Using FitnessGram to Measure the Impact of 'Lost' Physical Education During the COVID Years

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Abstract: Physical education can play a critical role in helping children establish a foundation for an active lifestyle. There is reason to believe the impact of COVID-19 eliminating compulsory physical education in the K-12 setting only exaspered the problem of increasingly physically unhealthy children in the United States. Much of what kinesiology and public-health scholars know about the fitness level of American youths are based on dated or retrospective data; FitnessGram has emerged as a viable option for revealing the present-day physical health of youth populations. There is clear potential for FitnessGram data to contribute to advancing knowledge about current levels of health-related fitness in youth. In this study, researchers using FitnessGram data from an independent K-12 school district in Texas, USA (ISD) investigated K-12 students' fitness levels and patterns after the COVID-19 pandemic. Results indicate students suffered diminished cardiovascular fitness levels during COVID years (2020-2021), but not diminished strength and endurance or range of motion. Findings from FitnessGram data advocate for *quality* and *compulsory* physical education and movement/physical activity in school settings, as well as the adoption of Comprehensive School Physical Activity Promotion (CSPAP).

Keywords: COVID-19, Fitnessgram, Physical Education, CSPAP, Health-Related Fitness Model, Sport Pedagogy

1. Introduction

It has been well documented that physical activity patterns developed during childhood typically persist into adulthood (Pennington, 2020a; Pennington *et al.*, 2022). Due to evidence of increasingly high levels of adult and childhood obesity in the United States, a renewed effort has been undertaken to identify the etiology of this epidemic (Pennington & Nelson, 2020). Physical education can play a critical role in helping children establish a foundation for an active lifestyle. When teaching in models outside of health-related fitness, teachers tend to use few behaviors aimed at prompting or promoting fitness (Pennington, 2020b). Therefore, it is possible that traditional physical education curricula are deficient in providing the kinds of robust physical activity needed to combat these sedentary behavior trends. In this light, researchers and professional organizations have called for innovative and well-designed physical education activities that achieve health-enhancing fitness.

Health and fitness-related trends in American youth were looking bleak, even before COVID (Kercher, 2021). Nevertheless, there is reason to believe the impact of COVID-19 reducing (or eliminating, altogether) compulsory physical education and physical fitness-enhancing practices in the K-12 setting only exaspered the problem of increasingly physically unhealthy children in the United States. Much of what kinesiology and public-health scholars know about the fitness level of American youth are based on dated or retrospective data (Bai *et al.,* 2015). There is relatively little known about current levels of fitness in Unites States children and adolescents, aside from the well-documented statistics on the prevalence of overweight and obesity (Skinner & Skelton, 2014; Ogden *et al.,* 2012). The Institute of Medicine recently released recommendations for assessments that could be used in a national fitness study as well as recommendations for field-based assessments in school programs (Pillsbury, Oria, & Pate, 2013); the FitnessGram emerged as a viable option for meeting such ends.

1.1 The Fitness Gram

FitnessGram is a comprehensive youth fitness battery developed by The Cooper Institute for use in

school testing (Pluim & Gard, 2018). FitnessGram has been the predominant testing system for school fitness assessment and has been adopted by the Presidential Youth Fitness Program (Corbin *et al.*, 2014). FitnessGram is a digital platform designed to help physical education teachers measure, record, disseminate and analyze the results of school-based student fitness testing; it is widely used in the United States and is spreading to other countries (Pluim & Gard, 2018). According to the FitnessGram web homepage, students participating in the FitnessGram assessment gain a better understanding of their own health-related fitness (n.d.). Schools that include the FitnessGram assessment in their physical education programs are better equipped to meet student fitness needs and teach healthy habits that will last well into the future. Rather than focusing on percentile norms, which rank students against each other, FitnessGram focuses on criterion-referenced standards. These standards, developed by the FitnessGram Advisory Board, determine if a student is at health risk. The goal of FitnessGram is for all children to be in the Healthy Fitness Zone [rather than 'needs improvement' or 'health risk'] in all five components: (1) aerobic capacity, (2) muscular strength, (3) muscular endurance, (4) flexibility, (5) and body composition.

