Program Review of High Intensity Functional Training in an Adaptive Population

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Master of Public Health Defense

Committee Members

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- Dr. Sara Rosenkranz

Collaborators

- Challenged Athletes Foundation (CAF): Nico Marcolongo
- Movement RX – Theresa Larson, DPT
- Good Leg Project – Max Conservo

Background

- Personal adaptive needs
- Discovered barriers
- Found lack in information

(Crossroadsaaa, 2017)

Introduction

- More than 56 million in the U.S. living with a chronic condition / disability.
  - Affects Activities of Daily Living (ADL)
    - Each person affected differently
  - Increased risk for certain diseases
  - Lower Quality of Life (QoL)
  - Unique to the individual

(Okoro, Hollis, Cyrus, & Griffin-Blake, 2018; Washburn, Zhu, Mcauley, Frogley, & Figoni, 2002)

International Classification of Functioning, Disability and Health (ICF)

- Developed by the World Health Organization
- Disability: an umbrella term for impairments, activity limitations and participation restrictions.
- Provides a framework for the description of health and health-related states.
- Classifies disability and health.

(Center for Health Statistics, n.d.; ICF. Geneva: World Health Organization, 2001)

Physical Activity for Health

- Physical Activity (PA) to improve / sustain health
  - Physical Activity Guidelines for American 2nd edition
  - Adaptive and inclusive addition
    - As much activity as possible

(U.S. Department of Health and Human Services, 2018)

Inclusive Training (Adaptive) Programs

- Goals are to address physical activity barriers for individuals with disabilities through:
  - Access
  - Participation
  - Adherence

- Examples:
  - Rehabilitation, adaptive sport, inclusive policy change, Americans with Disabilities Act (ADA) compliant facilities and access

(Wilson & Clayton, 2010; Yazicioglu, Yavuz, Goktepe, & Tan, 2012)

Rehabilitation

- Goal is to promote physical function to foster:
  - Independence
  - Social activity
  - Environmental interaction
  - Improve psychological health
- Adaptive Sports used in out-patient form:
  - Leisure activity
  - Pleasure
  - Competition

(Blanchard & Glasgow, 2014, Crossroadsaaa, 2017)

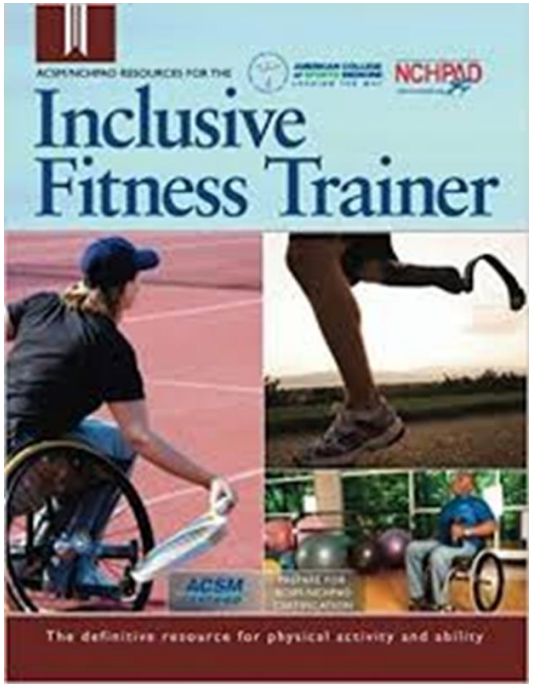
Issue

- Where to go for adaptive and inclusive physical activity resources?

ACSM/NCHPAD Resources for the Inclusive Fitness Trainer

Provides:

- Recommendations forADA compliance
- Guideline for adaptive physical activity as rehabilitation, sport, and/or leisure time activity



