr(>F)

treatment 2 0.70430 0.35215 7.6288 0.001376 \*\*

Dif\_Colour 1 0.12241 0.12241 2.6519 0.110259

Dif\_Length 1 0.01770 0.01770 0.3835 0.538793

Residuals 46 2.12337 0.04616

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

**> shapiro.test(residuals(model))**

Shapiro-Wilk normality test

data: residuals(model)

W = 0.98429, p-value = 0.7298

*(b) Calculation of effect size*

**> etaSquared( model, type = 2, anova = FALSE )**

 eta.sq eta.sq.part

treatment 0.173489751 0.195159552

Dif\_Colour 0.040371755 0.053412696

Dif\_Length 0.005964829 0.008267963

1. *Testing whether the number of courtship displays performed by the viewing male in the courtship treatment is correlated with the amount of time the focal male spent with the viewing male in the Social Partner-Choice phase.*

**> model<-lm(asin(PropViewer)~CourtshipDisplays)**

**> summary(model)**

Call:

lm(formula = asin(PropViewer) ~ CourtshipDisplays)

Residuals:

 Min 1Q Median 3Q Max

-0.52791 -0.21769 0.00404 0.23202 0.57094

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.542954 0.114709 4.733 0.000391 \*\*\*

CourtshipDisplays 0.014194 0.006676 2.126 0.053211 .

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.3441 on 13 degrees of freedom

Multiple R-squared: 0.258, Adjusted R-squared: 0.201

F-statistic: 4.521 on 1 and 13 DF, p-value: 0.05321

**> shapiro.test(residuals(model))**

Shapiro-Wilk normality test

data: residuals(model)

W = 0.97091, p-value = 0.8712

1. *Testing whether there is a difference in the proportion of time the focal male spent near either of the stimulus males in the Social Partner-Choice phase. These results are presented in the text and in Figure 2 (b).*
2. **Control treatment**

**> t.test(asin(PropViewer), mu=0.5, alternative="two.sided")**

One-sample t-test

data: asin(PropViewer)

t = -2.6709, df = 17, p-value = 0.01612

alternative hypothesis: true mean is not equal to 0.5

95 percent confidence interval: 0.2394475 0.4694202

sample estimates: mean of x 0.3544338

**> shapiro.test(asin(PropViewer))**

Shapiro-Wilk normality test

data: asin(PropViewer)

W = 0.96183, p-value = 0.6373

1. **No courtship displays treatment**

**> t.test(PropViewer, mu=0.5, alternative="two.sided")**

One-sample t-test

data: PropViewer

t = -4.0714, df = 17, p-value = 0.0007943

alternative hypothesis: true mean is not equal to 0.5

95 percent confidence interval: 0.2542443 0.4220092

sample estimates: mean of x 0.3381268

**> shapiro.test(PropViewer)**

Shapiro-Wilk normality test

data: PropViewer

W = 0.92223, p-value = 0.1416

**(c) Courtship displays treatment**

**> t.test(asin(PropViewer), mu=0.5, alternative="two.sided")**

One Sample t-test

data: asin(PropViewer)

t = 1.9837, df = 14, p-value = 0.06725

alternative hypothesis: true mean is not equal to 0.5

95 percent confidence interval: 0.4839894 0.9104006

sample estimates: mean of x 0.697195

**> shapiro.test(asin(PropViewer))**

Shapiro-Wilk normality test

data: asin(PropViewer)

W = 0.94308, p-value = 0.4227

1. *Testing whether the social association time of the focal male was correlated with differences in size and colour between the paired stimulus males.*

**> model<-lm(PropViewer~Dif\_Colour+Dif\_Length)**

**> summary(model)**

Call:

lm(formula = PropViewer ~ Dif\_Colour + Dif\_Length)

Residuals:

 Min 1Q Median 3Q Max

-0.44031 -0.16408 -0.01455 0.08788 0.58612

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.425956 0.033073 12.879 <2e-16 \*\*\*

Dif\_Colour 0.120371 0.052056 2.312 0.0251 \*

Dif\_Length 0.001301 0.001191 1.093 0.2800

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2337 on 48 degrees of freedom

Multiple R-squared: 0.1164, Adjusted R-squared: 0.07961

F-statistic: 3.162 on 2 and 48 DF, p-value: 0.05127

**> shapiro.test(residuals(model))**

Shapiro-Wilk normality test

data: residuals(model)

W = 0.97417, p-value = 0.327

1. *Testing whether the social association time of the focal male was correlated with the stimulus male that was most similar to him in body length.*

**> FLengthDif<-(focal\_length1-Viewer\_length1)/focal\_propcolour1**

**> FLengthDif2<-(focal\_length1-nonViewer\_length1)/focal\_propcolour1**

**> model<-lm(PropViewer~FLengthDif+FLengthDif2, data = data)**

**> summary(model)**

Call:

lm(formula = PropViewer ~ FLengthDif + FLengthDif2, data = data)

Residuals:

Min 1Q Median 3Q Max

-0.40006 -0.15804 -0.02522 0.11060 0.58076

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 4.147e-01 3.477e-02 11.927 5.83e-16 \*\*\*

FLengthDif -5.898e-04 1.449e-03 -0.407 0.686

FLengthDif2 4.914e-05 1.312e-03 0.037 0.970

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2477 on 48 degrees of freedom

Multiple R-squared: 0.007282, Adjusted R-squared: -0.03408

F-statistic: 0.176 on 2 and 48 DF, p-value: 0.8391

**> shapiro.test(residuals(model))**

Shapiro-Wilk normality test

data: residuals(model)

W = 0.95576, p-value = 0.05506

1. *Testing whether the social association time of the focal male was correlated with the stimulus male that was most similar to him in proportion of body covered in orange or black colour.*

**> FColourDif<-(focal\_propcolour1-Viewer\_propcolour1)/focal\_propcolour1**

**> FColourDif2<-(focal\_propcolour1-nonViewer\_propcolour1)/ focal\_propcolour1**

**> model<-lm(PropViewer~FColourDif+FColourDif2, data = data)**

**> summary(model)**

Call:

lm(formula = PropViewer ~ FColourDif + FColourDif2, data = data)

Residuals:

Min 1Q Median 3Q Max

-0.43185 -0.17100 -0.02826 0.11359 0.59125

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.40870 0.03793 10.776 2.07e-14 \*\*\*

FColourDif -0.05632 0.04238 -1.329 0.190

FColourDif2 0.05465 0.03824 1.429 0.159

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.2425 on 48 degrees of freedom

Multiple R-squared: 0.04918, Adjusted R-squared: 0.009558

F-statistic: 1.241 on 2 and 48 DF, p-value: 0.2981

**> shapiro.test(residuals(model))**

Shapiro-Wilk normality test

data: residuals(model)

W = 0.96742, p-value = 0.1725