# **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 Time  Psychomotor Vigilance Test  Matching to Sample  Grammatical Reasoning  Scanning Visual Vigilance  Repeated Acquisition | Reaction Time  Reaction Time  Memory  Executive Function  Attention  Memory | Y | ND  ND  ND  ND  Increased False Alarms  ND |
| 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 Time  Proof Reading Test | Reaction Time  Executive Function | Y | ND  ND |
| 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 Recall  4-Choice Serial Reaction Time  Perceptive Discrimination  Digit Span  Unstable Tracking | Memory  Reaction Time  Information Processing  Memory  Motor Coordination | Y | Shorter String Recall  ND  Increased Reaction Time  Reduced String Length  Greater 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 Recall  Choice Reaction Time  Perceptive Discrimination  Digit Span  Unstable Tracking | Memory  Reaction Time  Information Processing  Working Memory  Motor Coordination | Y | ND  ND  Longer Reaction Time  Shorter String Recall Length  ND |
| D’Anci et al. (59)a | 16 M, 13 F / HF | 1.8 | **Exercise** | Crossover | Digit Span  Simple, Choice Reaction Time | Memory  Reaction Time | NS | ND  ND |
| 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 Task  4-Choice Reaction Time  Matching to Sample  Grammatical Reasoning | Reaction Time  Reaction Time  Memory  Executive Function | Y | ND  ND  ND  ND |
| 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 Accuracy  Greater Errors |
| Faerevik et al. (61) | 8 M / NR | 1.5 | **Passive Heat**  (3 h; 40ºC, 19%RH)  Tc = 38.0ºC | Crossover | Vigilance Test  Vienna Determination Unit Test | Attention  Executive Function | Y | Increased Incorrect Reactions  ND |
| 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 Time  Psychomotor Vigilance Test  Matching to Sample  Grammatical Reasoning  Scanning Visual Vigilance  Repeated Acquisition | Reaction Time  Reaction Time  Memory  Executive Function  Attention  Memory | Y | ND  ND  Slower Response Time  ND  Increased False Alarms  ND |
| Gopinathan et al. (6) | 11 M / RF | 1,2,3,4 | **EHS**  (Time: NA; 45ºC, 30% RH)  Tc = NA | Crossover | Serial Addition, Trail-Marking Test  Word Recognition | Executive Function  Short 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 Recognition  Critical Flicker Fusion Test | Executive Function  Information Processing | NS | Impaired Accuracy  Faster Reaction Time  Decreased 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 Task  Logical Relations | Attention  Executive Function | Y | ND  ND |
| 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 Generation  Choice Reaction Time  Corsi Block Tapping | Memory  Reaction Time  Memory | Y | Worse Test Score  ND  ND |
| Morley et al. (64) | 10 M / HF | 1.6 | **EHS**  (50 min; 33-35ºC, %RH: NA)  Tc = 39.0ºC | Pre-Post | Psychomotor Vigilance Task  Repeatable Episodic Memory Task | Reaction Time  Memory | NS | ND  ND |
| Patel et al. (34) | 24 M / NR | 2.5 | **FR + Exercise** | Crossover | Simple reaction Time  Math Processing,  Standardized Assessment of Concussion  Match to Sample Task,  Sternberg Memory Task | Reaction Time  Executive Function  Memory | NS | ND  ND  ND  Impaired Accuracy  ND |
| Pruna et al. (65) | 12 M / HF | 2.4 | **Exercise** | Crossover | Visuomotor Training Device  Serial Sevens Test | Reaction Time  Executive Function | Y | ND  ND |
| 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 test  Substitution Test  Concentration Test | Motor Coordination  Information Processing  Memory | NS | Decreased Score at ≥ −2% BM  Fewer Correct at ≥ −2% BM  Fewer 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 Paradigm  Serial Addition Task,  Stroop Word-Color Test  Manual Tracking Test  Choice Reaction Task | Attention  Executive Function  Motor Coordination  Reaction Time | Y | ND  ND  ND  ND  ND |
| **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 Task  Brown-Peterson Test | Executive Function  Memory | Y | Improved Switch Costs,  Increased Switch Trial Errors  ND |
| Turner el al. (68) | 11 F / RF | 1.5 | **EHS**  (2 h; 34ºC, <10%RH)  Tc = NA | Crossover | Detection Task,  Identification task  Groton Maze Chase Test,  One Card Learning Task,  One & Two Back Task,  Paired Associate Learning  Groton Maze Learning Test,  Set Shifting Test | Reaction Time  Motor Coordination  Memory  Executive Function | Y | ND  ND  ND  ND  ND  ND  ND  ND |
| 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 Test  Visual Perception Task | Memory  Information Processing | Y | ND  ND |
| 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 Time  Executive Function | NS | ND  ND |
| Wilson et al. (69) | 8 M / RF | 1.8 | **Exercise + Sweat Suit**  (45 min, 20ºC, NA%RH)  Tc = NA | Crossover | Simple Reaction Time  Go-No-Go Task | Reaction Time  Executive Function | Y | ND  ND |
| Wittbrodt et al. (25) | 12 M / RF | 1.5 | **EHS**  (50 min; 32ºC, 65%RH)  Tc = 38.2ºC | Crossover | Letter-Digit Substitution,  Pattern Comparison  Perceptual Vigilance  Trail Making Test  Match-to-Sample | Information Processing  Attention  Executive Function  Memory | Y | ND  ND  ND  ND  ND |
| Wong et al. (54) | 10 M, 9 F / RF | 1.4 – 2.1 | **EHS**  (60 min; 29ºC, 71%RH)  Tc = NA | Pre-Post | Detection Task  Identification Task  Visual Leaning Task,  Working Memory Task  List Based Task | Motor Coordination  Attention  Memory | Y | Decreased Speed  Decreased Performance  Increased Speed and Decreased Accuracy in Males  ND  Decreased Accuracy |