Although FitnessGram has been designed to serve primarily educational goals, there is clear potential for the data to contribute to advancing knowledge about current levels of health-related fitness in youth (Bai *et al.,* 2015). Welk and colleagues (2010) demonstrated that trained teachers can provide reliable and valid fitness data (Welk 2010; Morrow *et al.*, 2010).

1.2 Physical Education During the COVID-19 Pandemic

Due to social distancing and lockdown protocols implemented because of the COVID-19 pandemic of 2020, many physical education teachers were forced to adapt their conventional teaching methods by becoming more adaptable and innovative and putting forth more effort to assist in the transfer of knowledge in a digital modality (Baxter, 2021). Unfortunately, the added time in front of technological devices – and total lack of in-person physical educatio ndelivery- has increased sedentary behavior and decreased physical activity and exercise in *both* teachers and students (Vrbik *et al.,* 2020). Vrbik and colleague's study of 137 high school Croatian boys showed a decrease in physical education class

participation when organized online [similarly to the delivery method in ISD during the COVID-19 lockdown], and a significant decrease of engagement in recreational activities during the lockdown. This can be attributed to the closure of indoor recreational facilities, the overall prevalence of an unproductive state in which it takes a lot of motivation, discipline and will power to simply move, stretch or exercise, and the lack of availability of friends and peers as social components.

The purpose of the research is to: (1) reveal the current health and fitness status of students in the ISD; (2) reveal trends, patterns, and relationships between the specific health and fitness variables measured by FitnessGram; and (3) identify the areas of health and fitness ISD students apparently do NOT independently address in the absence of frequent, face-to-face interaction with physical educators. Additionally, based on the results of this study, the researchers will advocate for *quality* and *compulsory* physical education and movement/physical activity in school settings, and advocate for the integration of Comprehensive School Physical Activity Promotion (CSPAP).

2. Method

2.1 Setting and Participants

Data was collected at an independent K-12 school district in Texas, USA. Purposeful sampling was taken of grades 2-6. First grade was not included as FitnessGram data in not included in state reports thus not collected. Grades 7-12 were not included because physical education is not a compulsory subject in this ISD, thus excluded to limit potentially flawed data.

Included in this study were a total of 1,228 students (Male, N= 608, Female, N= 620).

A breakdown by grade is as follows: 2nd grade (Male, n =136, Female, n= 143); 3rd grade (Male, n= 108, Female, n= 130); 4th grade (Male, n= 99, Females, n= 94); 5th grade (Male, n= 130, Female, n= 112); and 6th grade (Male, n= 135 Female, n= 141).

2.1 Data Collection and Analysis

FitnessGram assesses three general components of health-related physical fitness, which have been identified as important to overall health and function. The components are listed below, with links

to general descriptions of these tests if available. Many test items offer multiple options to choose from.

The following tests were implemented in the study from which quantitate data was derived: *Anthropometric data* (i.e., height and weight); *Aerobic capacity PACER test* (a 20-meter progressive, multi-stage shuttle run set to music); *Muscular strength and endurance*: Curl Up: (abdominal strength and endurance test), Trunk Lift (trunk extensor strength, flexibility, and endurance), Modified Pull-Ups (upper body strength and endurance); and *Flexibility* (back-saver sit-and-reach). Students' performance data of the physical testing battery was measured, collected, separated by biological sex, and analyzed for statical differences.

Data analysis and interpretation were conducted using counts, means, standard deviations, and one-sample t-test statistical analysis to test for statistical differences.

3. Results

3.1 Descriptive Data; Participant Performance Measures

Anthropometric Data Height in Inches and Weight in Pounds. Based on the results of measuring height and weight, it was discovered that the male participants, unsurprisingly, average greater mass and height compared to female participants.

- **2nd Grade.** (Male, n =136, average height = 52 in, SD = 2.58, average weight = 69.3 lbs., SD = 16.95, Female, n= 143, average height = 51.5 in. SD = 2.57, average weight = 66.4 lbs., SD = 19.97).

- **3rd Grade.** (Male, n= 108, average height = 54.9 in, SD = 3.57, average weight = 80.03lbs, SD = 22.05, Female, n= 130, average height = 54.4 in, SD = 3.23, average weight = 80.8 lbs., SD = 23.25).

