Lehman College
City University of New York

Office of Academic Programs and Educational Effectiveness Guidelines for Academic Program Review (Revised 2020 Spring)

Self-Study

The self-study encourages faculty and staff to analyze the overall effectiveness and quality of the program. Specifically, the self-study should look back over the past 5 years (or since the most recent program review) and, utilizing qualitative and quantitative data, address:

1. The relation of the program to the College's mission, vision, and goals: addressing such questions as how the program *educates*, *empowers*, and *engages* students and contributes to achieving the College's *Institutional Learning Goals*; how the program advances 90x30; and, how the program integrates the College's *Strategic Plan*.

2. The program's curriculum in relation to desired outcomes: addressing such questions as how the program compares to comparable programs and/or norms established by relevant professional organizations; how the program ensures students can achieve program learning goals; how the program assesses student learning; how the program collaborates with/supports other programs within the College; how the program considers and addresses student perceptions and expectations.

3. The faculty's activities in scholarship, teaching and professional service, including faculty development and pedagogical innovations.

4. The program's use of assessment for continuous improvement.

5. Future directions for the program, based on an analysis of the program's current strengths and weaknesses, external opportunities and obstacles, forecasts for the program's field, and changes implemented since the last program review. A plan and timeline for the next 5-year period should be developed.

Section 1: The relation of the program to the College's mission, vision, and goals: addressing such questions as how the program educates, empowers, and engages students and contributes to achieving the College's Institutional Learning Goals; how the program advances 90x30; and how the program integrates the College's Strategic Plan.

The borough of the Bronx ranks as the poorest borough of New York City and the second poorest county in New York State. Ranked near the bottom 5% of counties in the nation for economic mobility for children in poor families. The Bronx also lags in educational attainment, with only 26.1% of residents aged 25 to 64 having more than high school diplomas, compared to 43.4% statewide and 34.7% nationally. Additionally, the proportion of the Bronx population that is Hispanic (56.4%) is double that of New York City (29.1%) and three times that of New York State overall (19.2%) (U.S. Census, 2019). Lehman's enrollment reflects its location; 57% of Lehman students are Hispanic/Latina and 27% are African Americans/Blacks

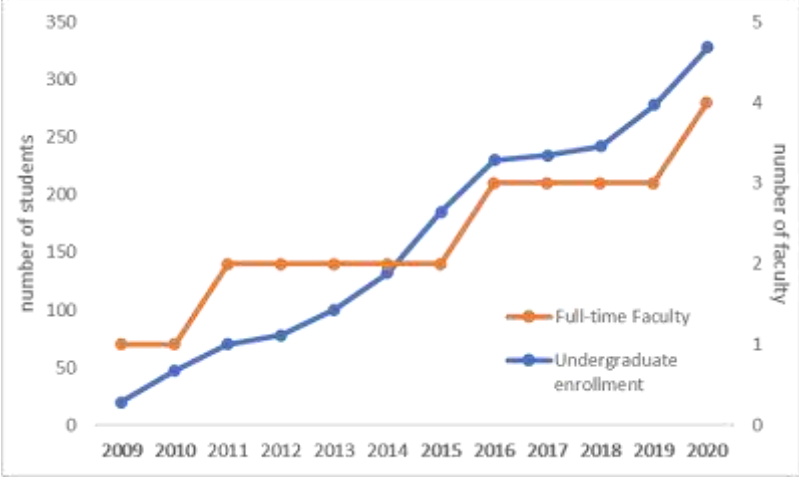
The College is committed to serving as an engine of upward mobility by providing opportunities for applied and experiential learning and career engagement for its students. The Exercise Science program at Lehman College aims to fulfill the mission of the college, to serve the Bronx and the surrounding community, as well as to offer a research supported education that embraces diversity of our students and encourages their personal and academic development. The need for applied learning is especially acute in the Hispanic community and CUNY Institute for Health Equity (CIHE) is poised to play an important role in increasing faculty and student research engagement that promotes student retention throughout the college. Providing students in the Bachelor of Science in Exercise Sciences program access to research opportunities through the CUNY Institute for Health Equity will promote health equity while minimizing health disparities among citizens of the Bronx and beyond.

In addition, the program strives to contribute to the college's 90x30 initiative "to educate more members of our community, helping to provide the means for economic

mobility, thereby uplifting the communities in which we all live". The Exercise Science program achieves these aims by increasing the number of students we educate while maintaining a relatively low student to teacher ratio. The program also provides options for students by offering 2 different degree paths within the major, but also offers classes to non-majors to enhance their knowledge and prepare them for life outside of academics. As a whole, the Exercise Science program meets the college's vision, and strives to continually improve in our ability to optimally educate students in the program.

