TABLE 1: Studies Examining the Efficacy of Naps as a Fatigue Countermeasure

Study/Measure	Statistic (*df*)	*N*	DOE	Effect Size	Nap Duration	Postnap Interval	Time of Day
Badia & Harsh (1985)							
Logical (P)	t(9) = 0.54	10	–	−0.179	1.0	1.00	09:00
Probe (P)	t(9) = 1.10	10	–	−0.359	1.0	1.00	09:00
Matrix2 (P)	t(9) = 1.06	10	–	−0.346	1.0	1.00	09:00
Add/Sub (P)	t(9) = 0.04	10	+	+0.013	1.0	1.00	09:00
Wilkinson (P)	t(9) = 1.77	10	–	−0.560	1.0	1.00	09:00
Mast6 (P)	t(9) = 1.54	10	+	+0.493	1.0	1.00	09:00
Logical (P)	t(9) = 0.05	10	–	−0.017	2.0	1.00	10:00
Probe (P)	t(9) = 1.27	10	+	+0.412	2.0	1.00	10:00
Matrix2 (P)	t(9) = 0.17	10	–	−0.057	2.0	1.00	10:00
Add/Sub (P)	t(9) = 0.14	10	+	+0.047	2.0	1.00	10:00
Wilkinson (P)	t(9) = 1.50	10	–	−0.481	2.0	1.00	10:00
Mast6 (P)	t(9) = 1.54	10	+	+0.493	2.0	1.00	10:00
Logical (P)	t(9) = 3.95	10	+	+1.089	4.0	1.00	12:00
Probe (P)	t(9) = 2.52	10	+	+0.764	4.0	1.00	12:00
Matrix2 (P)	t(9) = 1.06	10	–	−0.346	4.0	1.00	12:00
Add/Sub (P)	t(9) = 1.35	10	+	+0.436	4.0	1.00	12:00
Wilkinson (P)	t(9) = 4.49	10	+	+1.193	4.0	1.00	12:00
Mast6 (P)	t(9) = 0.84	10	–	−0.276	4.0	1.00	12:00
Bonnet & Arand (1995)							
AddCorr (P)	t(99) = 0.576	12	+	+0.058	4.0	3.00	23:00
AddCorr (P)	t(99) = 0.485	12	–	−0.049	4.0	13.00	05:00
AddCorr (P)	t(99) = 1.742	12	–	−0.174	4.0	15.00	11:00
AddCorr (P)	t(99) = 2.605	12	–	−0.259	4.0	21.00	17:00
AddCorr (P)	t(99) = 1.116	12	+	+0.117	1.0	0.00	23:00
DSS (P)	t(238) = 3.274	12	+	+0.211	4.0	0.50	20:30
DSS (P)	t(238) = 2.391	12	+	+0.154	4.0	3.00	23:00
DSS (P)	t(238) = 1.594	12	+	+0.103	4.0	7.00	03:00
DSS (P)	t(238) = 2.154	12	+	+0.259	4.0	9.00	05:00
DSS (P)	t(238) = 0.517	12	+	+0.034	4.0	13.00	09:00
DSS (P)	t(238) = 0.000	12	+	+0.000	4.0	14.50	10:30
DSS (P)	t(238) = 0.280	12	–	−0.018	4.0	18.50	14:30
DSS (P)	t(238) = 0.043	12	–	−0.003	4.0	20.50	16:30
DSS (P)	t(238) = 0.323	12	–	−0.021	4.0	24.50	20:30
DSS (P)	t(238) = 0.862	12	+	+0.056	1.0	0.00	23:00
Bonnet et al. (1995)							
Vigilance (P)	t(699) = 0.817	60	+	+0.031	2.62	3.50	23:30
Vigilance (P)	t(699) = 0.245	60	–	−0.009	2.62	9.50	05:30
Vigilance (P)	t(699) = 1.143	60	–	−0.043	2.62	15.50	11:30
Vigilance (P)	t(699) = 0.572	60	–	−0.022	2.62	21.50	17:30