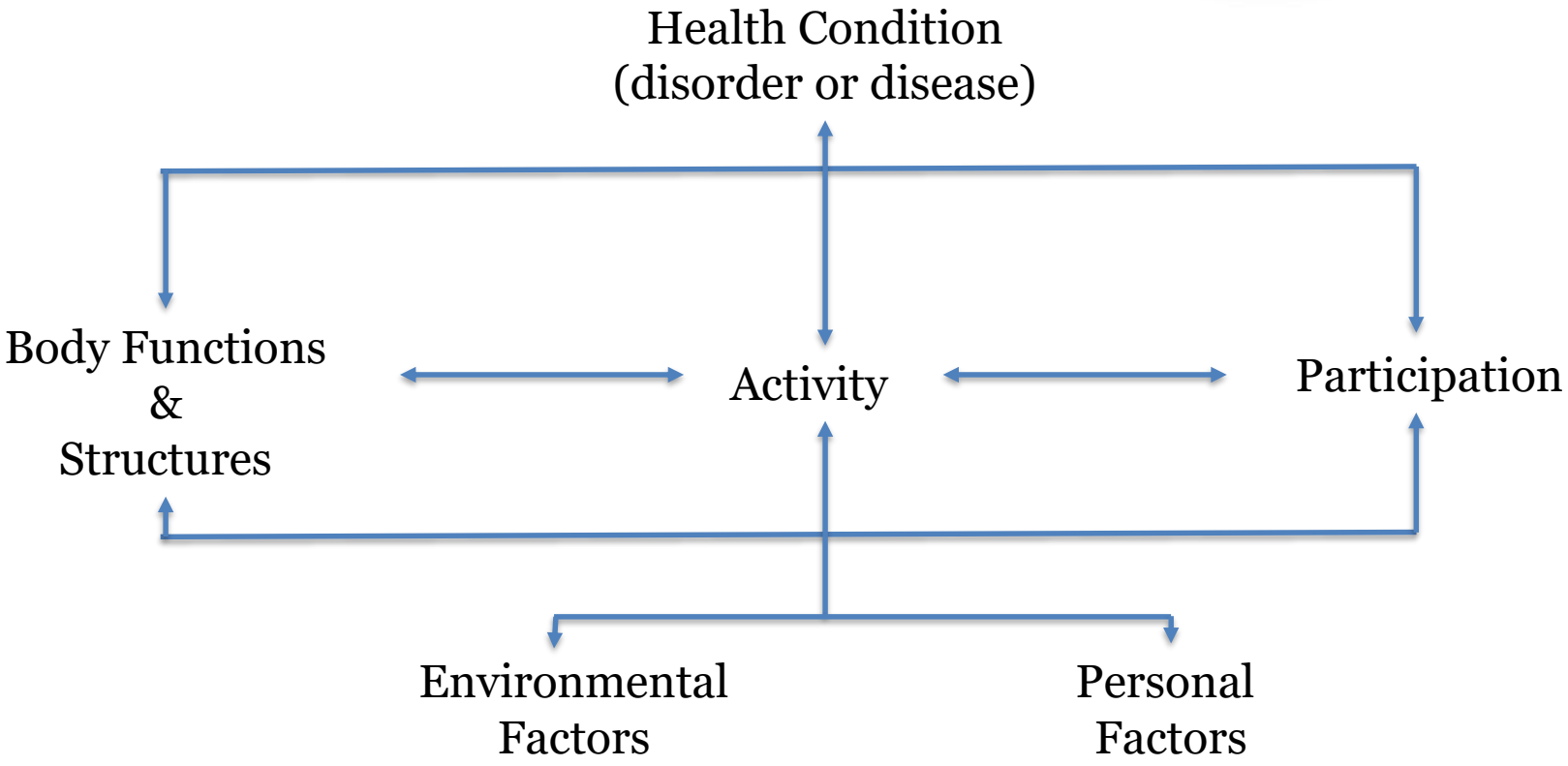
(Wing, American College of Sports Medicine., National Center on Health, & American College of Sports Medicine, 2013)

ICF Model

- Endorsed by:
  - American College of Sports Medicine
  - National Center on Health, Physical Activity and Disability
  - American Physical Therapy Association

(Atkinson & Nixon-Cave, 2011; Rimmer, 2006)

ICF Model



(Atkinson & Nixon-Cave, 2011; Rimmer, 2006)

Basic Human Movements (BHM)

- Interact with environment
  - Squat, push, pull, hinge, rotate, lunge, brace
- Uses:
  - Identify inefficiency
  - Set goals
  - Assess progression

(Giles, 2006; Giles 2015)

High Intensity Functional Training (HIFT)

- Type of exercise that emphasizes functional, multi-joint movements that are modified to any fitness level, designed to improve general physical fitness.
- Inclusive through modification and scales

(Crawford et al., 2018; Feito, Heinrich, Butcher, & Poston, 2018; K.M. Heinrich et al., 2015; Katie M. Heinrich, Crawford, Johns, Frye, & Gilmore, 2019)

Adaptive HIFT

- Allows HIFT to be inclusive as a means for fitness and continued rehabilitation.
- Guided by models commonly used in physical therapy
  - International Classification of Functioning, Disability and Health
  - Ecological Task Analysis
  - Newell's Model of Constraints

Sample Adaptive HIFT

Project Goals

- To observe baseline values for:
  - Movement specific perceptions
  - QoL
  - Sport and exercise beliefs
- Measure feasibility
- View changes in basic human movements

Methods

- Two site, single condition pre-test post-test pilot study
- 8-week Adaptive HIFT exercise program
  - N=8 (65% male)
  - Two convenience samples from California HIFT gyms
  - Adaptive needs (i.e., paraplegia, amputation, limb salvage, or cerebral palsy)

Measures

- Outpatient Physical Therapy Improvement in Movement Assessment Log (OPTIMAL)
- World Health Organization Quality of Life-BREF (WHOQoL-BREF)
- Sport and Exercise Ability
- Moderate and Vigorous Intensity Physical Activity Motivation
- BHM

Outpatient Physical Therapy Improvement in Movement Assessment Log (OPTIMAL)

- Measures difficulty and confidence in performing 22 activities of daily living
- Difficulty of completing a specific task in a controlled environment such as a doctor's office
  - LIKERT scale
  - 1 = "able to do without any difficulty"
  - 5 = "unable to do"
- Confidence to complete a specific task in an unsupervised environment such as at home or work
  - LIKERT scale
  - 1 = "fully confident in my ability to perform"
  - 5 = "not confident in my ability to perform"

