Supplemental Table Mobile sleep outcomes

Therapeutic Area	Technology	Position of device	Epochs	Study design	Type of clinical study	Other mobile outcomes	Other standard outcome assessment	Use of mobile outcomes	Objectives	Source
Cardiology (Heart Failure)	Pressure sensor (EverOn)	Not Attached to the Body (Under the mattress)	Not specified	Observational (Cohort study)	Prevention	Cardiac (Biomarker) Breathing (Biomarker)	Cardiometabolic and anthropometric measures (ClinRO) Cardiac (PRO, ClinRO, and ObsRO)	Exploratory endpoint	To assess normal and altered physiological patterns in the home environment, and to determine if altered physiological patterns correlate with hospital readmissions.	Bennett 2015 [1]
Nutrition (Vitamin D) Sleep	Inertial sensor (Sleep-watch-O)	Wrist (Non-dominant)	60 seconds	Observational (Cohort study)	Epidemiological	NA	Physical activity (PerfO, ClinRO) Psychosocial (PRO, ClinRO) Sleep (PRO, Biomarkers)	Co-Prim Endpoint	To examine whether levels of serum 25(OH)D are associated with objective measures of sleep in older men.	Massa 2015 [2]
Pediatrics (Adolescent Physical Activity) Sleep	Inertial sensor (ActiGraph GT3X+ accelerometer)	Waist (Right hip)	60 seconds	Observational (Cohort study)	Epidemiological	Physical activity (PerfO)	Cardiometabolic and anthropometric measures (ClinRO) Physical activity (ClinRO) Sleep (PRO, ObsRO)	Co-Prim Endpoint	To examine between-season and within-week variation in physical activity, sedentary behavior, cardio-respiratory fitness and sleep duration among 8–11 year-old children.	Hjorth 2013 [3]
Psychology (Behavioral or Emotional Difficulties, Neurobehavioral Functioning)	Inertial sensor (Somnowatch)	Wrist (Non-dominant)	Not specified	Observational (Cohort study)	Epidemiological	NA	Psychosocial (ClinRO, ObsRO) Sleep (ObsRO, Biomarkers)	Exploratory endpoint	To investigate the relation between objectively assessed sleep patterns, HPA system, and behavioral/emotional difficulties in preschoolers.	Hatzinger 2010 [4]
Sleep	Inertial sensor (ActiSleep sleep monitor)	Wrist (Dominant)	60 seconds	Observational (Cohort study)	Diagnostic	NA	Sleep (PerfO, PRO)	Exploratory endpoint	To investigate the relationships between sleep measured by wrist actigraphy, visuospatial motor skill learning and measures of cortical excitability in response to one training episode in young, healthy individuals.	Borich 2012 [5]
Sleep	Inertial sensor (Actiwatch-L)	Wrist	Not specified	Interventional (RCT)	Quality of life	NA	Sleep (Biomarkers, PRO)	Co-Prim Endpoint	To evaluate, in rotating workers, the impact of a circadian-aimed short wavelengths controlled strategy on both the performance at work and circadian clock adaptation to the night shift.	Sasseville 2010 [6]
Sleep (Children with bladder disorders)	Inertial sensor (Miniature Actigraph)	Wrist (Non-dominant)	Not specified	Observational (Case control)	Quality of life	NA	Psychosocial (ObsRO) Sleep (ObsRO, PRO)	Co-Prim Endpoint	To assess the association between night diapers use and sleep quality of school-aged children with enuresis.	Kushnir 2013 [7]

Sleep (Circadian Rhythm)	Inertial sensor and light meter (Daysimeter-D)	Head (Attached to Glasses), Wrist	Not specified	Observational (Case control)	Quality of life	NA	Sleep (Biomarker, PRO)	Exploratory endpoint	To examine if light–dark exposure patterns determine circadian phase and not the sleep schedule.	Appleman 2013 [8]
Sleep (Insomnia)	Inertial sensor (Actiwatch 2)	Wrist (Non-dominant)	Not specified	Interventional (RCT)	Quality of life	NA	Psychosocial (PRO, ClinRO) Sleep (PRO, ClinRO)	Secondary endpoint	To explore the impact of CBTI on sleep discrepancy in older adults during in-home sleep using actigraphy in relation to changes in perceived insomnia severity.	Kay 2015 [9]
Sleep (Insomnia)	Inertial sensor (SenseWear Armband)	Arm (Non-Dominant Upper)	Not specified	Interventional (RCT)	Quality of life	Physical activity (PerfO)	Psychosocial (PRO, ClinCRO) Sleep (PerfO, PRO, ClinRO) General health history (PRO)	Secondary endpoint	To determine whether nightly administration of melatonin, magnesium, and zinc improves primary insomnia in long-term care facility residents, aged 70 and older.	Rondanelli 2011 [10]
Sleep (Sleep quality and fatigue among patients living with HIV)	Inertial sensor (Actiware-Sleep 3.4, Actiwatch actigraphy device)	Wrist (Non-dominant)	Not specified	Observational (Cohort study)	Quality of life	NA	Sleep (ObsRO, PRO)	Secondary endpoint	To assess total sleep time and wake after sleep onset, using objective sleep data as measured by an Actiwatch in a sample of Chinese HIV+ women after they learned of their disease.	Chen 2013 [11]