Vigilance (P)	t(699) = 2.205	60	–	−0.083	2.62	27.50	23:30
Vigilance (P)	t(699) = 5.105	60	–	−0.192	2.62	33.50	05:30
Vigilance (P)	t(699) = 4.369	60	–	−0.165	2.62	39.50	11:30
Vigilance (P)	t(699) = 2.001	60	–	−0.076	2.62	45.50	17:30
Vigilance (P)	t(699) = 0.568	24	+	+0.021	8.00	3.50	23:30
Vigilance (P)	t(699) = 1.214	24	+	+0.046	8.00	9.50	05:30
Vigilance (P)	t(699) = 0.749	24	+	+0.028	8.00	15.50	11:30
Vigilance (P)	t(699) = 0.232	24	+	+0.009	8.00	21.50	17:30
Vigilance (P)	t(699) = 0.103	24	+	+0.004	8.00	27.50	23:30
Vigilance (P)	t(699) = 1.782	24	–	−0.067	8.00	33.50	05:30
Vigilance (P)	t(699) = 2.557	24	–	−0.097	8.00	39.50	11:30
Vigilance (P)	t(699) = 2.144	24	–	−0.081	8.00	45.50	17:30
POMS (F)	t(564) = 0.263	60	+	+0.011	2.62	3.50	23:30
POMS (F)	t(564) = 2.587	60	–	−0.109	2.62	9.50	05:30

TABLE 1 (continued)

Study/Measure	Statistic (*df*)	*N*	DOE	Effect Size	Nap Duration	Postnap Interval	Time of Day
POMS (F)	t(564) = 4.279	60	–	−0.179	2.62	15.50	11:30
POMS (F)	t(564) = 3.890	60	–	−0.163	2.62	21.50	17:30
POMS (F)	t(564) = 4.863	60	–	−0.203	2.62	27.50	23:30
POMS (F)	t(564) = 7.128	60	–	−0.296	2.62	33.50	05:30
POMS (F)	t(564) = 7.907	60	–	−0.327	2.62	39.50	11:30
POMS (F)	t(564) = 6.934	60	–	−0.288	2.62	45.50	17:30
POMS (F)	t(564) = 0.209	24	+	+0.009	8.00	3.50	23:30
POMS (F)	t(564) = 0.492	24	–	−0.021	8.00	9.50	05:30
POMS (F)	t(564) = 1.476	24	–	−0.062	8.00	15.50	11:30
POMS (F)	t(564) = 1.925	24	–	−0.081	8.00	21.50	17:30
POMS (F)	t(564) = 2.214	24	–	−0.093	8.00	27.50	23:30
POMS (F)	t(564) = 3.856	24	–	−0.162	8.00	33.50	05:30
POMS (F)	t(564) = 3.567	24	–	−0.150	8.00	39.50	11:30
POMS (F)	t(564) = 3.610	24	–	−0.151	8.00	45.50	17:30
Caldwell et al. (1998)							
Errors (P)	t(102) = 3.933	18	–	−0.380	2.00	10.17	09:10
Errors (P)	t(102) = 6.802	18	–	−0.631	2.00	14.17	13:10
Errors (P)	t(102) = 6.517	18	–	−0.607	2.00	18.17	17:10
VAS (F)	t(561) = 1.503	18	–	−0.063	2.00	10.00	09:00
VAS (F)	t(561) = 1.629	18	–	−0.069	2.00	11.00	10:00
VAS (F)	t(561) = 1.004	18	–	−0.042	2.00	12.00	11:00
VAS (F)	t(561) = 0.504	18	+	+0.021	2.00	13.00	12:00
VAS (F)	t(561) = 1.508	18	–	−0.064	2.00	14.00	13:00
VAS (F)	t(561) = 1.629	18	–	−0.069	2.00	15.00	14:00
VAS (F)	t(561) = 1.125	18	–	−0.047	2.00	16.00	15:00