- **4th Grade.** (Male, n= 99, average height = 56.4, SD = 2.8, average weight = 86.9 lbs., SD = 27.21, Females, n= 94, average height = 56.9, SD = 2.94, average weight = 86.4, SD = 26.9).

- **5th Grade.** (Male, n=130, average height = 57.5 in, SD = 3.6, average weight = 100.7 lbs., SD = 26.5, Female, n= 112, average height = 57.7 in., SD = 3.09, average weight = 104.5 lbs., SD = 33.9).

- **6th Grade.** (Male, n= 135, average height = 51.9 in, SD = 2.17, average weight = 67.89 lbs., SD = 19.08, Female, n=141, average height = 51.9, SD = 3.02, average weight = 67.9lbs, SD = 17.03.

Aerobic Capacity PACER Test in Laps. Based on the results of measuring aerobic capacity, it was discovered that the male participants had slightly more aerobic capacity performing the PACER test, with occasional statistical difference.

- **2nd Grade.** Female participants (n= 144) ran 17 PACER laps; Male participants (n= 141) ran 22 PACER laps; dF= 262; T-stat = -4.09; p-value = 5.62 indicating no significant difference between the male and female PACER results.

- **3rd Grade.** Female participants (n= 147) ran 20 PACER laps; Male participants (n= 125) ran 24 PACER laps; dF= 239; T-stat = -2.48; p-value = 0.013, indicating a significant difference between the male and female PACER results.

- **4th Grade.** Female participants (n= 126) ran 24 PACER laps; Male participants (n= 134) ran 28 PACER laps; dF= 191; T-stat = -1.76; p-value = 0.079, indicating no significant difference between the male and female PACER results.

- **5th Grade.** Female participants (n=131) ran 27 PACER laps; Male participants (n=148) ran 35 PACER laps; dF= 248; T-stat = 3.36; p-value = 0.000 indicating a significant difference between the male and female PACER results.

- **6th Grade.** Female participants (n=122) ran 30 PACER laps; Male participants (n=135) ran 37 PACER laps; dF= 205; T-stat = -2.67; p-value = 0.008 indicating no significant difference between the male and female PACER results.

Abdominal Strength Curl Up Test. Based on the results of measuring abdominal muscular fitness, it was discovered that male participants had slightly more strength and endurance performing the curl up, but with minimal statistical difference.

- **2nd Grade.** Female participants (n= 143) performed an average of 17.4 curl-ups; Male participants (n= 136) performed an average of 17.5 curl-ups; dF=274; T-stat= -0.267; p-

value= 0.789, indicating no significant difference in the curl-up test performance between male and female participants.

- **3rd Grade.** Female (n= 130) and Male (n= 108) participants each performed an average of 19 curl-ups; dF= 236; T-stat= -0.076. p-value= 0.939, indicating no significant difference between male and female participants.

- **4th Grade.** Female participants (n= 94) performed an average of 20 curl ups; Male participants (n=99) performed an average of 23 curl ups; dF= 191; T-stat= 0.317, p-value= 0.75, indicating no significant difference between male and female participants.

- **5th Grade**. Female participants (n= 112) performed an average of 33.4 curl-ups; Male participants n= 130) performed an average of 39.9 curl-ups; dF= 239; T-stat= -2.844; p-value= 0.005, indicating a significant difference between male and female participants.

- **6th Grade.** Female participants (n= 141) performed an average of 17.64 curl ups; Male participants (n= 135) performed an average of 17.35 curl ups; dF= 272; T-stat= 0.338; p-value= 0.735, indicating no significant difference between male and female participants in curl ups.

Upper Body Mobility Trunk Lift Test in Inches. Based on the results measuring upper body mobility, it was discovered that female participants had slightly more flexibility, strength, and endurance.

- **2nd Grade.** The average height reached on the trunk lift for female participants (n= 137) was 9.29, male participants (n= 139) reached 8.58; dF= 274; T-stat= 3.00; p-value= 0.00, indicating a significant statistical difference in the trunk lift performance between female and male participants.

- **3rd Grade.** The average height reached during the trunk lift for female participants (n=126) was 10.7; male participants (n=111) reached 9.5; dF= 235.00; T-stat= 4.39; p-value= 0.00, indicating a statistical difference in the trunk lift performance between female and male participants.