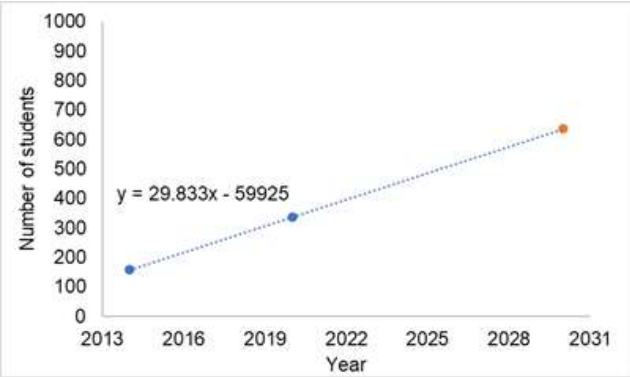
The Exercise Science program at Lehman college is relatively new; however, it has grown quickly to meet the demands of our students. The Exercise Science program was developed by Dr. Gul Sonmez and began student enrollment for our bachelors in Exercise and Movement Science in 2009 with 20 students and only a single full time faculty member. Due to enthusiasm for the program, an additional major, Pre-Physical Therapy was added in 2012 after Dr. Brad Schoenfeld joined the department as a substitute lecturer the previous year. By 2014, there were 2 full-time faculty Dr. Sonmez and Dr. Schoenfeld, and 2 adjunct instructors serving 132 students. This broke out to ~65 students per full-time faculty member. The 2 adjunct instructors were serving 91 total students, with about 45 students per adjunct instructor.

Figure 1. This figure shows the student enrollment each fall compared to full-time faculty within the exercise science program.



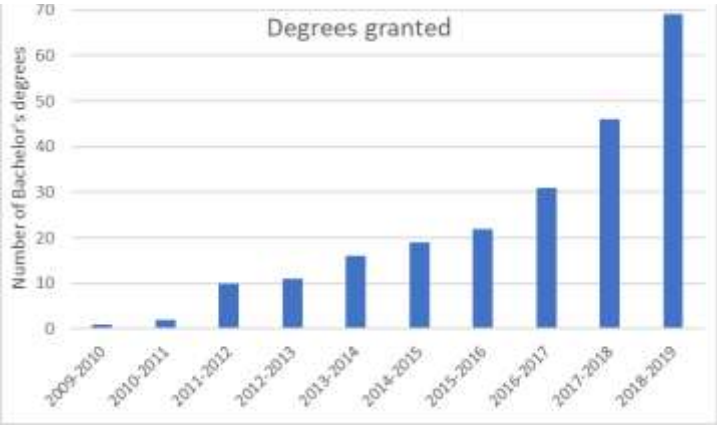
Our department has grown to currently have 338 undergraduate students enrolled in our department among the majors of Pre-Physical Therapy (208 students), and Exercise and Movement Science (117 students) (see figure 1 above). In the Fall of 2019, Exercise Science was the second largest program in the Health Sciences Department. By adding 2 additional full-time faculty, Dr Andrew Alto and Dr. Douglas Oberlin by Fall 2020, we have maintained the ratio of students to faculty fairly closely (about 85 students per full-time faculty) **(see figure 1**). This is in keeping with the college's vision of maintaining small class sizes with close interaction between students and faculty. To this end we also now have 8 adjunct instructors helping teach classes, thus maintaining approximately 42 students per adjunct instructor. The increased rate of enrollment in our department is also in line with the college's 90x30 initiative. Our department's student body has grown by 113%, more than double the number of students enrolled in 2014. If our growth continues at this rate, by 2030 we could be serving up to 600 or more students **(see figure 2).**

Figure 2. This figure shows the projected student enrollment in exercise science if current trends were maintained.



In the 2014-2015 academic year, 19 degrees were granted, which increased to 69 degrees by the 2018-2019 academic year **(see figure 3).**

Figure 3. This shows the number of degrees granted within exercise science across academic years.



Additionally, more than half of our students (55.9%) of our students are from the Bronx. This is also in line with the 90x30 initiative to "boost educational attainment rates in the Bronx", as well as the college's mission to "serve the Bronx and surrounding region as an intellectual, economic, and cultural center". The popularity of the majors offered within Exercise Sciences, as well as the newly offered master's degree, is evidence that the department is fulfilling the mission of the college, providing undergraduate and graduate studies and actively engaging students in their academic, personal, and professional development. This rapid growth also contributes to the 90x30 initiative, as it offers additional routes for students to earn degrees, climb the economic ladder, and enhance the communities where students and alumni live and work.

The increase in student enrollment and graduation rate has not led to a decline in the quality of pedagogical outcomes. The department routinely tests its incoming and outgoing students to determine how much is learned and retained throughout the students' education through the program assessment every academic year. The graduates from our program are set to enter a growing job market. According to data from the Bureau of Labor Statistics, the number of jobs is projected to grow 11% for exercise physiologists, 15% for fitness trainers and instructors, 16% for athletic trainers, 18% for physical therapists, and 29% for physical therapist assistants between 2019

and 2029 (https://www.bls.gov/ooh/healthcare/). This contributes to the 90x30 initiative "increasing the number of residents with a postsecondary education leading to reduced unemployment and higher wages". This is also in line with the college's values "contributing to individual achievement and the transformation of lives and communities" as our alumni move into the workforce.

In addition to Exercise Science majors, the Exercise Science program offers EXS 260, 264, and 265 as introductory courses available to non-majors and electives to the programs under the Department of Health Sciences. These courses offer credits to students in other degree programs and provide them general knowledge about exercise, physical activity, behavior change, and health. This is in line with the college's vision "to prepare students to live and work in the global community", as it prepares students to leave school with the knowledge to maintain a healthy and fulfilling life. This is consistent with our college's values of providing an education that transforms lives and communities, and a natural outgrowth of the 90x30 initiative because increasing the number of residents with a postsecondary education leads to improved physical and mental health of the communities in which educated citizens live. This is particularly impactful in the Bronx, which has higher rates of inactivity and obesity, as well as related diseases such as diabetes and coronary heart disease compared to the rest of the state or country (https://tinyurl.com/y7cz4pen). Therefore, the exercise science program at Lehman college promotes improved physical and mental health throughout our community, even though students who are not within one of the program's majors.