VAS (F)	t(561) = 0.000	18	+	+0.000	2.00	17.00	16:00
VAS (F)	t(561) = 1.004	18	–	−0.042	2.00	18.00	17:00
VAS (F)	t(561) = 0.000	18	+	+0.000	2.00	19.00	18:00
VAS (F)	t(561) = 1.503	18	–	−0.063	2.00	20.00	19:00
VAS (F)	t(561) = 1.887	18	+	+0.080	2.00	21.00	20:00
Gillberg et al. (1996)							
Hits (P)	t(28) = 3.234	8	+	+0.578	0.50	0.75	12:00
Hits (P)	t(28) = 1.197	8	+	+0.224	0.50	3.75	13:00
KSS (F)	t(14) = 1.817	8	+	+0.468	0.50	2.25	13:50
Hayashi, Ito et al. (1999)							
Logical (P)	t(54) = 1.784	10	+	+0.240	0.33	0.33	13:00
Logical (P)	t(54) = 0.855	10	+	+0.116	0.33	1.33	14:00
Logical (P)	t(54) = 0.332	10	–	−0.045	0.33	2.33	15:00
Logical (P)	t(54) = 1.765	10	–	−0.238	0.33	3.33	16:00
Logical (P)	t(54) = 1.735	10	+	+0.234	0.33	4.33	17:00
Calc (P)	t(54) = 0.627	10	+	+0.085	0.33	0.33	13:00
Calc (P)	t(54) = 0.886	10	–	−0.120	0.33	1.33	14:00
Calc (P)	t(54) = 0.558	10	+	+0.076	0.33	2.33	15:00
Calc (P)	t(54) = 0.286	10	+	+0.039	0.33	3.33	16:00
Calc (P)	t(54) = 0.241	10	–	−0.033	0.33	4.33	17:00
Visual Det (P)	t(54) = 1.247	10	+	+0.169	0.33	0.33	13:00
Visual Det (P)	t(54) = 1.145	10	–	−0.155	0.33	1.33	14:00
Visual Det (P)	t(54) = 0.079	10	+	+0.011	0.33	2.33	15:00
Visual Det (P)	t(54) = 1.319	10	–	−0.179	0.33	3.33	16:00
Visual Det (P)	t(54) = 0.778	10	+	+0.106	0.33	4.33	17:00
Aud Vigil (P)	t(54) = 1.082	10	+	+0.147	0.33	0.33	13:00
Aud Vigil (P)	t(54) = 0.431	10	+	+0.059	0.33	1.33	14:00
Aud Vigil (P)	t(54) = 0.294	10	–	−0.040	0.33	2.33	15:00
Aud Vigil (P)	t(54) = 1.325	10	–	−0.179	0.33	3.33	16:00

TABLE 1 (continued)

Study/Measure	Statistic (*df*)	*N*	DOE	Effect Size	Nap Duration	Postnap Interval	Time of Day
Aud Vigil (P)	t(54) = 0.125	10	+	+0.017	0.33	4.33	17:00
Sleepiness (F)	t(54) = 2.534	10	+	+0.338	0.33	0.33	13:00
Sleepiness (F)	t(54) = 1.164	10	+	+0.158	0.33	1.33	14:00
Sleepiness (F)	t(54) = 0.137	10	–	–0.019	0.33	2.33	15:00
Sleepiness (F)	t(54) = 0.323	10	+	+0.044	0.33	3.33	16:00
Sleepiness (F)	t(54) = 0.128	10	+	+0.017	0.33	4.33	17:00
Fatigue (F)	t(54) = 1.252	10	+	+0.170	0.33	0.33	13:00
Fatigue (F)	t(54) = 1.548	10	–	–0.209	0.33	1.33	14:00
Fatigue (F)	t(54) = 3.958	10	–	–0.515	0.33	2.33	15:00
Fatigue (F)	t(54) = 5.474	10	–	–0.689	0.33	3.33	16:00
Fatigue (F)	t(54) = 5.209	10	–	–0.660	0.33	4.33	17:00
