# **Supplementary Table 1**: Characteristics of the 33 studies examining the effects of dehydration (DEH) on cognitive performance. RF = Recreationally Fit, HF = Highly Fit (VO2peak: > 55 mL/kg/min), NR = Fitness Not Reported, EHS = Exercise-Heat Stress (Ambient Temperature ≥ 27ºC), FR = Fluid Restriction, BM = Body Mass, M = Males, F = Females, Tc = Peak Core Temperature; a core temperature reported before cognitive testing, not peak of heat exposure. ND = No difference between DEH and control condition. NA = Data not available; NS = Not specified. All studies were repeated measures design.

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| **Reference** | **A Subjects /** **Fitness Status** | **BM Loss (%)** | **DEH Method** | **Study Design** | **Cognitive Task** | **Cognitive Domain** | **Practice** | **Reported Effects** **of DEH (p < 0.05)** |
| Armstrong et al. (33) | 25 F / RF | 1.4 | **EHS, EHS + Diuretic** (3 h; 28ºC, 49%RH)Tc = 38.1ºC | Crossover | Four Choice Reaction TimePsychomotor Vigilance TestMatching to SampleGrammatical ReasoningScanning Visual VigilanceRepeated Acquisition | Reaction TimeReaction TimeMemoryExecutive FunctionAttentionMemory | Y | NDNDNDNDIncreased False AlarmsND |
| Baker et al. (56) | 11 M / HF | 1,2,3,4(Mean=2.5%) | **EHS**(3h; 40ºC, 20%RH)Tc = 38.0ºC | Crossover | Test of Variables of Attention | Attention | Y | Decreased Vigilance |
| Barroso et al. (57) | 12 M / HF | 1.8 | **EHS**(min NS;30ºC, 61%RH)Tc = NA | Pre-Post | Simple Reaction Time | Reaction Time | Y | Improved Reaction Time |
| Bijlani et al. (58) | 14 M / NR | 3 | **EHS**(120-150 min; 41ºC, RH: NA)Tc = Rise of 1ºC | Pre-Post | Choice Reaction TimeProof Reading Test | Reaction TimeExecutive Function | Y | NDND |
| Choma et al. (55) | 14 M / HF | 6.2 | **FR** | Pre-Post | Digit Span, Story Recall |  Memory | Y | Decreased Recall |
| Cian et al. (51) | 8 M / HF | 2.8 | **Passive Heat**(2 h; oC/RH: NA) Tc = 37.4ºC  **& Exercise** | Crossover | Picture Recall4-Choice Serial Reaction TimePerceptive DiscriminationDigit SpanUnstable Tracking | MemoryReaction TimeInformation ProcessingMemoryMotor Coordination | Y | Shorter String Recall NDIncreased Reaction Time Reduced String LengthGreater Deviation |
| **Reference** | **Subjects / Fitness Status** | **BM Loss (%)** | **DEH Method** | **Study Design** | **Cognitive Task** | **Cognitive Domain** | **Practice** | **Reported Effects** **of DEH (p < 0.05)** |
| Cian et al. (39) | 7 M / HF | 2.6 | **Passive Heat**(2 h; 47.5ºC, 45%RH)Tc = 38.4ºC**& Exercise** | Crossover | Picture RecallChoice Reaction TimePerceptive DiscriminationDigit SpanUnstable Tracking | MemoryReaction TimeInformation ProcessingWorking MemoryMotor Coordination | Y | NDNDLonger Reaction TimeShorter String Recall LengthND |
| D’Anci et al. (59)a | 16 M, 13 F / HF | 1.8 | **Exercise** | Crossover | Digit SpanSimple, Choice Reaction Time | MemoryReaction Time | NS | NDND |