Section 2: The program's curriculum in relation to desired outcomes: addressing such questions as how the program compares to comparable programs and/or norms established by relevant professional organizations; how the program ensures students can achieve program learning goals; how the program assesses student learning; how the program collaborates with/supports other programs within the College; how the program considers and addresses student perceptions and expectations.

The Exercise Science program at Lehman College is on par with similar exercise science, sport science, and kinesiology programs at universities around the country. We've compared our program to local alternatives as well as national contemporaries to assess how well our curriculum compares to other accredited institutions **(see table 1)**. We've selected other CUNY schools that offer similar programs as well as a local university to compare with the Exercise Science program at Lehman College. In addition, we have chosen several schools from around the country which are highly ranked for their quality and/or affordability to compare with the Exercise Science program at Lehman College.

Lehman college stands out from our CUNY sister programs by offering a bachelors in Exercise and Movement Science which covers essential exercise science curriculum but goes above and beyond to ensure our students understand how to use their understanding of exercise science to train athletes for optimal performance. Lehman college also offers a Pre-Physical Therapy bachelor's degree which is similar to the Pre-Health Professions degree from Brooklyn College. However, the Brooklyn College degree is more generalized while the Pre-Physical Therapy degree at Lehman College gives additional instruction around biomechanics, as well as behavioral change and exercise prescription. While there are differences in the programs offered at Lehman college and these other institutions, they are of similar quality, offering strong foundational knowledge as well as specialty knowledge in specific core areas.

Table 1. This table shows the colleges/programs that were used as a comparison for the exercise science program at Lehman College.

College	Lehman College	Queens College	Brooklyn College	Montclair State University	University of Illinois	University of Georgia	University of North Carolina	Michigan State University	University of South Florida
Department	Exercise Science	Nutrition and Exercise Science	Kinesiology	Exercise Science and Physical Education Department	Kinesiology	Kinesiology	Exercise and Sport Science	Kinesiology	Exercise Science
Program(s)	Exercise and movement science **And** Pre-Physical Therapy	Nutrition and Exercise Science	Fitness Professional **And** Pre-Health Professions	Exercise Science, Pre-professional and clinical **And** Exercise Science, sports conditioning	Kinesiology	Exercise and Sport Science	Exercise and Sport Science **And** Fitness Professional	Kinesiology	Exercise Science
Relationship	Our program	Alternative CUNY school		Local Alternative University	Nationally ranked college for exercise science program by quality and/or affordability				

When comparing foundational educational requirements, our sister schools as well as our local contemporary are all similar **(see table 2).** All of these programs for exercise professionals require a foundational course in biology, chemistry, anatomy, and physiology. Some programs or majors also require a physics course. Indeed, there are few differences to discuss among other CUNY schools or Montclair State University. Queens College requires more chemistry than other programs, which is due to their emphasis on nutrition as well as exercise. It is notable that the Pre-Physical Therapy major at Lehman college does require a greater foundation in both chemistry and physics compared to either Brooklyn College's pre-health professions major or Montclair State University's pre-professional and clinical major. Lehman College requires as much, if not more, foundational courses than our local peers to ensure that our students are prepared for their major course requirements.

Table 2. This table shows the prerequisite requirements for each of the local exercise science programs.

College	Lehman College		Queens College	Brooklyn College		Montclair State University	
Department	Exercise Science		Nutrition and Exercise Science	Kinesiology		Exercise Science and Physical Education Department	
Program(s)	Exercise and movement science	Pre-Physical Therapy	Nutrition and Exercise Science	Fitness Professional	Pre-Health Professions	Exercise Science, Pre-professional and clinical	Exercise Science, sports conditioning
Anatomy or A&P1	BIO181	BIO181	BIO40	KINS3281	KINS3281	BIOL244	BIOL244
Anatomy or A&P1 Lab	BIO181L	BIO181L	BIO40L	KINS3281L	KINS3281L	BIO244L	BIO244L
Physiology or A&P2	BIO182	BIO182	BIO41	KINS3285	KINS3285	BIOL245	BIOL245
Physiology or A&P2 Lab	BIO182L	BIO182L	BIO41L	KINS3285L	KINS3285L	BIO245L	BIO245L
Chemistry 1	CHE114	CHE166	CHEM101 3	CHEM1100	CHEM1100	CHEM120	CHEM113
Chem 1 Lab	CHE115	CHE167	CHEM101 1	CHEM1100L	CHEM1100L	CHEM120L	CHEM113L
Chemistry 2		CHE168	CHEM102 3		CHEM2100		
Chem 2 Lab		CHE169	CHEM102 1		CHEM2100L		
Chemistry 3			CHEM103 3				
Chem 3 Lab			CHEM103 1				
Physics 1		PHY166		PHYS1100	PHYS1100	PHYS193	
Physics 2		PHY167			PHYS2100		

We also compared our program to the foundational requirements found in curricula around the country **(see table 3).** Again, Lehman College offers a comparable foundational curriculum compared to some of the best national programs. This ensures that Lehman College graduates are well prepared to enter the job market alongside graduates from any other national program.