- **4ᵗʰ Grade.** The average height reached during the trunk lift for female participants (n=100)

was 10.41; male participants (n=94) reached 10.47; dF= 192.00; T-stat = -0.25; p-value = 0.80, indicating no statistical difference in the trunk lift performance between female and male participants.

- **5ᵗʰ Grade.** The average height reached during the trunk lift for female participants (n=137) was 10.82; male participants (n=120) reached 11.05; dF= 255.00; T-stat= -1.34; p-value= 0.18, indicating no statistical difference in the trunk lift performance between female and male participants.

- **6th Grade.** The average height reached during the trunk lift for female participants (n=110) was 10.71; male participants (n=104) reached 10.48; dF= 212.00; T-stat = 0.98; p-value= 0.33, indicating no statistical difference in the trunk lift performance between female and male participants.

Upper Body Muscular Strength and Endurance Modified Pull Ups Test. Based on the results measuring upper body muscular fitness, it was discovered that male participants had slightly more strength and endurance with age towards middle school.

- **2ⁿᵈ Grade.** Female participants (n=138) averaged 7.02 modified pull ups; Male participants (n=136) averaged 7.91 modified pull ups; dF= 272; T-stat = -2.03; P value= 0.043, indicating a statistical difference in the modified pull ups between the males and females.

- **3rd Grade.** Female participants (n=130) averaged 5.58 modified pull ups; Male participants (n=110) averaged of 6.8 modified pull ups; dF= 238; T-stat=-1.74; P value= 0.082, indicating no significant difference between male and female participants.

- **4th Grade.** Female participants (n=93) averaged 6.04 modified pull ups; Male participants (n=100) averaged 7.11 modified pull ups; dF=191; T-stat=-1.77; P value= 0.077, indicating no significant difference in modified pull up performance between male and female participants.

- **5th Grade.** Female participants (n=118) averaged 7.5 modified pull ups; Males (n=135) averaged 8.4 modified pull ups; dF= 251; T-stat=-2.15; P value= 0.03, indicating a statical

difference in modified pull up performance between male and female participants.

- **6th Grade.** Female participants (n=106) averaged 8 modified pull ups; Males (n=100) averaged 10.1 modified pull ups; dF= 204, T-stat=-1.93, P value= 0.054, indicating no significant difference in the modified pull ups between male and female participants.

Range of Sit-and-Reach Test in Inches. Based on the results measuring range of motion, it was discovered that female participants had slightly more flexibly capacity performing Sit and Reach test, but with no statistical difference.

- **2nd Grade.** Male participants (n=137) on average reached 9.4 inches with their left leg and 9.37 with their right; female participants (n=140) reached 10.54 with their left and 10.71 with their right. The left leg stats were dF= 272; t-stat= 5.81; p-value= 1.65. The right leg stats were dF= 269; t-stat= 6.97; p-value= 1.18, indicating no significant difference in the Sit and Reach test stats in both the right and left legs between the male and female participants.

- **3rd Grade.** Male participants (n=155) on average reached 8.7 inches with their left leg and 7.25 with their right; female participants (n=117) reached 9.87 with their left and 10.34 with their right. The left leg stats were dF= 214; t-stat= 4.36; p-value= 1.99. The right leg stats were dF= 271; t-stat= -2.67; p-value= 0.04, indicating no significant difference in the Sit and Reach test stats in the left leg, but there was a significant difference in the right leg stats between the male and female participants.

- **4th Grade.** Male participants (n=99) on average reached 9.34 inches with their left leg and 9.73 with their right; female participants

(n=94) reached 9.91 with their left and 9.96 with their right.

- The left leg stats were dF= 191; t-stat= 1.87; p-value= 0.06. The right leg stats were dF= 192; t-stat= 1.00; p-value= 2.99, indicating no significant difference in the Sit and Reach test stats in the left or right leg stats between the male and female participants.