(Andrew A Guccione, Thelma J Mielenz, Robert F DeVellis, Marc S Goldstein, Janet K Freburger, Ricardo Pietrobon, Sarah C Miller, Leigh F Callahan, Kenneth Harwood, 20005; APTA, 2012a, 2012b; Elston, Goldstein, & Makambi, 2013)

World Health Organization Quality of Life-BREF (WHOQoL-BREF)

- 26-item instrument to measure overall health and quality of life
  - 5-point rating scale
- 24-items grouped into 4-domain levels within quality of life
  - Physical health
  - Psychological health
  - Social relationships
  - Environment
  - 4-20 point scale; 4 = lowest, 20 = highest

(Hawthorne, Herrman, & Murphy, 2006; O'Carroll, Smith, Couston, Cossar, & Hayes, 2000; THE WHOQOL GROUP, 1990)

Sport and Exercise Ability

- Asked to self-rate their "ability to do" 8-items related to sport and exercise ability
  - LIKERT scale
  - 1 = "I cannot do this activity at all"
  - 10 = "I am certain I can do this activity successfully"

(Perez, n.d.)

Moderate and Vigorous Intensity Physical Activity Motivation

- Asked to self-rate their perception of completing moderate or vigorous levels of physical activity.
  - LIKERT scale
  - 1 = "I'm Sure I Cannot" / "Strongly Disagree"
  - 5 = "I'm Sure I Can" / "Strongly Agree"

(Sallis et al., 2009)

Adaptive HIFT Program

- One site led by physical therapist with CrossFit level 1 certificate holder, other by a CrossFit level 1 certificate holder;
  - Both are adaptive athletes
  - Co-created "Functional Training for Adaptive Athletes" and "Adaptive Training" courses
- 8-weeks of 2-3, 60-minute adaptive HIFT sessions per week.
- Consisted of high intensity low volume movements
- 5-15 minute warm-up, 15 minutes of instruction / technique work, 10-20 minute workout, 10 minutes of cooldown.

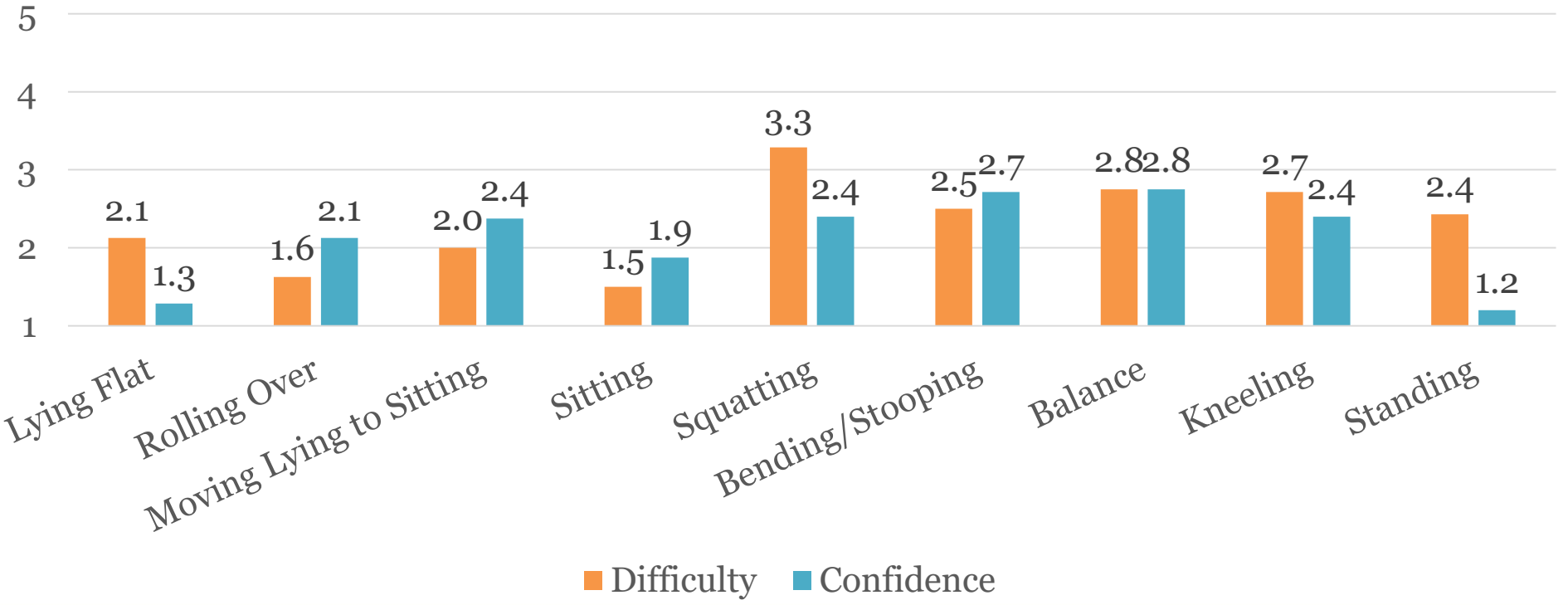
Statistical Analysis

- Basic Human Movements & Case Studies
  - SPSS 25 (Armonk, NY)
  - Paired samples t-test
  - Effect sizes and percent change using Cohen's D formula
- Descriptive measures for other tests

