Supplementary Table 1. Statistical analyses of Figures 1–4.

Figure	Statistical test	Pairwise comparison	Test statistic	*P*
1a, left	Two-way repeated-measures ANOVA			
	Time		$F_{23,2806} = 106.7$	<0.0001
	Genotype		$F_{3,122} = 19.49$	<0.0001
	Time × Genotype		$F_{69,2806} = 10.45$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > Hk (Hk^1/Hk^1)* vs. *Hk (Hk^1/Hk^1)*	$q_{122} = 7.826$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > Hk (Hk^1/Hk^1)* vs. *R23E10 (Hk^1/Hk^1)*	$q_{122} = 7.078$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > Hk (Hk^1/Hk^1)* vs. +/+	$q_{122} = 0.2777$	0.8599
1a, right	Two-way repeated-measures ANOVA			
	Time		$F_{23,282} = 134.9$	<0.0001
	Genotype		$F_{3,123} = 12.76$	<0.0001
	Time × Genotype		$F_{69,2829} = 11.78$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > Hk^{K289M} (Hk^1/Hk^1)* vs. *Hk^{K289M} (Hk^1/Hk^1)*	$q_{123} = 0.02229$	0.9875
	Holm-Šídák's post-hoc test	*R23E10 > Hk^{K289M} (Hk^1/Hk^1)* vs. *R23E10 (Hk^1/Hk^1)*	$q_{123} = 0.5163$	0.9741
	Holm-Šídák's post-hoc test	*R23E10 > Hk^{K289M} (Hk^1/Hk^1)* vs. +/+	$q_{123} = 7.299$	<0.0001
1b	One-way ANOVA			
	Genotype		$F_{7,245} = 15.81$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > Hk (Hk^1/Hk^1)* vs. *Hk (Hk^1/Hk^1)*	$t_{245} = 5.483$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > Hk (Hk^1/Hk^1)* vs. *R23E10 (Hk^1/Hk^1)*	$t_{245} = 4.956$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > Hk (Hk^1/Hk^1)* vs. +/+	$t_{245} = 0.1944$	0.9763
	Holm-Šídák's post-hoc test	*R23E10 > Hk^{K289M} (Hk^1/Hk^1)* vs. *Hk^{K289M} (Hk^1/Hk^1)*	$t_{245} = 0.01720$	0.9863
	Holm-Šídák's post-hoc test	*R23E10 > Hk^{K289M} (Hk^1/Hk^1)* vs. *R23E10 (Hk^1/Hk^1)*	$t_{245} = 0.3984$	0.9704
	Holm-Šídák's post-hoc test	*R23E10 > Hk^{K289M} (Hk^1/Hk^1)* vs. +/+	$t_{245} = 5.633$	<0.0001
1d	Mann-Whitney test	dFB somata: SD day vs. rested flies	U = 232	0.6447
	Kruskal-Wallis ANOVA			
	SD		$H_2 = 22.28$	<0.0001
	Dunn's post-hoc test	dFB somata: SD night vs. rested flies		0.0026
	Dunn's post-hoc test	dFB somata: SD day + night vs. rested flies		<0.0001
		dFB dendrites: SD day vs. rested flies	U = 221	0.6416
	Mann-Whitney test			
	Kruskal-Wallis ANOVA			
	SD		$H_2 = 28.85$	<0.0001
	Dunn's post-hoc test	dFB dendrites: SD night vs. rested flies		0.0029
	Dunn's post-hoc test	dFB dendrites: SD day + night vs. rested flies		<0.0001
		KC dendrites: SD day + night vs. rested flies	$t_{36} = 1.538$	0.1328
	Unpaired t-test			
2b	One-way ANOVA			
	Genotype		$F_{2,91} = 7.951$	0.0007
	Holm-Šídák's post-hoc test	*R23E10 > MitoTimer* vs. *R23E10*	$t_{91} = 2.768$	0.0004