| D’Anci et al. (59)b | 12 M, 12 F / HF | 1.2 | **Exercise** | Crossover | Map Recall | Memory | NS | ND |
| Ely et al. (9) | 32 M / NR | 4.0 – 4.2 | **EHS**(3h, 50ºC, 20%RH)Tc: 37.5-37.9ºCa | Crossover | Psychomotor Vigilance Task4-Choice Reaction TimeMatching to SampleGrammatical Reasoning | Reaction TimeReaction TimeMemoryExecutive Function | Y | NDNDNDND |
| Epstein et al. (60) | 9 M / NR | 2.4 | **Passive Heat**(2 h; 50ºC, 40%RH)Tc = 38.5ºC | Crossover | Target Evaluation and Shooting | Information Processing | NS | Impaired AccuracyGreater Errors |
| Faerevik et al. (61) | 8 M / NR | 1.5 | **Passive Heat**(3 h; 40ºC, 19%RH)Tc = 38.0ºC  | Crossover | Vigilance TestVienna Determination Unit Test | AttentionExecutive Function | Y | Increased Incorrect ReactionsND |
| Ganio et al. (32) | 26 M / RF | 1.6 | **EHS, EHS + Diuretic**(3 h; 28 ºC, 42%RH)Tc = 37.7ºC | Crossover | Four Choice Reaction TimePsychomotor Vigilance TestMatching to SampleGrammatical ReasoningScanning Visual VigilanceRepeated Acquisition | Reaction TimeReaction TimeMemoryExecutive FunctionAttentionMemory | Y | NDNDSlower Response TimeNDIncreased False AlarmsND |
| Gopinathan et al. (6) | 11 M / RF | 1,2,3,4 | **EHS**(Time: NA; 45ºC, 30% RH)Tc = NA | Crossover | Serial Addition, Trail-Marking TestWord Recognition | Executive FunctionShort Term Memory | Y | Decrease Correct (Addition)Reduced Performance (Trail)Less Correct Responses |
| Grego et al. (45) | 8 M / HF | 3.1 | **Exercise** | Pre-Post | Map RecognitionCritical Flicker Fusion Test | Executive FunctionInformation Processing | NS | Impaired AccuracyFaster Reaction TimeDecreased Perception |
| **Reference** | **Subjects / Fitness Status** | **BM Loss (%)** | **DEH Method** | **Study Design** | **Cognitive Task** | **Cognitive Domain** | **Practice** | **Reported Effects** **of DEH (p < 0.05)** |
| Kakos (2013) (36) | 11 M / RF | 2.6 | **EHS**(2 h; 38ºC, RH: NA)Tc = 37.9ºC | Pre-Post | Running Memory Continuous Performance TaskLogical Relations | AttentionExecutive Function | Y | NDND |
| McGregor et al. (62) | 9 M / HF | 1.3, 2.4 | **Exercise** | Pre-Post | Mental Concentration Test  | Information Processing | Y | ND |
| McMorris et al. (63) | 8 M / RF | 2.8 | **EHS**(2 h: 36ºC, 75%RH)Tc rise = 1.1ºC | Crossover | Random Movement GenerationChoice Reaction TimeCorsi Block Tapping | MemoryReaction TimeMemory | Y | Worse Test ScoreNDND |
| Morley et al. (64)  | 10 M / HF | 1.6 | **EHS**(50 min; 33-35ºC, %RH: NA)Tc = 39.0ºC | Pre-Post | Psychomotor Vigilance TaskRepeatable Episodic Memory Task | Reaction TimeMemory | NS | NDND |
| Patel et al. (34) | 24 M / NR | 2.5 | **FR + Exercise** | Crossover | Simple reaction TimeMath Processing,Standardized Assessment of Concussion Match to Sample Task, Sternberg Memory Task | Reaction TimeExecutive FunctionMemory | NS | NDNDNDImpaired AccuracyND |
| Pruna et al. (65) | 12 M / HF | 2.4 | **Exercise** | Crossover | Visuomotor Training DeviceSerial Sevens Test | Reaction TimeExecutive Function | Y | NDND |