Demographics

- Age M = 39.1, SD = 11.1
- Sex Male = 5, Female = 3
- Assistive Device:
  - Cane = 1
  - Manual Wheelchair = 3
  - Motorized Wheelchair = 1
  - Other = 2
  - Missing = 1

Figure 1. Change & Maintaining Body Position Averages



*Difficulty score of 1 = "able to do without any difficulty" to 5 = "unable to do". Confidence score of 1 = "fully confident in my ability to perform" to 5 = "not confident in my ability to perform".

Figure 2. Walking and Moving Averages

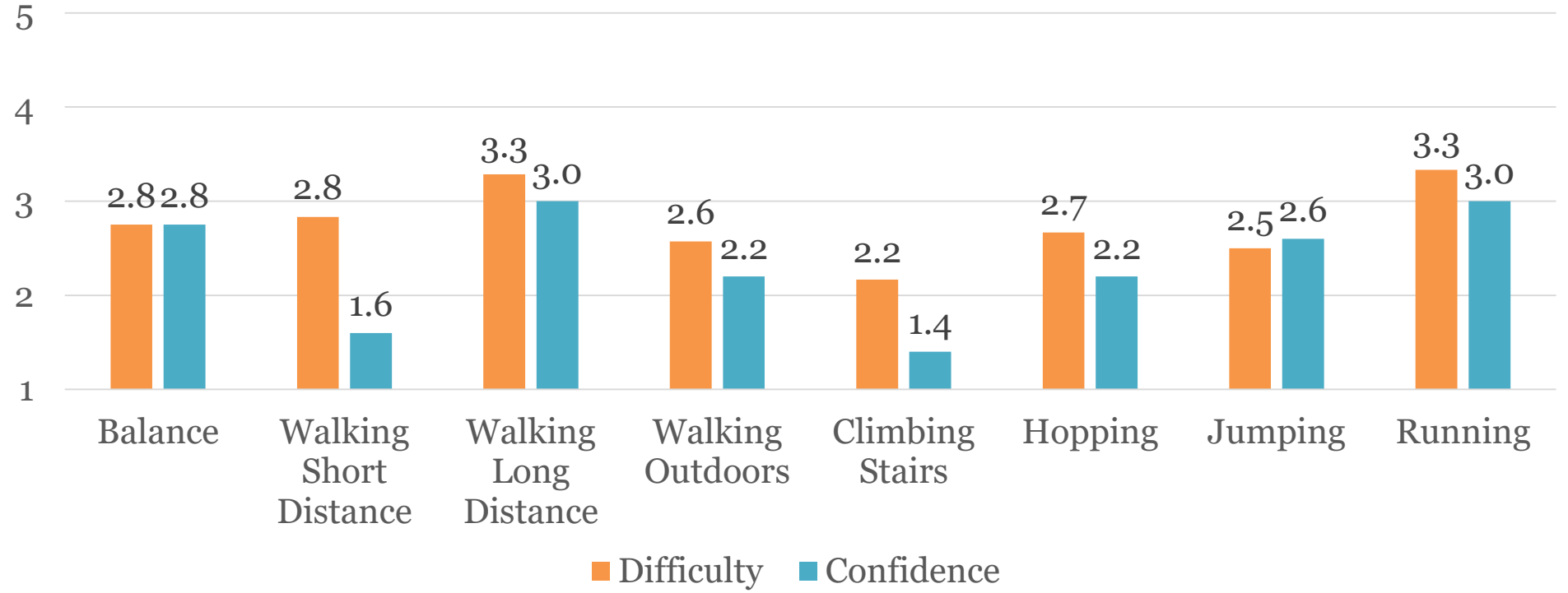


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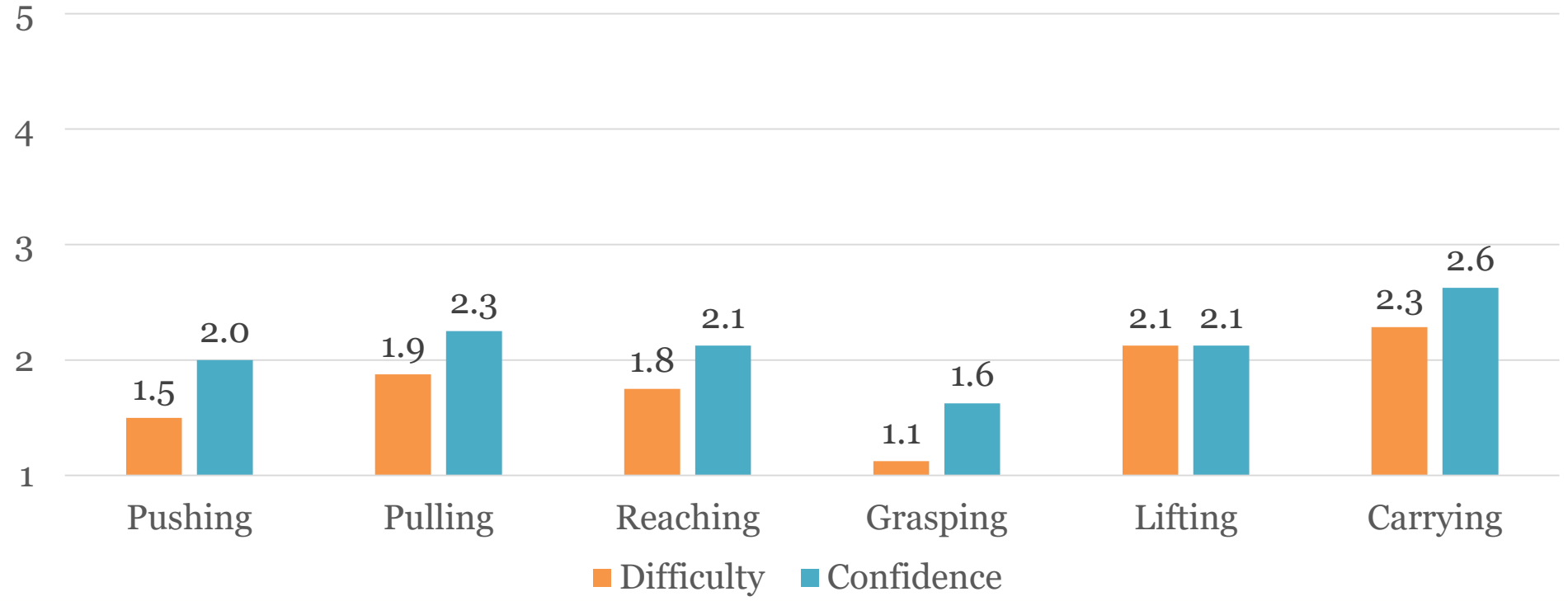
Figure 3. Carrying Moving & Handling Objects Averages



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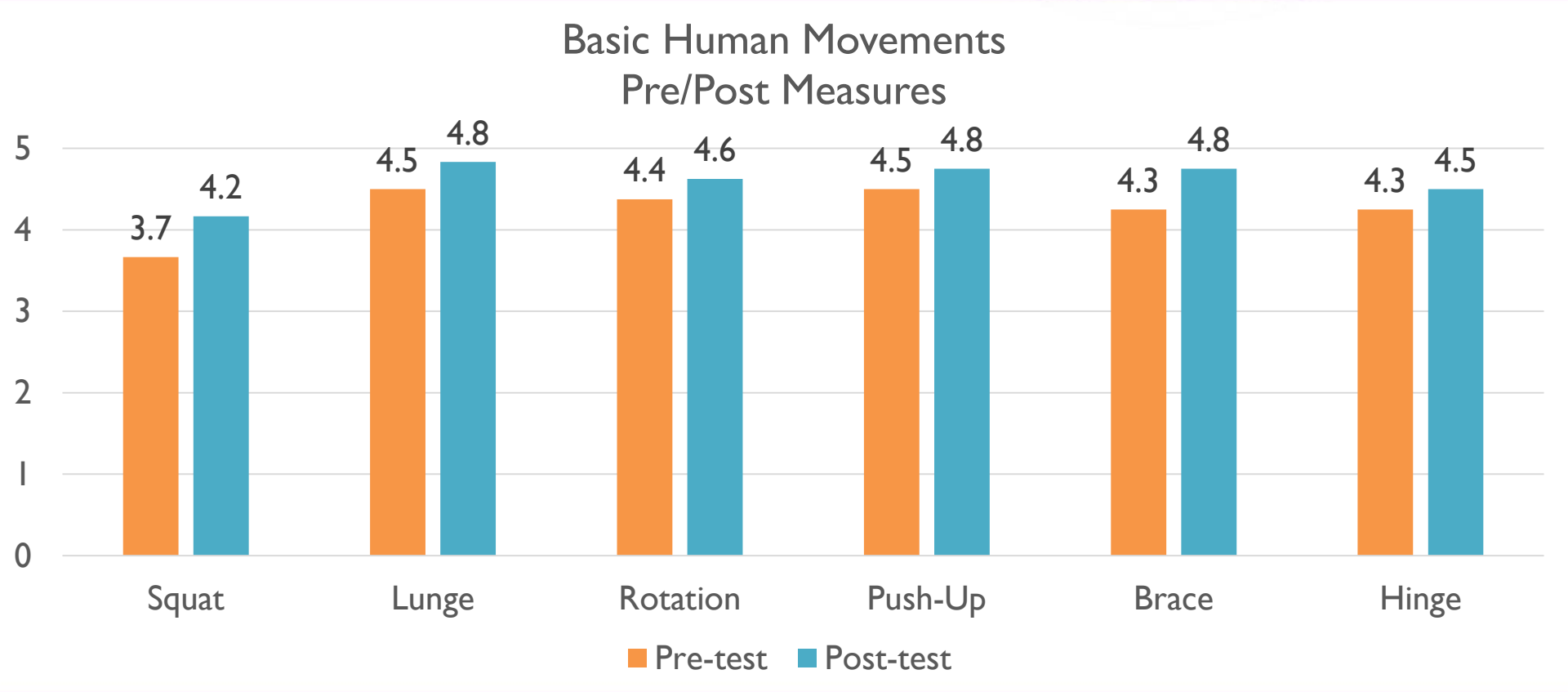
WHOQoL-BREF (N=8)	
Domain	M (SD)
General Quality of Life	4.3 (.5)
Health Satisfaction	3.9 (1.3)
Physical Health Domain	14.3 (1.7)
Psychological Health Domain	15.5 (2.8)
Social Domain	14.5 (1.9)
Environment Domain	16.6 (1.6)