Hayashi, Watanabe et al. (1999)							
Logical (P)	t(36) = 1.440	7	+	+0.238	0.33	0.67	15:00
Logical (P)	t(36) = 0.507	7	+	+0.084	0.33	1.67	16:00
Logical (P)	t(36) = 0.621	7	+	+0.103	0.33	2.67	17:00
Calc (P)	t(36) = 1.131	7	+	+0.187	0.33	0.67	15:00
Calc (P)	t(36) = 2.008	7	+	+0.329	0.33	1.67	16:00
Calc (P)	t(36) = 1.864	7	+	+0.306	0.33	2.67	17:00
Visual Det (P)	t(36) = 1.070	7	+	+0.177	0.33	0.67	15:00
Visual Det (P)	t(36) = 0.876	7	+	+0.145	0.33	1.67	16:00
Visual Det (P)	t(36) = 0.564	7	+	+0.094	0.33	2.67	17:00
Aud Vigil (P)	t(36) = 1.266	7	+	+0.209	0.33	0.67	15:00
Aud Vigil (P)	t(36) = 1.331	7	+	+0.220	0.33	1.67	16:00
Aud Vigil (P)	t(36) = 0.839	7	+	+0.139	0.33	2.67	17:00
Sleepiness (F)	t(36) = 2.726	7	+	+0.440	0.33	0.67	15:00
Sleepiness (F)	t(36) = 2.025	7	+	+0.331	0.33	1.67	16:00
Sleepiness (F)	t(36) = 1.469	7	+	+0.242	0.33	2.67	17:00
Fatigue (F)	t(36) = 0.206	7	–	–0.034	0.33	0.67	15:00
Fatigue (F)	t(36) = 2.311	7	–	–0.376	0.33	1.67	16:00
Fatigue (F)	t(36) = 2.689	7	–	–0.434	0.33	2.67	17:00
Horne & Reyner (1996)							
KSS (F)	t(18) = 3.920	10	+	+0.827	0.25	0.50	15:45
Takahashi & Arito (2000)							
Logical (P)	t(55) = 1.094	12	+	+0.147	0.25	0.50	13:15
Logical (P)	t(55) = 1.824	12	+	+0.244	0.25	2.00	14:45
Logical (P)	t(55) = 0.608	12	+	+0.082	0.25	3.50	16:15
Logical (P)	t(55) = 2.797	12	+	+0.369	0.25	5.00	17:45
RT (P)	t(55) = 1.882	12	+	+0.251	0.25	0.50	13:15
RT (P)	t(55) = 2.425	12	+	+0.321	0.25	2.00	14:45
RT (P)	t(55) = 1.951	12	+	+0.260	0.25	3.50	16:15
RT (P)	t(55) = 2.563	12	+	+0.339	0.25	5.00	17:45
Digit Span (P)	t(55) = 1.319	12	+	+0.177	0.25	0.50	13:15
Digit Span (P)	t(55) = 2.002	12	+	+0.267	0.25	2.00	14:45
Digit Span (P)	t(55) = 1.739	12	+	+0.232	0.25	3.50	16:15
Digit Span (P)	t(55) = 0.949	12	+	+0.128	0.25	5.00	17:45
Sleepiness (F)	t(55) = 4.534	12	+	+0.579	0.25	0.50	13:15
Sleepiness (F)	t(55) = 5.069	12	+	+0.639	0.25	2.00	14:45
Sleepiness (F)	t(55) = 3.480	12	+	+0.454	0.25	3.50	16:15
Sleepiness (F)	t(55) = 5.258	12	+	+0.660	0.25	5.00	17:45
Takahashi et al. (1998)							
Sleepiness (F)	t(54) = 2.981	10	+	+0.395	0.25	0.75	13:30
Sleepiness (F)	t(54) = 2.799	10	+	+0.372	0.25	3.75	16:30
Sleepiness (F)	t(54) = 1.931	10	+	+0.260	0.75	0.75	13:15