Table 3. This table shows the prerequisite requirements for each of the national exercise science programs

College	Lehman College		University of Illinois	University of Georgia	University of North Carolina		Michigan State University	University of South Florida
Department	Exercise Science		Kinesiology	Kinesiology	Exercise and Sport Science		Kinesiology	Exercise Science
Program(s)	Exercise and movement science	Pre-Physical Therapy	Kinesiology	Exercise and Sport Science	Exercise and Sport Science	Fitness Professional	Kinesiology	Exercise Science
Anatomy or A&P1	BIO181	BIO181	MCB244	CBIO2200	EXSS175	EXSS175	KIN216	BSC2085
Anatomy or A&P1 Lab	BIO181L	BIO181L	MCB245	CBIO2200L	EXSS275L	EXSS275L		BSC2085L
Physiology or A&P2	BIO182	BIO182	MCB246	CBIO2210	EXSS276	EXSS276	PSL250	BSC2086
Physiology or A&P2 Lab	BIO182L	BIO182L	MCB247	CBIO2210L			PSL250L	BSC2086L
Chemistry 1	CHE114	CHE166		CHEM1211		CHEM101	CEM141	CHM2045
Chem 1 Lab	CHE115	CHE167		CHEM1211L		CHEM101L	CEM161	CHM2045L
Chemistry 2		CHE168		CHEM1212				
Chem 2 Lab		CHE169		CHEM1212L				
Physics 1		PHY166		PHYS1111				
Physics 1 Lab				PHYS1111L				
Physics 2		PHY167						

When examining the major courses within the program, Lehman College's Exercise Science program's major course requirements are similar to those of other CUNY schools and local universities **(see table 4).** The standard curriculum for all programs contains introductory courses to teach basics of exercise science and behavior modification, biomechanics and motor learning, exercise physiology, exercise

prescription, and internship opportunities. The exercise science program at Lehman College stands out for its focus on strength and conditioning, application of training principles and program planning, and understanding exercise science research. The knowledge obtained in the accompanying coursework allows our students to be competitive in the job market and prepares them for attaining quality certifications. Lehman College offers a greater focus on basic exercise and training curriculum compared to Queens College, which has a nutrition focus. It should be noted that Lehman College does offer a course in Sports Nutrition, which is required for students in the Exercise Science major. In addition, the Dietetics, Foods, and Nutrition program within the Department of Health Sciences offers comparable courses for the interested exercise science student.

Lehman College's major curriculum has a greater focus on more basic exercise science, and the proper application of scientific principles to the development of training compared to the program at Brooklyn College. Brooklyn College does not require some of the training application and research methods coursework that Lehman College requires for majors. Alternatively, Lehman College does not require first aid or sport psychology required by Brooklyn College's program; however, Lehman College students have access to HEA 303 Safety Education, Accident Prevention, and First Aid, which also culminates in an American Red Cross Heartsaver Certificate.

Table 4. This table shows the core curriculum from local colleges.

College	Lehman College		Queens College	Brooklyn College		Montclair State University	
Department	Exercise Science		Nutrition and Exercise Science	Kinesiology		Exercise Science and Physical Education Department	
Program(s)	Exercise and movement science	Pre-Physical Therapy	Nutrition and Exercise Science	Fitness Professional	Pre-Health Professions	Exercise Science, Pre-professional and clinical	Exercise Science, sports conditioning
Fitness industry management				KINS4400			
Intro to Exercise	EXS264	EXS264		KINS3000	KINS3000	HLTH101	HLTH101
Behavioral Aspects of PA	EXS265	EXS265				PEMJ131	PEMJ131
Biomechanics	EXS315	EXS315	FNES341	KINS4250		PEMJ321	PEMJ321
Motor Learning	EXS316	EXS316	FNES340		KINS3295	PEMJ324	PEMJ324
Exercise Physiology 1	EXS323	EXS323	FNES342	KINS4200	KINS4200	EXSC320	EXSC320
Exercise Physiology 1 Lab				KINS4200W	KINS4200W		
Exercise Physiology 2	EXS423	EXS423	FNES352	KINS4510			
Exercise Prescription	EXS326	EXS326	FNES353	KINS4402		EXSC331	EXSC331
Strength and conditioning	EXS425	EXS425		KINS4520			EXSC420
Research Methods and Statistics	EXS430	EXS430				EXSC255	EXSC255
Sports Nutrition	EXS342		FNES361				
Nutrition for the exercise professional			FNES362				
Fitness and Wellness Programing	EXS424						HPEM356
Application of training Principles	EXS427						EXSC476
Nutrition 1			FNES263		HNSC1200	NUFD182	
Nutrition 2			FNES264				
Nutritional counseling			FNES337				
Foundations of cardiac rehab						EXSC475	
Weight management			FNES230				
Stress, health, and disease							
First Aid and Safety				KINS3005	KINS3005	HPEM150	HPEM150
Exercise in diverse populations						EXSC430	
Exercise /Sport psychology				KINS4500			
Aerobic training							PEXSC233
Anaerobic training						PEMJ234	PEMJ234
Internship 1	EXS470	EXS470		KINS4760	KINS4760		EXSC480
Internship 2	EXS471	EXS471					

Montclair State University has a similar curriculum to Lehman College. Within their sports conditioning major, they divide out aerobic and anaerobic training into 2 separate classes. This is unlike Lehman College's exercise and movement science major, which requires more exercise physiology and sports nutrition coursework. Additionally, the program at Lehman College encourages more hands-on experience by requiring a second internship that Montclair State University does not. When comparing Lehman College's pre-physical therapy major to Montclair State University's pre-professional and clinical major, Lehman's students have more training in exercise physiology and strength and conditioning. Montclair State University students spend more time in general nutrition, cardiac rehab specific classes, and diverse populations classes. However, the Montclair State University students are not required to perform an internship while Lehman College students must complete 2 internship courses. This gives Lehman College Pre-Physical Therapy students more hands-on learning experience.

