

Additional file 3

Family: c("JSU", "Johnson SU")

Call: gamlss(formula = HRmean ~ cs(activity) + cs(hour) +
season + cs(temp_mean) + weekend + re(random = ~1 |
subject), family = JSU, data = hourly_data,
control = gamlss.control(n.cyc = 200),
trace = FALSE)

Fitting method: RS()

Mu link function: identity

Mu Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	74.643476	0.199002	375.09	<2e-16 ***
cs(activity)	1.003752	0.002040	491.98	<2e-16 ***
cs(hour)	0.359572	0.005497	65.41	<2e-16 ***
seasonautumn	-1.944277	0.097519	-19.94	<2e-16 ***
seasonwinter	-3.369872	0.104034	-32.39	<2e-16 ***
seasonspring	-3.346314	0.106456	-31.43	<2e-16 ***
cs(temp_mean)	-0.155103	0.008470	-18.31	<2e-16 ***
weekendWorkday	-1.485244	0.078806	-18.85	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Sigma link function: log

Sigma Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.555272	0.002555	1000	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Nu link function: identity

Nu Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.98493	0.08604	23.07	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Tau link function: log

Tau Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.10263	0.01985	55.54	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

NOTE: Additive smoothing terms exist in the formulas:
i) Std. Error for smoothers are for the linear effect only.
ii) Std. Error for the linear terms maybe are not accurate.

No. of observations in the fit: 114992
Degrees of Freedom for the fit: 33.99345
Residual Deg. of Freedom: 114958
at cycle: 61

Global Deviance: 907408.3
AIC: 907476.3
SBC: 907804.4

Table 1. Full output of the generalized additive model for location, scale and shape (GAMLSS) fitted to hourly mean heart rate (HRmean). The model was estimated using the Johnson SU (JSU) distribution with identity link for the location parameter (μ). Smooth terms were modeled using cubic splines for activity, hour of day, and mean temperature. Random intercepts were included for subject. Coefficients are presented with their standard errors, t-values, and associated p-values.

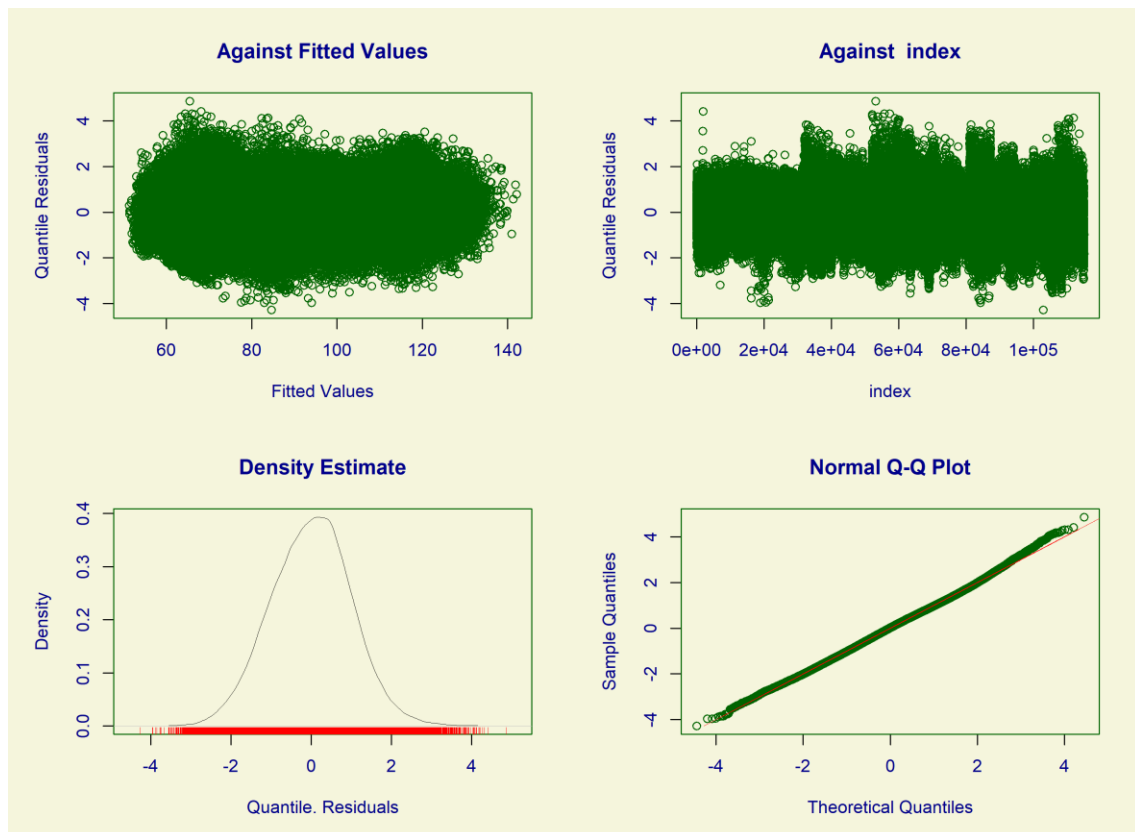


Figure 1. Diagnostic plots for the fitted GAMLSS model, showing (top) quantile residuals versus fitted values and index, and (bottom) the density estimate of residuals and the normal Q–Q plot. Together, these plots assess assumptions of homoscedasticity, independence, and normality of residuals.