	Holm-Šídák's post-hoc test	*R23E10 > MitoTimer* vs. *MitoTimer*	$t_{91} = 3.875$	0.0068
2c	One-way ANOVA			
	Genotype		$F_{2,91} = 66.92$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > AOX* vs. *R23E10*	$t_{91} = 11.16$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > AOX* vs. *AOX*	$t_{91} = 8.249$	<0.0001
2d	One-way ANOVA			
	Genotype		$F_{13,420} = 18.17$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > SOD1* vs. *R23E10*	$t_{420} = 2.730$	0.0390
	Holm-Šídák's post-hoc test	*R23E10 > SOD1* vs. *SOD1*	$t_{420} = 3.131$	0.0130
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$* vs. *R23E10*	$t_{420} = 4.435$	0.0002
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$* vs. *$SOD1^{A4V}$*	$t_{420} = 4.014$	0.0008
	Holm-Šídák's post-hoc test	*R23E10 > Hk^{RNAi}* vs. *R23E10*	$t_{420} = 6.083$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > Hk^{RNAi}* vs. *Hk^{RNAi}*	$t_{420} = 5.894$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$, Hk^{RNAi}* vs. *R23E10 > $SOD1^{A4V}$*	$t_{420} = 9.342$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$, Hk^{RNAi}* vs. *Hk^{RNAi}*	$t_{420} = 4.622$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$, Hk^{RNAi}* vs. *R23E10 > Hk^{RNAi}*	$t_{420} = 1.176$	0.2401
	Holm-Šídák's post-hoc test	*R23E10 > Sh^{RNAi}* vs. *R23E10*	$t_{420} = 4.978$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > Sh^{RNAi}* vs. *Sh^{RNAi}*	$t_{420} = 5.292$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$, Sh^{RNAi}* vs. *R23E10 > $SOD1^{A4V}$*	$t_{420} = 7.922$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$, Sh^{RNAi}* vs. *Sh^{RNAi}*	$t_{420} = 3.644$	0.0027
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$, Sh^{RNAi}* vs. *R23E10 > Sh^{RNAi}*	$t_{420} = 1.647$	0.2003
	Holm-Šídák's post-hoc test	*R23E10 > $Shal^{RNAi}$* vs. *R23E10*	$t_{420} = 3.858$	0.0015
	Holm-Šídák's post-hoc test	*R23E10 > $Shal^{RNAi}$* vs. *$Shal^{RNAi}$*	$t_{420} = 1.862$	0.2003
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$, $Shal^{RNAi}$* vs. *R23E10 > $SOD1^{A4V}$*	$t_{420} = 2.355$	0.0914
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$, $Shal^{RNAi}$* vs. *$Shal^{RNAi}$*	$t_{420} = 3.746$	0.0020
	Holm-Šídák's post-hoc test	*R23E10 > $SOD1^{A4V}$, $Shal^{RNAi}$* vs. *R23E10 > $Shal^{RNAi}$*	$t_{420} = 5.710$	<0.0001
2e	One-way ANOVA			
	Genotype		$F_{2,88} = 20.98$	<0.0001
	Holm-Šídák's post-hoc test	*R23E10* vs. *R23E10 > Catalase*	$t_{88} = 6.175$	<0.0001
	Holm-Šídák's post-hoc test	*Catalase* vs. *R23E10 > Catalase*	$t_{88} = 4.802$	<0.0001

3b	χ^2 test			
	Fraction asleep		$\chi^2_4 = 38.31$	<0.0001