| Serwah et al. (66) | 8 M / RF | 1.7 | **EHS** (78 min; 31ºC, 63%RH)Tc = rise of 1.8ºC | Crossover | Choice Reaction Time | Reaction Time | Y | ND |
| Sharma et al. (7) | 8 M / RF | 1, 2, 3 | **EHS**(min NA; 43ºC, 45%RH)Tc = 37.6, 37.8, 38.0ºC | Crossover | Psychomotor testSubstitution TestConcentration Test | Motor CoordinationInformation ProcessingMemory | NS | Decreased Score at ≥ −2% BMFewer Correct at ≥ −2% BMFewer Correct at ≥ −2% BM |
| Smith et al. (67) | 7 M / RF | 1.5 | **FR** | Crossover | Golf-Specific Cognitive Ability | Executive Function | NS | Impaired Distance Judgement |
| Szinnai et al. (53) | 8 M, 8 F / NR | 2.6 | **FR** | Crossover | Oddball ParadigmSerial Addition Task,Stroop Word-Color TestManual Tracking TestChoice Reaction Task | AttentionExecutive FunctionMotor CoordinationReaction Time | Y | NDNDNDNDND |
| **Reference** | **Subjects / Fitness Status** | **BM Loss (%)** | **DEH Method** | **Study Design** | **Cognitive Task** | **Cognitive Domain** | **Practice** | **Reported Effects** **of DEH (p < 0.05)** |
| Tomporowski et al. (38) | 11 M / HF | 1.3, 2.3, 3.7 | **EHS**(15-120 min; 30ºC, 40%RH)Tc = 37.7, 38.4, 38.8ºC | Pre-Post | Executive-Processing TaskBrown-Peterson Test | Executive FunctionMemory | Y | Improved Switch Costs,Increased Switch Trial ErrorsND |
| Turner el al. (68) | 11 F / RF | 1.5 | **EHS**(2 h; 34ºC, <10%RH)Tc = NA | Crossover | Detection Task,Identification taskGroton Maze Chase Test,One Card Learning Task,One & Two Back Task,Paired Associate LearningGroton Maze Learning Test,Set Shifting Test | Reaction TimeMotor CoordinationMemoryExecutive Function | Y | NDNDNDNDNDNDNDND |
| van den Heuval (10) | 8 M / NR | 3,5 | **Passive Heat** (3.5 h; 39-41ºC Water)Tc = 37.0-37.2ºCa | Crossover | N-Back TestVisual Perception Task | MemoryInformation Processing | Y | NDND |
| Watson et al. (26) | 11 M / NR | 1.1 | **FR** | Crossover | Monotonous Driving Task | Attention | Y | Greater Errors after 30 min |
| Weber et al. (27) | 32 M / HF | 2.4, 4.8 | **FR, FR + Exercise** | Pre-Post | Simple Reaction Time | Reaction TimeExecutive Function | NS | NDND |
| Wilson et al. (69) | 8 M / RF | 1.8 | **Exercise + Sweat Suit**(45 min, 20ºC, NA%RH)Tc = NA | Crossover | Simple Reaction TimeGo-No-Go Task | Reaction TimeExecutive Function | Y | NDND |
| Wittbrodt et al. (25) | 12 M / RF | 1.5 | **EHS**(50 min; 32ºC, 65%RH)Tc = 38.2ºC | Crossover | Letter-Digit Substitution,Pattern ComparisonPerceptual VigilanceTrail Making TestMatch-to-Sample | Information ProcessingAttentionExecutive FunctionMemory | Y | NDNDNDNDND |
| Wong et al. (54) | 10 M, 9 F / RF  | 1.4 – 2.1 | **EHS**(60 min; 29ºC, 71%RH)Tc = NA | Pre-Post | Detection TaskIdentification TaskVisual Leaning Task,Working Memory TaskList Based Task | Motor CoordinationAttentionMemory | Y | Decreased SpeedDecreased PerformanceIncreased Speed and Decreased Accuracy in MalesNDDecreased Accuracy |