Comparing the major course curriculum across all of these programs is difficult as each program has slightly different goals in how students are trained. Although, there is significant overlap as all programs prioritize certain introductory classes, movement classes, physiology classes, and application classes. While Lehman College exercise science majors are not identical to any other program, they cannot be said to be inferior.

We have also compared the major curriculum within the Exercise Science program at Lehman College to other national programs **(see table 5)**. Our program emphasizes similar coursework to comparable degree programs, including courses introducing exercise science, promoting behavioral modification, understanding human biomechanics and motor learning, understanding the physiologic underpinnings of exercise and training, and implementing training for aerobic and anaerobic performance within diverse populations.

The curriculum at Lehman College is particularly strong in its focus on exercise physiology, strength and conditioning, application of training principles, and hands-on experience through internship experiences. Some of the national programs sampled have dedicated courses within their core curriculum that are not currently offered within the Exercise Science program at Lehman College. As an example, many programs include

a course dedicated to exercise epidemiology. This material is taught through different courses within the program at Lehman College including: Fitness and Wellness Programming, Research Methods and Statistics in Exercise Science. Additionally, these courses are offered within the Health Science Departments (HSD 306). Courses in specific populations are available in the exercise science program (EXS 304 and EXS 426), however they are not required.

The curriculum in the Exercise and Movement Science major is designed to prepare students for careers in both fitness and/or clinical settings including fitness director, health and fitness instructors, strength and conditioning specialists, and personal trainers. Our coursework prepares our students for certification processes from many of the major exercise associations such as the American College of Sports Medicine (ACSM) and the National Strength and Conditioning Association (NSCA). The ACSM's highest health and fitness certification (ACSM-Exercise Physiologist) requires a bachelor's degree with courses in exercise physiology, strength and conditioning, biomechanics, exercise testing and prescription, special populations, and health risk appraisal. The NSCA's highest certification (the Certified Strength and Conditioning Specialist) also requires a bachelor's degree, or that a student is a senior in college to sit for the exam. The NSCA recommends knowledge of biomechanics, bioenergetics, metabolism, neuroendocrinology, cardiopulmonary physiology, understanding of statistics, and an applied knowledge of strength and conditioning techniques. The Exercise and Movement Science track prepares our students to be able to achieve these certifications from reputable institutions in the field of exercise and sport science, allowing them to be competitive in the exercise, health, athletics, and fitness job market.

Table 5. This table shows the core curriculum for national programs.

College	Lehman College		University of Illinois	University of Georgia	University of North Carolina		Michigan State University	University of South Florida
Department	Exercise Science		Kinesiology	Kinesiology	Exercise and Sport Science		Kinesiology	Exercise Science
Program(s)	Exercise and movement science	Pre-Physical Therapy	Kinesiology	Exercise and Sport Science	Exercise and Sport Science	Fitness Professional	Kinesiology	Exercise Science
Fitness industry management						EXSS220		PET4413
Intro to Exercise	EXS264	EXS264	KIN122	KINS2010			KIN121	
Behavioral Aspects of PA	EXS265	EXS265	KIN140				KIN173	PET3314
Biomechanics	EXS315	EXS315	KIN355	KINS4200	EXSS385	EXSS385	KIN330	PET3312
Motor Learning	EXS316	EXS316	KIN259	KINS3750	EXSS380		KIN251	
Exercise Physiology 1	EXS323	EXS323	KIN150	KINS4630	EXSS376	EXSS376	KIN310	APK3130
Exercise Physiology 2	EXS423	EXS423	KIN352					
Exercise Prescription	EXS326	EXS326				EXSS410	KIN250	PET3384
Clinical Exercise Prescription								PET4550
Strength and conditioning	EXS425	EXS425		KINS4640		EXSS408		PET4093
Strength and Conditioning Lab				KINS4640L				
Research Methods and Statistics	EXS430	EXS430	KIN201	KINS3830	EXSS273	EXSS273		
Sports Nutrition	EXS342					EXSS360		PET3361
Fitness and Wellness Programing	EXS424							PET4088
Application of training Principles	EXS427							PET4765
Weight management								PET3370
Stress, health, and disease								PET3211
Prevention/treatment of athletic injuries					EXSS288	EXSS288		
Exercise in diverse populations								PET3076
Physical fitness in youth							KIN360	
Exercise epidemiology			CHLH101	KINS4300	EXSS180		KIN445	
Exercise /Sport psychology			KIN340	KINS4400	EXSS181		KIN345	PET4219
Internship 1	EXS470	EXS470				EXSS593	KIN492	PET3940
Internship 2	EXS471	EXS471					KIN493	PET4941
Internship 3							KIN496	

Section 3: The faculty's activities in scholarship, teaching and professional service, including faculty development and pedagogical innovations.