*General Quality of Life and Health Satisfaction scores: 1 = absolute worst, 5 = absolute best. Domain scores: 4 = absolute worst score to 20 = absolute best score. World Health Organization Quality of Life – BREF.

Sport/Exercise Ability (N=8)

Measures	Mean (SD)
Do physical exercises or compete in a sport that requires strength	8.4 (2.9)
Practice a sport that required effort	8.1 (3.0)
Compete in a sport that requires accuracy	7.3 (3.2)
Do physical exercises that require resistance	7.3 (3.3)
Avoid obstacles in a race	7.1 (3.3)
Do physical exercises or compete in a sport that requires coordination	6.7 (3.6)
Do physical exercises or compete in a sport that requires balance	6.4 (3.4)
Do physical exercises or compete in a sport that requires agility	6.3 (3.7)

* 1 = absolute worst, 10 = absolute best



1 = "Absolute worst", 5 = "Absolute best".

Pre

Post

Wheelchair to Walking Canes

Pre

Post

WHOQoL Domains for Case Studies

	Subject 1			Subject 2		
Measures	Pre	Post	% Δ	Pre	Post	% Δ
General QoL	4	4	0	4	4	0
Health Satisfaction	4	4	0	1	4	300
Physical Health	15.4	15.4	0	10.9	16.6	53
Psychological	14	14	0	10.7	16	50
Social Relationships	14.7	13.3	-9	12	14.7	22
Environment	16.5	15.5	-6	15	17.5	17

*General Quality of Life and Health Satisfaction scores: 1 = absolute worst, 5 = absolute best. Domain scores: 4 = absolute worst score to 20 = absolute best score. % Δ = percent change.

Table 15. Sport/Exercise Ability for Case Studies

	Subject 1			Subject 2		
Measures	Pre	Post	% Δ	Pre	Post	% Δ
Practice a sport that required effort	2	10	400	10	10	0
Compete in a sport that requires accuracy	2	10	400	10	10	0
Do physical exercises that require resistance	2	10	400	10	10	0
Do physical exercises or compete in a sport that requires agility	2	9	350	10	10	0
Avoid obstacles in a race	1	10	900	10	7	-30
Do physical exercises or compete in a sport that requires coordination	3	10	233	10	10	0
Do physical exercises or compete in a sport that requires balance	2	10	400	10	10	0
Do physical exercises or compete in a sport that requires strength	2	10	400	10	10	0

* 1 = absolute worst, 10 = absolute best. % Δ = percent change.

Project Goals

- To observe baseline values for:
  - Movement specific perceptions
  - QoL
  - Sport and exercise beliefs
- Measure feasibility
- View changes in basic human movements

Discussion

- Limitations
- Validity

Public Health Physical Activity Competencies

Competency		*Description of Competency*
1	***Population health***	Investigate the impact of physical activity on population health and disease outcomes.
2	***Social, behavioral and environmental influences***	Investigate social, behavioral and environmental factors that contribute to participation in physical activity.
3	***Theory application***	Examine and select social and behavioral theories and frameworks for physical activity programs in community settings.
4	***Developing and evaluating physical activities interventions***	Develop and evaluate physical activity interventions in diverse community settings.
5	***Support evidence-based practice***	Create evidence-based strategies to promote physical activity and communicate them to community stakeholders.