	Fisher's exact test	*R23E10 > miniSOG* vs. *R23E10*		<0.0001
	Fisher's exact test	*R23E10 > miniSOG* vs. *miniSOG*		<0.0001
	Fisher's exact test	*R23E10 > miniSOG* vs. *R23E10 > miniSOG, Hk^{RNAi}*		0.0030
	Fisher's exact test	*R23E10 > miniSOG* vs. *R23E10 > miniSOG, Shal^{RNAi}*		0.3622
3c	Kruskal-Wallis ANOVA			
	Genotype		$H_4 = 44.11$	<0.0001
	Dunn's post-hoc test	*R23E10 > miniSOG* vs. *R23E10*		<0.0001
	Dunn's post-hoc test	*R23E10 > miniSOG* vs. *miniSOG*		<0.0001
	Dunn's post-hoc test	*R23E10 > miniSOG* vs., *R23E10 > miniSOG Hk^{RNAi}*		0.0019
	Dunn's post-hoc test	*R23E10 > miniSOG* vs. *R23E10 > miniSOG, Shal^{RNAi}*		>0.9999
3d	Two-way repeated-measures ANOVA			
	Time		$F_{7,462} = 194.3$	<0.0001
	Genotype		$F_{2,66} = 4.206$	0.0191
	Time × Genotype		$F_{14,462} = 7.480$	<0.0001
	Holm-Šídák's post-hoc test	ZT 10: *R23E10 > miniSOG* vs. *R23E10*	$t_{528} = 5.054$	<0.0001
	Holm-Šídák's post-hoc test	ZT 10: *R23E10 > miniSOG* vs. *miniSOG*	$t_{528} = 5.333$	<0.0001
	Holm-Šídák's post-hoc test	ZT 10.5: *R23E10 > miniSOG* vs. *R23E10*	$t_{528} = 4.752$	<0.0001
	Holm-Šídák's post-hoc test	ZT 10.5: *R23E10 > miniSOG* vs. *miniSOG*	$t_{528} = 5.152$	<0.0001
4b	Paired *t*-test	R_m	$t_{10} = 5.962$	0.0001
	Paired *t*-test	τ_m	$t_{10} = 3.696$	0.0041
4c	Two-way repeated-measures ANOVA			
	Current		$F_{24,480} = 25.87$	<0.0001
	Illumination		$F_{1,20} = 2.993$	0.0990
	Current × Illumination		$F_{24,480} = 2.147$	0.0014
	Kolmogorov-Smirnov test		D = 0.4101	<0.0001
4e	Paired *t*-test	I_A	$t_{13} = 0.3533$	0.7295
	Wilcoxon signed-rank test	τ_{fast}	W = 71	0.0245
	Wilcoxon signed-rank test	τ_{slow}	W = 24	0.3804
4g	Unpaired *t*-test	R_m	$t_{19} = 2.127$	0.0467
	Unpaired *t*-test	τ_m	$t_{19} = 0.6939$	0.4962
4h	Two-way repeated-measures ANOVA			
	Current		$F_{24,456} = 25.70$	<0.0001
	Genotype		$F_{1,19} = 6.193$	0.0223
	Current × Genotype		$F_{24,456} = 3.482$	<0.0001
	Kolmogorov-Smirnov test		D = 0.3918	<0.0001
4j	Unpaired *t*-test	I_A	$t_{25} = 0.02189$	0.9827
	Unpaired *t*-test	τ_{fast}	$t_{25} = 2.993$	0.0061
	Mann-Whitney test	τ_{slow}	U = 58	0.1257
4l	Mann-Whitney test	R_m	U = 22	0.0023
	Mann-Whitney test	τ_m	U = 32.50	0.0166
4m	Two-way repeated-measures ANOVA			
	Current		$F_{24,552} = 55.27$	<0.0001
	Genotype		$F_{1,23} = 16.60$	0.0005
	Current × Genotype		$F_{24,552} = 15.15$	<0.0001
	Kolmogorov-Smirnov test		D = 0.3208	<0.0001
4o	Unpaired *t*-test	I_A	$t_{16} = 0.7079$	0.4892
	Unpaired *t*-test, Welch-corrected	τ_{fast}	$t_{10.56} = 3.903$	0.0027
	Mann-Whitney test	τ_{slow}	U = 29	0.3401

Supplementary Table 2. Statistical analyses of Extended Data Figures 1–4.