Research

Research is fundamental to broadening knowledge in science-based disciplines. Accordingly, the Lehman College Exercise Science program makes a concerted effort to carry out scholarly activity. Our faculty has been extremely productive in this regard over the past 5 years, combining to publish more than 200 papers in peer-reviewed journals. These papers have been published in some of the highest impact factor journals in field, including British Journal of Sports Medicine (IF: 12.0), Sports Medicine (IF: 9.8), Acta Physiologica (IF: 6.0), Medicine and Science in Sports and Exercise (IF: 4.3), and Frontiers in Physiology (IF: 4.1). **Appendix A** displays recent examples of publications from our faculty. To facilitate our research efforts, we have fostered collaborations with laboratories, both on a national and international basis. These collaborative efforts extend to over two dozen labs, spanning across 5 continents. As a testament to the lab's quality and productivity, one of our faculty members (Brad Schoenfeld) is currently listed as the world's top researcher in resistance training by Expert Scape (https://expertscape.com/ex/resistance+training), an independent site that ranks researchers based on their scholarly activity.

Over the years, we have aspired to engage our students in the research process. In an applied science such as exercise, it is essential for students to appreciate the importance of taking an evidence-based approach to "bridge the gap" between science and practice. Allowing students to participate in research helps to demystify the process, providing an appreciation of its intricacies and facilitating their ability to translate research into practice. In the past 5 years, many dozens of our undergraduate students have served as research assistants in the studies we have carried out, furthering their development as future scholars and practitioners. Moreover, they have received acknowledgments on the published papers from these studies, bolstering their

credentials for future employment **(see Appendix B).** Our research has received extensive recognition in the mainstream media. Outlets such as the New York Times, Washington Post, and The Atlantic, among many others, have written feature articles highlighting findings from our studies. In addition to serving as a tribute to the impact of our scholarly efforts, these articles have generated a tremendous amount of publicity for our program, helping to boost enrollment.

It should be noted that all these scholarly accomplishments have been largely achieved through the efforts of just two full-time faculty (Drs. Gul Sonmez and Brad Schoenfeld). Within the past year, we have added two additional tenure-track faculty (Drs. Andrew Alto and Douglas Oberlin) to the program. Given their individual areas of expertise, we anticipate substantially increasing our research-based productivity and expanding our presence in the field. Indeed, Dr. Alto and Dr. Sonmez are currently writing a textbook for the publisher Kendell/Hunt on the topic of exercise psychology with an estimated published date in Fall 2021.

Teaching

Consistent with the mission of Lehman College, teaching is a central focus of the exercise science program. The number of students in our program has grown exponentially since inception. To date, 330 students have declared an intent to major in exercise science and 24 students have declared minors; this is approximately triple what we had just 5 years ago. Thus, our student to full-time faculty ratio remains very high (~100:1), which in turn presents obvious challenges in our ability to educate and advise the student body. Nevertheless, we have assembled a terrific group of adjunct instructors to assist in our teaching efforts and, with their help, have been able to effectively manage the challenge. In addition, we have purchased a variety of teaching aids to enhance our students' learning experience. For example, we acquired Muscle and Motion software, a program that provides an interactive demonstration of applied anatomy and biomechanics, allowing students to visualize concepts learned in the classroom. In addition, we purchased a license for McGraw-Hill Connect, a web-based platform that allows professors to assign "learn smart" assignments specifically tailored to each student's needs, and provides the ability to integrate videos, short clips and other ancillary material.

Other software programs are employed to enhance learning where applicable. Given the heavily applied aspect of exercise science, we schedule several courses to have accompanying laboratory work. As previously noted, our Human Performance Lab is a state-of-the-art facility; we have an extensive array of equipment that involves multiple exercise-related disciples. Students therefore are able to get hands-on experience in areas such as testing and prescription, motor learning, biomechanics, and exercise physiology. When combined with the in-class instruction, students graduate the program with the necessary knowledge and skills to be competent fitness professionals.

Service

We as a program recognize that service is a foundational value, one that is essential to the College's success in fulfilling its core mission. Not only is service critical to supporting and maintaining the quality of the institution, but it also contributes to the betterment of the profession and society as a whole. The exercise science faculty therefore has committed to performing service at all levels of the institution, as well as in community and professional contexts.

At the departmental level, our faculty have served on numerous committees, including the personnel and budget committee, curriculum committee, grade appeal committee, and numerous search committees; in several instances we have chaired these committees. One of the faculty (Dr. Gul Sonmez) has served two terms as the department chair, helping to lead the department to its unprecedented growth and navigate through a variety of challenges that have manifested during her stint. It should be noted that Dr. Sonmez selflessly stepped in to fill the vacancy of chair when the previous chair abruptly resigned from the role for medical reasons this past semester.

At the college level, our faculty have served on various committees including the election committee, senate committee on budget and long-range planning, and have participated in search committees for hiring the college provost and assistant athletic director. Moreover, one of the faculty (Dr. Brad Schoenfeld) has served as the college Faculty Athletic Representative since 2017.