References

- Andrew, GA., Thelma, MJ., Robert , Marc S Goldstein, Janet K Freburger, Ricardo Pietrobon, Sarah C Miller, Leigh F Callahan, Kenneth Harwood, and T. S. C. (20005). OPTIMAL Development Research Report Abstract. *Physical Therapy*, *85*(6), 515–530. Retrieved from http://www.apta.org/OPTIMAL/ResearchReportAbstract/
- APTA. (2012a). *OPTIMAL INSTRUMENT*. Retrieved from www.apta.org/optimal.
- APTA. (2012b). *Scoring of OPTIMAL 1.1*. Retrieved from http://www.apta.org/uploadedFiles/APTAorg/Practice_and_Patient_Care/Practice_Administration/Documentation_and_Records/Documentation/OPTIMAL/OPTIMAL_ScoringInstructions.pdf
- Atkinson, H. L., & Nixon-Cave, K. (2011). *A Tool for Clinical Reasoning and Reflection Using the International Classification of Functioning, Disability and Health (ICF) Framework and Patient Management Model.* Retrieved from http://www.abpts.org/uploadedFiles/ABPTSorg/MOSC/Requirement_3/ABPTS_SampeICFChart.pdf
- Blanchard, S., & Glasgow, P. (2014). A theoretical model to describe progressions and regressions for exercise rehabilitation. *Physical Therapy in Sport*, *15*(3), 131–135. https://doi.org/10.1016/j.ptsp.2014.05.001
- Center for Health Statistics, N. (n.d.). *THE ICF: AN OVERVIEW INTRODUCING THE ICF*. Retrieved from https://www.cdc.gov/nchs/data/icd/icfoverview_finalforwho10sept.pdf
- Crawford, D., Drake, N., Carper, M., DeBlauw, J., Heinrich, K., Crawford, D. A., … Heinrich, K. M. (2018). Are Changes in Physical Work Capacity Induced by High-Intensity Functional Training Related to Changes in Associated Physiologic Measures? *Sports*, *6*(2), 26. https://doi.org/10.3390/sports6020026
- Crossroadsaaa, “Great hike, great work”, August 9, 2017, https://www.instagram.com/p/BXkpdBdDExx/
- Crossroadsaaa, “Fall is in the air!”, August 27, 2017, https://www.instagram.com/p/BYMN_0ojhg3/
- Davis, W. E., & Burton, A. W. (1991). Ecological Task Analysis: Translating Movement Behavior Theory Into Practice. *ADAPTED PHYSICAL ACTIVITY QUARTERLY*, *8*, 154–177. Retrieved from https://pdfs.semanticscholar.org/5847/29420dfbe25e7f11fa369ed2fd70733207ca.pdf
- Elston, B., Goldstein, M., & Makambi, K. H. (2013). Item Response Theory Analysis of the Outpatient Physical Therapy Improvement in Movement Assessment Log (OPTIMAL). *Physical Therapy*, *93*(5), 661–671. https://doi.org/10.2522/ptj.20120120

- Feito, Y., Heinrich, K. M., Butcher, S. J., & Poston, W. S. C. (2018). High-Intensity Functional Training (HIFT): Definition and Research Implications for Improved Fitness. *Sports (Basel, Switzerland)*, *6*(3). https://doi.org/10.3390/sports6030076
- Giles, K. (2006). *Developing Physical Competence: the cornerstone of LTAD-Part One*. Retrieved from https://www.movementdynamics.com/uploads/pdfs/physical-competence.pdf
- Giles K. (2015). Physical Competence Assessment Manual [Internet]. 4th ed. UK: Movement Dynamics; 2015 [cited 2019 Mar 27]. Available from: http://www.lulu.com/shop/kelvin-giles/physical-competence-assessment-manual/paperback/product-22101278.html
- Hawthorne, G., Herrman, H., & Murphy, B. (2006). Interpreting the WHOQOL-Brèf: Preliminary population norms and effect sizes. *Social Indicators Research*, *77*(1), 37–59. https://doi.org/10.1007/s11205-005-5552-1
- Heinrich, K.M., Becker, C., Carlisle, T., Gilmore, K., Hauser, J., Frye, J., & Harms, C. A. (2015). High-intensity functional training improves functional movement and body composition among cancer survivors: a pilot study. *European Journal of Cancer Care*, *24*(6), 812–817. https://doi.org/10.1111/ecc.12338
- Heinrich, KM., Crawford, D. A., Johns, B. R., Frye, J., & Gilmore, K. E. O. (2019). Affective responses during high-intensity functional training compared to high-intensity interval training and moderate continuous training. *Sport, Exercise, and Performance Psychology*, (Advanced online publication). Retrieved from https://psycnet.apa.org/doiLanding?doi=10.1037%2Fspy0000159
- Hutzler, Y. (2007). A systematic ecological model for adapting physical activities: Theoretical foundations and practical examples. *Adapted Physical Activity Quarterly*, *24*(4), 287–304. https://doi.org/10.1123/apaq.24.4.287
- ICF. Geneva:World Health Organization. (2001). Towards a Common Language for Functioning, Disability and Health ICF Towards a Common Language for Functioning, Disability and Health: ICF The International Classification of Functioning, Disability and Health. Retrieved from https://www.who.int/classifications/icf/icfbeginnersguide.pdf
- Khan, F., Amatya, B., & NG, L. (2010). USE OF THE INTERNATIONAL CLASSIFICATION OF FUNCTIONING, DISABILITY AND HEALTH TO DESCRIBE PATIENT-REPORTED DISABILITY: A COMPARISON OF GUILLAIN-BARRÉ SYNDROME WITH MULTIPLE SCLEROSIS IN A COMMUNITY COHORT. *J Rehabil Med*, *42*, 708–714. https://doi.org/10.2340/16501977-0592
- O'Carroll, R. E., Smith, K., Couston, M., Cossar, J. A., & Hayes, P. C. (2000). A comparison of the WHOQOL-100 and the WHOQOL-BREF in detecting change in quality of life following liver transplantation. *Quality of Life Research*, *9*(1), 121–124. https://doi.org/10.1023/A:1008901320492