- **5th Grade.** Male participants (n=135) on average reached 10.52 inches with their left leg and 10.5 with their right; female participants (n=119) reached 11.02 with their left and 10.94 with their right. The left leg stats were dF= 250; t-stat= 2.22; p-value= 0.02. The right leg stats were dF= 250; t-stat= 1.82; p-value= 0.07, indicating no significant difference in the Sit and Reach test stats in the right leg, but there was a significant difference in the left leg stats between the male and female participants.

- **6th Grade.** Male participants (n=92) on average reached 11.56 inches with their left leg and 9.90 with their right; female participants (n=108) reached 11.45 with their left and 11.56 with their right. The left leg stats were dF= 211; t-stat= -0.62; p-value= 0.54. The right leg stats were dF= 195; t-stat= 6.93; p-value= 5.76, indicating no significant difference in the Sit and Reach test stats in either the left or right leg between the male and female participants.

3.2 Participant Performance Measures Compared to FitnessGram Healthy Fitness Zone Standards

For each test area, the FitnessGram uses the Healthy Fitness Zone (HFZ) to evaluate fitness performance. The performance goal for all test areas is the HFZ.

Table 1. HFZ Performance Standards in the 20m PACER

	Age	NI–Health Risk	NI	HFZ
Female	10	≤ 37.3	37.4 – 40.1	≥ 40.2
	11	≤ 37.3	37.4 – 40.1	≥ 40.2
	12	≤ 37.0	37.1 – 40.0	≥ 40.1
	13	≤ 36.6	36.7 – 39.6	≥ 39.7
Male	10	≤ 37.3	37.4 – 40.1	≥ 40.2
	11	≤ 37.3	37.4 – 40.1	≥ 40.2
	12	≤ 37.6	37.7 – 40.2	≥ 40.3
	13	≤ 38.6	38.7 – 41.0	≥ 41.1

Table 2. HFZ Performance Standards in the Muscular Strength and Endurance and Range of Motion Tests

Age	HFZ Curl-Up # completed	HFZ Trunk Lift # of inches	HFZ Modified Pull-Up # completed	HFZ Back Saver Sit & Reach # of inches
Female				
7	≥4	6 – 12	≥ 3	9
8	≥6	6 – 12	≥ 4	9
9	≥9	6 – 12	≥ 4	9
10	≥12	9 – 12	≥ 4	9
11	≥15	9 – 12	≥ 4	10
12	≥18	9 – 12	≥ 4	10
13	≥18	9 – 12	≥ 4	10
Male				
7	≥4	6 – 12	≥ 3	8
8	≥6	6 – 12	≥ 4	8
9	≥9	6 – 12	≥ 5	8
10	≥12	9 – 12	≥ 5	8
11	≥15	9 – 12	≥ 6	8
12	≥18	9 – 12	≥ 7	8
13	≥21	9 – 12	≥ 8	8

The Needs Improvement (NI)-Health Risk zone is for students who score below NI. The symbol '≥' indicates a score is greater than or equal to the indicated value; ≤ indicates a score is less than or equal to the indicated value. Tables 1-4 indicate the FitnessGram HFZ standards for the variables measured in the present study.

For the purposes of data interpretation and association of 'age' and 'grade', age 7-8 is associated with Grade 2; age 8-9 is associated with Grade 3; age 9-10 is associated with Grade 4; age 10-11 is associated with Grade 5; age 11-12 is associated with Grade 6. Data for age 13 is included for the reader to further analyze due to the potential of Grade 6 including students at age 13.

FitnessGram uses the Healthy Fitness Zone. Students at age 9 with time or laps reported are compared to the HFZ for students age 10. Because of a lack of standardization for earlier ages and grades, the data collected can only be interpreted for participants of Grades 4-6.

Concerning the results of Grade 3 in the observed participants, both Female and Male participants (completing an average of 20 and 24 laps, respectively) fell well below the HFZ standards and are categorized as in the NI-Health Risk category.

Concerning the results of Grade 4 in the observed participants, both Female and Male participants (completing an average of 24 and 28 laps, respectively) fell well below the HFZ standards and are categorized as in the NI-Health Risk category.

Concerning the results of Grade 5 in the observed participants, both Female and Male participants (completing an average of 27 and 35 laps, respectively) fell well below the HFZ standards and are categorized as in the NI-Health Risk category. However, Male participants are closely approaching the NI category. Concerning the results of Grade 6 in the observed participants, both Female and Male participants (completing an average of 30 and 37 laps, respectively) fell well below the HFZ standards and are categorized as in the NI-Health Risk category. However, Male participants are closely approaching the NI category.