Our faculty also makes a concerted effort to be involved in professional organizations. In particular, the faculty have devoted time to service in the two preeminent fitness organizations: American College of Sports Medicine (ACSM) and National Strength and Conditioning Association. One of the faculty (Dr. Brad Schoenfeld) served on the Board of Directors of the NSCA until 2018 and is one of only 78 individuals in the history of the organization to have received fellowship. With the exception of the 2019-2020 year (due to the Covid pandemic), students are mentored and encouraged to register to participate in the ACSM Greater New York Regional Chapter student bowl. For the past 4 years, Dr. Alto has taken students to the student bowl, for which they receive free registration to the full conference day and have a chance to win an all-expense paid trip to the national student bowl. This experience also serves to give students an opportunity to network and build professional relationships, which often benefit students both academically and professionally.

Section 4: The program's use of assessment for continuous improvement.

Each year we undertake a rigorous effort to assess our program. The assessment normally focuses on a specific goal of the program. In the assessment, we endeavor to determine the extent to which our courses are meeting the mission of the program, and how we can potentially make improvements in this regard. The following is an overview of how we carried out the assessment process over the past five years and the resulting outcomes from our efforts.

For the 2015-2016 academic year, we assessed the goals of the exercise science program as a whole. This approach had the primary objective of determining how our goals could be refined to best meet the needs of our students. Moreover, we felt that revision of these goals would serve as the basis for their use in future assessments, allowing us to better evaluate the individual aspects of our program. Our efforts resulted in narrowing our focus to the following five overarching goals with their associated learning objectives:

1. Demonstrate an understanding of functional anatomy and biomechanics of the human body. The following are learning objectives for this goal:

a. Explain the knowledge of the structure of the human body and locate anatomic landmarks.
b. Describe movements for major joints of the body and analyze the movement patterns and muscles involved in performing various activities.
c. Discuss various locomotors and sport-related activities with regard to the biomechanical principles that explain the kinematics and kinetics of motion.

2. Demonstrate an understanding of the physiological basis for exercise and physical activity in direct application to physical fitness and athletic conditioning. The following are learning objectives for this goal:

a. Explain the metabolic processes responsible for generation of ATP and the relationship among the anaerobic and aerobic systems.
b. Articulate the metabolic and cardiorespiratory responses and adaptations to training.
c. Demonstrate the ability to assess metabolic and cardiorespiratory function and to interpret the results.
d. Describe their understanding of the neuromuscular responses and adaptations to training and describe the impact of the neuromuscular system on human performance.
e. Demonstrate the ability to assess neuromuscular function, and to interpret the results.

3. Demonstrate the ability to assess health status, conduct fitness testing, and prescribe and administer exercise programs. The following are learning objectives for this goal:

a. Demonstrate the different methods for assessing health status of clients and evaluate the results for exercise assessment and programming. Lehman College – Exercise Science February 2010
b. Apply the guidelines for stress test administration and the principles of fitness assessment, through their ability to conduct exercise testing.
c. Interpret information from fitness assessment and evaluate the results to develop an appropriate exercise recommendation.

4. Demonstrate an understanding of the principles of nutrition and the role of diet and exercise on body composition and weight control. The following are learning objectives for this goal:

a. Explain the effects of body composition on health and athletic performance.
b. Discuss the role of diet and exercise in determining body composition.
c. Perform nutritional assessment via analysis of dietary intake, basal metabolic rate, energy expenditure, and body composition; interpret the results with specific attention to weight control and nutritional health.
d. Interpret appropriate nutritional guidelines related to physical activity and alterations in body composition and apply the principles to various groups within the population.

5. Demonstrate an understanding of health and wellness programming based upon the ability to assess need, and to design, implement, and evaluate a program. The following are learning objectives for this goal:

a. Conduct a needs assessment and identify a health problem in the related target population based on the results.
b. Apply behavior change theories related to health promotion interventions.
c. Follow the major criteria and guidelines for developing a health promotion program and related interventions.

After mapping out these goals and learning objectives, we set a plan to systematically assess them over the coming years. This directive was implemented as planned as detailed in the subsequent paragraphs.

For the 2016-2017 academic year, we assessed how well students learn the principles of applied anatomy during the exercise science program, as articulated in Goal 1 of our program. Our assessment involved giving students a written test at the beginning and end of the semester. The test involved a series of multiple-choice questions about the location and exercise-related function of the major muscles of the human body. We gave the test to both entry level students and upper-level students to

gauge the progression of learning across their pursuit of a bachelor's degree, with a sample of 19 students in each group.

Our results showed that students enter the exercise science program with limited knowledge of applied anatomy and then show significant improvements in learning over the course of their time in the program. The enhancements in knowledge showed a graded response, with improvements progressing at each stage of the program. Importantly, the results indicated that most of the learned knowledge in applied anatomy from earlier courses is maintained, as the final mean score in the lower-level group was similar to the baseline score in the upper-level group.

Overall, our findings suggested that the primary goals of the plan were basically met (**see Appendix C).** We targeted a 20% increase from baseline for both lower and upper-level students. The lower-level students showed an improvement of 27% and the upper-level students showed an improvement of 19%. The result for the upper-level students, although satisfactory, was a bit below what we would have liked to see ideally. Moreover, we expected that the upper-level students would have retained their knowledge from their previous coursework We did not have baseline data from the students per se, but using the results of the lower level students in this assessment as a guide, the upper level students came into the course with approximately the same knowledge as when the lower level students finished their course (61% vs 62% for the lower and upper level students, respectively). Thus, we determined it best to continue along the same path for the lower-level students and focus our teaching efforts to further improve the upper-level students. We felt the best approach in this regard was to place a greater emphasis on demonstrations, as well as purchasing interactive software that allowed for visualization of concepts in conjunction with lecture material.