- Okoro, C. A., Hollis, N. D., Cyrus, A. C., & Griffin-Blake, S. (2018). Prevalence of Disabilities and Health Care Access by Disability Status and Type Among Adults — United States, 2016. *MMWR. Morbidity and Mortality Weekly Report*, *67*(32), 882–887. https://doi.org/10.15585/mmwr.mm6732a3
- Perez, E. (n.d.). *Modified Exercise-Related Self-Confidence (MISEI)*. Retrieved from http://www.uky.edu/~eushe2/Pajares/misei.pdf
- Rimmer, J. H. (2006). Use of the ICF in identifying factors that impact participation in physical activity/rehabilitation among people with disabilities. *Disability and Rehabilitation*, *28*(17), 1087–1095. Retrieved from https://ksu-illiad-oclc-org.er.lib.k-state.edu/illiad/illiad.dll?Action=10&Form=75&Value=938355
- Sallis, J. F., Saelens, B. E., Frank, L. D., Conway, T. L., Slymen, D. J., Cain, K. L., … Kerr, J. (2009). Neighborhood built environment and income: examining multiple health outcomes. *Social Science & Medicine (1982)*, *68*(7), 1285–1293. https://doi.org/10.1016/j.socscimed.2009.01.017
- THE WHOQOL GROUP. (1990). Development of the World Health Organization WHOQOL-BREF Quality of Life Assessment. *Psychological Medicine*, *28*, 551–558.
- Tompsett, C., Burkett, B., & Mckean, M. R. (2015). Comparing Performances of Fundamental Movement Skill and Basic Human Movements: A Pilot Study. *Journal of Fitness Research*, *4*(3), 13–26.
- Tompsett, C., Burkett, B., & McKean, M. R. (2014). Development of Physical Literacy and Movement Competency: a Literature Review. *Journal of Fitness Research*.
- U.S. Department of Health and Human Services. (2018). *Physical Activity Guidelines for Americans 2nd edition*. Washington DC. Retrieved from https://health.gov/paguidelines/second-edition/pdf/Physical_Activity_Guidelines_2nd_edition.pdf
- Washburn, R. A., Zhu, W., Mcauley, E., Frogley, M., & Figoni, S. F. (2002). Surgeon General's Report on Physical Activity and Health, 23 and the 1995 National Institutes of Health Consensus Devel-opment Conference on. *Physical Activity and Cardiovascular Health*, *24*. https://doi.org/10.1053/apmr.2002.27467
- Wilson, P. E., & Clayton, G. H. (2010). Sports and Disability. *PMRJ*, *2*, S46–S54. https://doi.org/10.1016/j.pmrj.2010.02.002
- Wing, C., American College of Sports Medicine., National Center on Health, P. A. and D., & American College of Sports Medicine. (2013). *ACSM/NCHPAD resources for the inclusive fitness trainer*. Retrieved from https://books.google.com/books/about/ACSM_NCHPAD_Resources_for_the_Inclusive.html?id=mPpkmwEACAAJ
- Yazicioglu, K., Yavuz, F., Goktepe, A. S., & Tan, A. K. (2012). Influence of adapted sports on quality of life and life satisfaction in sport participants and non-sport participants with physical disabilities. *Disability and Health Journal*, *5*, 249–253. https://doi.org/10.1016/j.dhjo.2012.05.003

MPH Applied Practical Experience Report

- Kansas State University Lafene Health Center
- Office of Health Promotion

Office of Health Promotion

Mission: to provide leadership in health maintenance (wellness) promotion, and disease and illness prevention for Kansas State University students, staff, faculty and surrounding community members.

Office of Health Promotion

- College Courses:
  - Healthful and Safe College Life – EDCEP 103
  - Peer Health Education and Leadership EDCEP 360
- Presentations
- Smoking Cessation Resources

Office of Health Promotion

- Director: Julie Gibbs
- Tasks
  - Market/educate parents/students regarding K-State vaccination requirements
  - Educate parents about alcohol and drug communication with students
  - Evaluate classes that teach various health topics and peer education
  - Physical Activity Vital Sign (PAVS) on campus (In-Progress)

Applied Practical Experience Competencies

	Competency	Project
3	Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate	EDCEP 103 & 311
4	Interpret results of data analysis for public health research, policy or practice	EDCEP 103 & 311
12	Discuss multiple dimensions of the policymaking process, including the roles of ethics and evidence	Physical activity vital sign
13	Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes	Physical activity vital sign
14	Advocate for political, social or economic policies and programs that will improve health in diverse populations	Physical activity vital sign
16	Apply principles of leadership, governance and management, which include creating a vision, empowering others, fostering collaboration and guiding decision making	Physical activity vital sign
17	Apply negotiation and mediation skills to address organizational or community challenges	Physical activity vital sign
21	Perform effectively on interprofessional teams	EDCEP 103 & 311; Physical activity vital sign