Sleepiness (F)	t(54) = 3.792	10	+	+0.495	0.75	3.25	16:30

TABLE 1 (continued)

Study/Measure	Statistic (*df*)	*N*	DOE	Effect Size	Nap Duration	Postnap Interval	Time of Day
Tietzel & Lack (2001)							
Digit Subs (P)	t(22) = 3.989	12	+	+0.772	0.17	0.08	15:15
Digit Subs (P)	t(22) = 5.013	12	+	+0.929	0.17	0.58	15:45
Digit Subs (P)	t(22) = 3.337	12	–	–0.662	0.50	0.08	15:15
Digit Subs (P)	t(22) = 1.188	12	+	+0.251	0.50	0.58	15:45
Letter canc(P)	t(22) = 2.895	12	+	+0.584	0.17	0.08	15:15
Letter canc(P)	t(22) = 5.679	12	+	+1.023	0.17	0.58	15:45
Letter canc(P)	t(22) = 3.340	12	–	–0.663	0.50	0.08	15:15
Letter canc(P)	t(22) = 0.220	12	–	–0.047	0.50	0.58	15:45
Sleepiness (F)	t(22) = 2.585	12	+	+0.526	0.17	0.08	15:15
Sleepiness (F)	t(22) = 2.277	12	+	+0.468	0.17	0.58	15:45
Sleepiness (F)	t(22) = 2.277	12	+	+0.468	0.17	1.00	16:10
Sleepiness (F)	t(22) = 2.100	12	–	–0.434	0.50	0.08	15:15
Sleepiness (F)	t(22) = 0.000	12	+	+0.000	0.50	0.58	15:45
Sleepiness (F)	t(22) = 0.700	12	+	+0.149	0.50	1.00	16:10
Tilley & Wilkinson (1984)							
RT (P)	t(42) = 5.217	8	–	–0.737	4.00	9.50	13:30
RT (P)	t(42) = 3.083	8	–	–0.459	4.00	14.00	18:00
RT (P)	t(42) = 7.351	8	–	–0.973	4.00	19.00	23:00
RT (P)	t(42) = 10.194	8	–	–1.235	4.00	33.50	13:30
RT (P)	t(42) = 2.134	8	–	–0.324	4.00	5.50	13:30
RT (P)	t(42) = 1.422	8	–	–0.218	4.00	10.00	18:00
RT (P)	t(42) = 5.453	8	–	–0.765	4.00	15.00	23:00
RT (P)	t(42) = 9.485	8	–	–1.174	4.00	29.50	13:30
RT (P)	t(42) = 2.134	8	+	+0.324	8.00	5.50	13:30
RT (P)	t(42) = 7.114	8	+	+0.949	8.00	10.00	18:00
RT (P)	t(42) = 0.236	8	+	+0.036	8.00	15.00	23:00
RT (P)	t(42) = 2.134	8	+	+0.324	8.00	29.50	13:30

Note. Measure: P = performance; F = fatigue. DOE: Direction of effect (+ = better than baseline, – = worse than baseline). Effect size: Z_{Fisher}. Nap duration: in hours or fractions thereof. Postnap interval: in hours or fractions thereof. AddCorr = additions correct; DSS = digit symbol substitution; POMS = Profile of Mood States; CAS = Visual Analog Scale; KSS = Karolinska Sleepiness Scale; Calc = calculation; Visual Det = visual detection; Aud Vigil = auditory vigilance; RT = reaction time; Digit Subs = digit substitutions; Letter canc = letter cancellation.