Family: c("JSU", "Johnson SU")

Call: `gamlss(formula = HRmean ~ cs(activity) * sex + cs(hour) * sex + season * sex + cs(temp_mean) * sex + weekend * sex + re(random = ~1 | subject), family = JSU, data = nex, control = gamlss.control(n.cyc = 200), trace = FALSE)`

Fitting method: RS()

Mu link function: identity

Mu Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	69.10549	0.410749	168.242	< 2e-16 ***
cs(activity)	1.170150	0.003685	317.537	< 2e-16 ***
sexFemale	10.18788	0.556687	18.301	< 2e-16 ***
cs(hour)	0.373454	0.010825	34.500	< 2e-16 ***
seasonautumn	-1.054020	0.187298	-5.627	1.84e-08 ***
seasonwinter	-3.491693	0.202547	-17.239	< 2e-16 ***
seasonspring	-5.074358	0.205384	-24.707	< 2e-16 ***
cs(temp_mean)	-0.100768	0.018397	-5.477	4.33e-08 ***
weekendWorkday	-2.528652	0.153523	-16.471	< 2e-16 ***
cs(activity):sexFemale	-0.340029	0.005125	-66.348	< 2e-16 ***
sexFemale:cs(hour)	0.013113	0.014692	0.892	0.372138
sexFemale:seasonautumn	-2.746639	0.254946	-10.773	< 2e-16 ***
sexFemale:seasonwinter	-1.002022	0.274072	-3.656	0.000256 ***
sexFemale:seasonspring	-0.898784	0.276209	-3.254	0.001138 **
sexFemale:cs(temp_mean)	-0.039732	0.024712	-1.608	0.107883
sexFemale:weekendWorkday	0.518625	0.208077	2.492	0.012688 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Sigma link function: log

Sigma Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.608710	0.003203	814.6	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Nu link function: identity

Nu Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	2.2657	0.1262	17.95	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Tau link function: log

Tau Coefficients:

	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	1.12974	0.02521	44.82	<2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

NOTE: Additive smoothing terms exist in the formulas:

- i) Std. Error for smoothers are for the linear effect only.
 - ii) Std. Error for the linear terms maybe are not accurate.
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No. of observations in the fit: 73869

Degrees of Freedom for the fit: 36.99301

Residual Deg. of Freedom: 73832.01
at cycle: 64

Global Deviance: 590426.7

AIC: 590500.7

SBC: 590841.4

Table 2. Output of the generalized additive model for location, scale and shape (GAMLSS) fitted to hourly mean heart rate (HRmean) for jaguars at NEX. The model was estimated using the Johnson SU (JSU) distribution with identity link for the location parameter (μ). Smooth terms were modeled using cubic splines for activity, hour of day, and mean temperature. Random intercepts were included for subject. Coefficients are presented with their standard errors, t-values, and associated p-values.

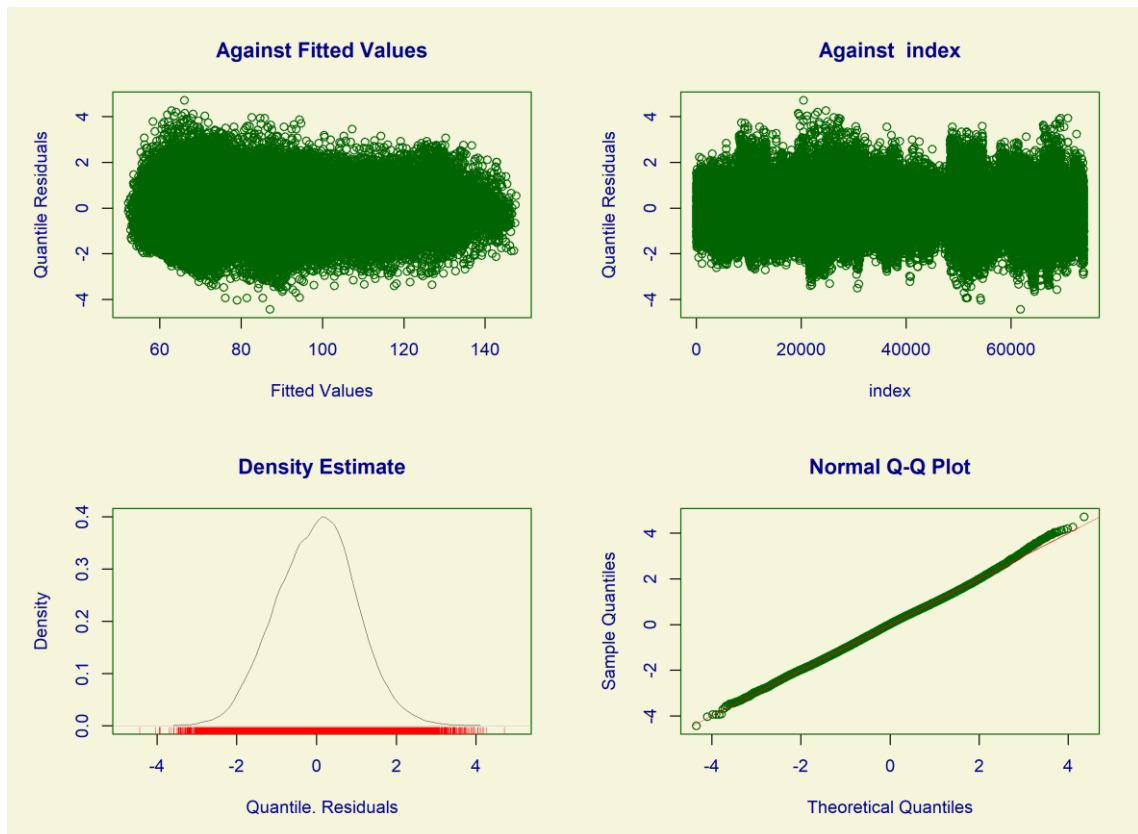


Figure 2. Diagnostic plots for the fitted GAMLSS model for NEX, showing (top) quantile residuals versus fitted values and index, and (bottom) the density estimate of residuals and the normal Q–Q plot. Together, these plots assess assumptions of homoscedasticity, independence, and normality of residuals