PerfO = Performance Outcome; ObsRO = Observer Reported Outcome; PRO = Patient Reported Outcome; ClinRO = Clinician Reported Outcome

References

1. Bennett MK, Shao M, Gorodeski EZ. Home monitoring of heart failure patients at risk for hospital readmission using a novel under-the-mattress piezoelectric sensor: A preliminary single centre experience. Journal of telemedicine and telecare. 2015. Epub 2015/12/17. doi: 10.1177/1357633x15618810. PubMed PMID: 26670209.
2. Massa J, Stone KL, Wei EK, Harrison SL, Barrett-Connor E, Lane NE, et al. Vitamin D and actigraphic sleep outcomes in older community-dwelling men: the MrOS sleep study. Sleep. 2015;38(2):251-7. Epub 2015/01/13. doi: 10.5665/sleep.4408. PubMed PMID: 25581929; PubMed Central PMCID: PMCPMC4288606.
3. Hjorth MF, Chaput JP, Michaelsen K, Astrup A, Tetens I, Sjodin A. Seasonal variation in objectively measured physical activity, sedentary time, cardio-respiratory fitness and sleep duration among 8-11 year-old Danish children: a repeated-measures study. BMC public health. 2013;13:808. Epub 2013/09/10. doi: 10.1186/1471-2458-13-808. PubMed PMID: 24010811; PubMed Central PMCID: PMCPMC3846279.
4. Hatzinger M, Brand S, Perren S, Stadelmann S, von Wyl A, von Klitzing K, et al. Sleep actigraphy pattern and behavioral/emotional difficulties in kindergarten children: association with hypothalamic-pituitary-adrenocortical (HPA) activity. Journal of psychiatric research. 2010;44(4):253-61. Epub 2009/09/19. doi: 10.1016/j.jpsychires.2009.08.012. PubMed PMID: 19762039.
5. Borich MR, Kimberley TJ. Using actigraphy and transcranial magnetic stimulation to assess the relationship between sleep and visuomotor skill learning. Restorative neurology and neuroscience. 2012;30(2):81-90. Epub 2011/11/30. doi: 10.3233/rnn-2011-0622. PubMed PMID: 22124036.
6. Sasseville A, Hebert M. Using blue-green light at night and blue-blockers during the day to improves adaptation to night work: a pilot study. Progress in neuro-psychopharmacology & biological psychiatry. 2010;34(7):1236-42. Epub 2010/07/06. doi: 10.1016/j.pnpbp.2010.06.027. PubMed PMID: 20599459.
7. Kushnir J, Cohen-Zrubavel V, Kushnir B. Night diapers use and sleep in children with enuresis. Sleep medicine. 2013;14(10):1013-6. Epub 2013/07/31. doi: 10.1016/j.sleep.2013.02.018. PubMed PMID: 23890954.

8. Appleman K, Figueiro MG, Rea MS. Controlling light-dark exposure patterns rather than sleep schedules determines circadian phase. Sleep medicine. 2013;14(5):456-61. Epub 2013/03/14. doi: 10.1016/j.sleep.2012.12.011. PubMed PMID: 23481485; PubMed Central PMCID: PMCPMC4304650.
9. Kay DB, Buysse DJ, Germain A, Hall M, Monk TH. Subjective-objective sleep discrepancy among older adults: associations with insomnia diagnosis and insomnia treatment. Journal of sleep research. 2015;24(1):32-9. Epub 2014/09/16. doi: 10.1111/jsr.12220. PubMed PMID: 25219802; PubMed Central PMCID: PMCPMC4747029.
10. Rondanelli M, Opizzi A, Monteferrario F, Antoniello N, Manni R, Klersy C. The effect of melatonin, magnesium, and zinc on primary insomnia in long-term care facility residents in Italy: a double-blind, placebo-controlled clinical trial. Journal of the American Geriatrics Society. 2011;59(1):82-90. Epub 2011/01/14. doi: 10.1111/j.1532-5415.2010.03232.x. PubMed PMID: 21226679.
11. Chen WT, Lee SY, Shiu CS, Simoni JM, Pan C, Bao M, et al. Fatigue and sleep disturbance in HIV-positive women: a qualitative and biomedical approach. Journal of clinical nursing. 2013;22(9-10):1262-9. Epub 2013/01/03. doi: 10.1111/jocn.12012. PubMed PMID: 23279292; PubMed Central PMCID: PMCPMC3625469.