Extended Data Figure	Statistical test	Pairwise comparison-	Test statistic	*P*
1a	Kruskal-Wallis ANOVA Genotype Dunn's post-hoc test Dunn's post-hoc test Dunn's post-hoc test Dunn's post-hoc test	 *R23E10 > SOD1* vs. *R23E10* *R23E10 >SOD1* vs. *SOD1* *R23E10 > SOD1^{A4V}* vs. *R23E10* *R23E10 > SOD1^{A4V}* vs. *SOD1^{A4V}*	 H_4 = 35.39	 <0.0001 0.2612 0.0003 0.0069 >0.9999
1b, left	Two-way ANOVA Vibrational Force Genotype Vibrational Force × Genotype		 $F_{3,60}$ = 46.37 $F_{2,60}$ = 0.6036 $F_{6,60}$ = 0.1624	 <0.0001 0.5501 0.9857
1b, right	Two-way ANOVA Vibrational Force Genotype Vibrational Force × Genotype		 $F_{3,60}$ = 33.13 $F_{2,60}$ = 1.424 $F_{6,60}$ = 0.08031	 <0.0001 0.2487 0.9979
1c	Two-way repeated-measures ANOVA Illumination Genotype Illumination × Genotype		 $F_{1,131}$ = 0.06064 $F_{4,131}$ = 2.114 $F_{4,131}$ = 1.213	 0.8059 0.0827 0.3086
2a	Kruskal-Wallis ANOVA Genotype Dunn's post-hoc test Dunn's post-hoc test Dunn's post-hoc test Dunn's post-hoc test	 *cry > SOD1* vs. *cry* *cry > SOD1* vs. *SOD1* *cry > SOD1^{A4V}* vs. *cry* *cry > SOD1^{A4V}* vs. *SOD1^{A4V}*	 H_4 = 27.67	 <0.0001 0.2600 0.8411 0.1426 >0.9999
2b	Kruskal-Wallis ANOVA Genotype Dunn's post-hoc test Dunn's post-hoc test Dunn's post-hoc test Dunn's post-hoc test	 *pdf > SOD1* vs. *pdf* *pdf > SOD1* vs. *SOD1* *pdf > SOD1^{A4V}* vs. *pdf* *pdf > SOD1^{A4V}* vs. *SOD1^{A4V}*	 H_4 = 17.02	 0.0019 >0.9999 0.0069 >0.9999 0.1732
2c	One-way ANOVA Genotype Holm-Šídák's post-hoc test Holm-Šídák's post-hoc test Holm-Šídák's post-hoc test Holm-Šídák's post-hoc test	 *OK107 > SOD1* vs. *OK107* *OK107 > SOD1* vs. *SOD1* *OK107 > SOD1^{A4V}* vs. *OK107* *OK107 > SOD1^{A4V}* vs. SOD1^{A4V}	 $F_{4,145}$ = 3.957 t_{145} = 1.194 t_{145} = 2.425 t_{145} = 2.451 t_{145} = 1.084	 0.0045 0.4139 0.0603 0.0603 0.4139
2d	Kruskal-Wallis ANOVA Genotype Dunn's post-hoc test Dunn's post-hoc test Dunn's post-hoc test Dunn's post-hoc test	 *GH146 > SOD1* vs. *GH146* *GH146> SOD1* vs. *SOD1* *GH146> SOD1^{A4V}* vs. *GH146* *GH146> SOD1^{A4V}* vs. *SOD1^{A4V}*	 H_4 = 6.535	 <0.0001 0.0452 0.6901 >0.9999 >0.9999
3	One-way ANOVA Genotype Holm-Šídák's post-hoc test Holm-Šídák's post-hoc test Holm-Šídák's post-hoc test Holm-Šídák's post-hoc test	 *R23E10 > 7238GD* vs. *R23E10* *R23E10 > 7238GD* vs. *7238GD* *R23E10 > 105172KK* vs. *R23E10* *R23E10 > 105172KK* vs. *105172KK*	 $F_{4,146}$ = 5.475 t_{146} = 2.012 t_{146} = 0.9673 t_{146} = 3.484 t_{146} = 0.7701	 0.0004 0.1718 0.9673 0.0026 0.9034
4b	Paired *t*-test Paired *t*-test	R_m τ_m	t_8 = 3.366 t_8 = 2.069	0.0098 0.0723
4c	Two-way repeated-measures ANOVA Current Illumination Current × Illumination Kolmogorov-Smirnov test		 $F_{24,384}$ = 18.05 $F_{1,16}$ = 0.3604 $F_{24,384}$ = 0.3568 D = 0.09243	 <0.0001 0.5567 0.9982 0.0947
4e	Wilcoxon signed-rank test Wilcoxon signed-rank test Wilcoxon signed-rank test	I_A τ_{fast} τ_{slow}	W = 18 W = 71 W = -35	0.8040 0.6387 0.2958