Curl Up Test. Concerning the results of Grade 2 in the observed participants, both Female and Male participants (completing an average of 19 curl ups) were significantly above the HFZ standards. Concerning the results of Grade 3 in the observed participants, both Female and Male participants (completing an average of 17.4 and 17.5 curl ups,

respectively) were significantly above the HFZ standards. Concerning the results of Grade 4 in the observed participants, both Female and Male participants (completing an average of 20 and 23 curl ups, respectively) were significantly above the HFZ standards. Concerning the results of Grade 5 in the observed participants, both Female and Male participants (completing an average of 33.4 and 33.9 curl ups, respectively) were significantly above the HFZ standards. Concerning the results of Grade 6 in the observed participants, both Female and Male participants (completing an average of 17.6 and 17.35 curl ups, respectively) were very near the HFZ standards.

Trunk Lift Test. Concerning the results of Grade 2 in the observed participants, both Female and Male participants (performing an average of 9.29 and 17.5 lift inches, respectively) were both within the HFZ standards. Concerning the results of Grade 3 in the observed participants, both Female and Male participants (performing an average of 10.7 and 9.5 lift inches, respectively) were both within the HFZ standards. Concerning the results of Grade 4 in the observed participants, both Female and Male participants (performing an average of 10.41 and 10.47 lift inches, respectively) were both within the HFZ standards. Concerning the results of Grade 5 in the observed participants, both Female and Male participants (performing an average of 10.82 and 11.05 lift inches, respectively) were both within the HFZ standards. Concerning the results of Grade 6 in the observed participants, both Female and Male participants (performing an average of 10.71 and 10.48 lift inches, respectively) were both within the HFZ standards.

Modified Pull Up Test. Concerning the results of Grade 2 in the observed participants, both Female and Male participants (performing an average of 7.02 and 7.91 modified pull ups, respectively) were both above the HFZ standards. Concerning the results of Grade 3 in the observed participants, both Female and Male participants (performing an average of 5.58 and 6.8 modified pull ups, respectively) were both above the HFZ standards. Concerning the results of Grade 4 in the observed participants, both Female and Male participants (performing an average of 6.04 and 7.11 modified pull ups, respectively) were both above the HFZ standards. Concerning the results of Grade 5 in the observed participants, both Female and Male participants (performing an average of 7.5 and 8.4 modified pull ups, respectively) were both above the

HFZ standards. Concerning the results of Grade 6 in the observed participants, both Female and Male participants (performing an average of 8 and 10.1 modified pull ups, respectively) were both above the HFZ standards.

Sit and Reach Test. Concerning the results of Grade 2 in the observed participants, both Female and Male participants (performing an average of 9.4 and 10.54 sit and reach inches, respectively) were both above the HFZ standards. Concerning the results of Grade 3 in the observed participants, both Female and Male participants (performing an average of 8.7 and 9.87 sit and reach inches, respectively) were both above the HFZ standards. Concerning the results of Grade 4 in the observed participants, both Female and Male participants (performing an average of 9.34 and 9.91 sit and reach inches, respectively) were both above the HFZ standards. Concerning the results of Grade 5 in the observed participants, both Female and Male participants (performing an average of 10.52 and 11.02 sit and reach inches, respectively) were both above the HFZ standards. Concerning the results of Grade 6 in the observed participants, both Female and Male participants (performing an average of 11.56 and 11.45 sit and reach inches, respectively) were both above the HFZ standards.

4. Discussion

There is evidence participants of the observed population are lower-performing in tests of aerobic capacity compared to the Fitness Gram HFZ standards. Without being able to compare the results of the same participant group from PACER tests in years prior to COVID-19, as well as other unobservable variables, it is impossible to definitely suggest that poor performance in the PACER test is directly attributable to reduced compulsory physical education during the COVID-19 pandemic. Nevertheless, The PACER test results suggest as children age, boys in the observed groups tend to have a statistically significantly higher performance in the PACER than girls. Based on these results, youth health and fitness professionals/practitioners can deduce that the male students will have a higher aerobic capacity in comparison to the female participants. This can be applied to compulsory school physical education. By understanding the limitations of each sex, the educator can set relative goals for each gender from day-to-day class to end-of-year benchmark achievements to develop students towards the Fitness Gram HFZ.

Reasons for participant performance in the curl up being significantly higher than HFZ is unknown. Further investigation of the curl up administration is warranted. Nevertheless, the results suggest that participants' abdominal strength and endurance was not negatively affected by the lack of compulsory physical education during the COVID-19 pandemic. Curl up results suggest that males and females in most elementary grades are very similar in the number of curl-ups they can complete. Youth health and fitness professionals and practitioners should include training for both upper and lower body in all age groups as a fitness priority.

Reasons for participant performance in the trunk lift being within than HFZ is unknown. Results suggest that participants' trunk extensor range of motion was not negatively affected by the lack of compulsory physical education during the COVID-19 pandemic. Trunk lift results suggest that youth health and fitness professionals and practitioners should expect to see a significant sex difference of trunk extensor strength in early elements grades, with the strength of that difference weaking as student's age towards middle school. Based on these results, physical educators should prioritize activities that promote flexibility and range of motion.

Reasons for participant performance in the modified pull up being within than HFZ is unknown. Results suggest that participants' upper body strength and endurance was not negatively affected by the lack of compulsory physical education during the COVID-19 pandemic. Modified pull up results from this study suggest that there are typically no significant differences between the females and males while performing modified pull-ups. Observation of a significant discrepancy would come after the age of puberty.

Reasons for participant performance in the sit and reach test being within or above the HFZ is unknown; as is the case will all the results, participant motivation was not measured in this study. Results suggest that participants' range of motion was not negatively affected by the lack of compulsory physical education during the COVID-19 pandemic. Sit and Reach results suggest that male and female participants are statically similar in their results within respective grade groups. Typically, older students and females have higher performance than males. Based on these results, professionals such as physical education teachers should focus more on increasing flexibility in the lower extremities of their students to decrease lower back pain when they get older.

4.1 Comprehensive School Physical Activity Promotion

One approach to quickly rebounding from the negative health effects of COVID-19 reducing or eliminating typical physical education classes is for the entire school to enact a school-wide emphasize on health and wellness. Comprehensive school physical activity promotion programs (CSPAP) could be a response to many health-related challenges in K-12 schools (Pennington et al., 2022). To be successful, CSPAP must contain certain components in its implementation. For example, (1) achieving student moderate-to-vigorous physical activity (MVPA) is a main focus; (2) physical activity is pursued throughout the school day, before and/or after school and at recess; (3) a full staff buy-in must occur; and (4) family and community must be engaged. It would be difficult for the CSPAP champion – the physical educator - to achieve success if any one element is missing from the program. If physical educators are to embrace the role of CSPAP champion, they must receive training in their physical education-teacher education (PETE) professionalization (Webster *et al.,* 2015).

Many PETE scholars have claimed preservice teachers do not receive adequate training in addressing/or promoting MVPA (McKenzie, 2007). Webster and colleagues (2016) recommended that preservice teachers and physical education teachers increase their knowledge of health and fitness content (including related knowledge in nutrition, nursing, and/or psychology) *beyond* sport and physical education and increase their knowledge in physical activity promotion. Interaction with scholars and practitioners of nutrition and emotional/psychological wellbeing, for example, would *further* prepare PETE students for their roles as physical educators and/or CSPAP champions.

5. Conclusion

The body of research investigating the relationships between physical activity and psychological and emotional health make it clear that advancing the physical health of an individual will consequently positively affect the individual physiologically and emotional, as well as they are so deeply intertwined – if not casual. Such links between physical movement and mental and

psychological/emotional health suggest a positive relationship exists between movement, physical health, and thus mental health, and this association between mental health and physical activity behaviors occurs regardless of gender. As has been well documented, there is an intense need to increase individuals' physical activity and movement opportunities, and this could occur in designated school-wide programs like that of CSPAP.

Participants provided consent at the onset of the study and approval was granted by the Institutional Review Board.

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Conflict of interest
The author declare no conflict of interest.

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