For the year 2017-18 we assessed how well students learn the principles of metabolic processes, articulated in Goal 2, during the exercise science program. Our assessment involved giving students a written test at the beginning and end of the semester. The test involved a series of multiple-choice questions about the metabolic processes responsible for generation of ATP and their relationship among the anaerobic and aerobic systems, and how these factors are modified through exercise training. We

gave the test to both entry level students and upper-level students to gauge the progression of learning across their pursuit of a bachelor's degree.

Our results showed that students enter the exercise science program with limited knowledge of exercise-related metabolic processes, as displayed by their low initial score (55.2%) on the testing assessment **(see Appendix D).** Over the course of the semester, these students showed improvements in their knowledge, although their final grade would be considered poor by the standards set for the program (65.3%). Based on initial upper level testing scores (69.2%), it appeared that students maintain the knowledge obtained during the lower level coursework. Moreover, the final scores for upper level students would be considered good by the standards set for the program (80.4%). Overall, our findings indicated that students are meeting the learning requirements articulated in Goal 2 over the course of their progression from initiation into the program to completion of the requisite coursework.

For the 2018-2019 academic year, we assessed EXS 264 and 326 with a multiple-choice question quiz to assess learning across the course sequence **(see Appendix E).** The assessment involved a 10-question quiz to assess current understanding of fitness-related test outcomes (articulated in Goal 3), and to assess the change of this understanding across two courses. The assessment indicated that while there was an increase in understanding of fitness-related test outcomes between the two courses, the target goal of a 15% increase in quiz scores between the two courses was not met; accordingly, we decided that adjustments were needed to the current course structure and content. We determined the primary reasons for the target goal not being met might be due to an enrollment size too large, not enough time in the lab, and a textbook that wasn't suitable for the learning objectives of the classes. To improve the learning outcomes, and bring us closer to the target, we revisited both EXS 264 and EXS 326 course objectives, textbooks and the structure of the courses. As a result, new textbooks were adopted for the courses, the EXS 326 class enrollment was reduced from 25 students per class to 16-18 students per class. In addition, the class was changed from being part lecture and part lab to purely lab based.

For the past year (2019-2020), the department carried out an assessment to determine the effectiveness of the internship programs across the entire Health Sciences Department. The assessment involved a multiple question survey that asked students various questions about their internship experience using a Likert scale **(see Appendix F).** Specific to the exercise science program, the survey indicated that the vast majority of students are satisfied with the internship experience. The primary area that appeared to be in need of improvement was that some students required more help in assignments/meetings to better succeed in the internship. Given the limited classroom time associated with the internship (1 hour/week), we determined the best way to enhance student learning and better achieve the objectives of the course was to institute online forums in Blackboard whereby students are able to discuss their internship experience and can interact with one another to gain insights into the experiences of others. It was decided that the forums would be moderated by the professor, who would direct learning and ask/answer questions when appropriate. We plan to survey students at the end of the next internship after instituting the forums to gauge their satisfaction and determine if this helped them to a better internship experience.

5. Future directions for the program, based on an analysis of the program's current strengths and weaknesses, external opportunities and obstacles, forecasts for the program's field, and changes implemented since the last program review. A plan and timeline for the next 5-year period should be developed.

Strengths

The Exercise Science program at Lehman College is one of the fastest growing, and one of the highest enrolled, majors in the Health Sciences department. With faculty members having published over 200 peer reviewed papers and been awarded several hundred thousand dollars in funding over the past 5 years, the next big step for the Exercise Science program is to develop a PhD program, which will be the first at CUNY in an exercise-related subject Consistent with the continued growth of the new M.S in Human Performance & Fitness, and the enrollment of the undergraduate program in

Exercise Science tripling in size over the past 5 years, the analysis of the programs strengths illustrate both the demand, and potential for a PhD program in Exercise Science at CUNY, which would be housed at Lehman College.

As the Exercise Science program grows both its undergraduate and graduate programs, improves the upward mobility of students, and increases the number of graduate degrees obtained by CUNY students, the program is furthering Lehman's 90x30 initiative. With 34% of Lehman College's surrounding communities living in poverty, compared to 20% NYC wide (https://www1.nyc.gov/assets/doh/downloads/pdf/data/2018chp-bx5.pdf), the economic growth, upward mobility, and increase in salary potential for the exercise science graduates cannot be understated. To illustrate the Exercise Science programs strength in the economic growth of both its students and community, the average median household income in the Bronx is $38,467 (https://datausa.io/profile/geo/bronx-county-ny). In comparison, the average salary of an exercise physiologist is $54,750, that of an exercise and fitness instructor is $45,110 (https://www.bls.gov/oes/current/oesnat.htm#00-0000) and that of a strength and conditioning coach ranges from $49,037 and $76,722 (https://www.nsca.com/contentassets/9bea7db2290c4102892951c38c821580/salarysurveyoverview.pdf).

Moreover, according to a WELCOA National Wellness Compensation Survey, the average salary for health & wellness consultants is between $51,525 and up to $98,532 for managerial positions. These careers illustrate just a few opportunities that have the potential to nearly double the salary of the student's households both in the near and distant future. Figure 2 illustrates some of the earning potentials throughout different careers within the field of exercise science.

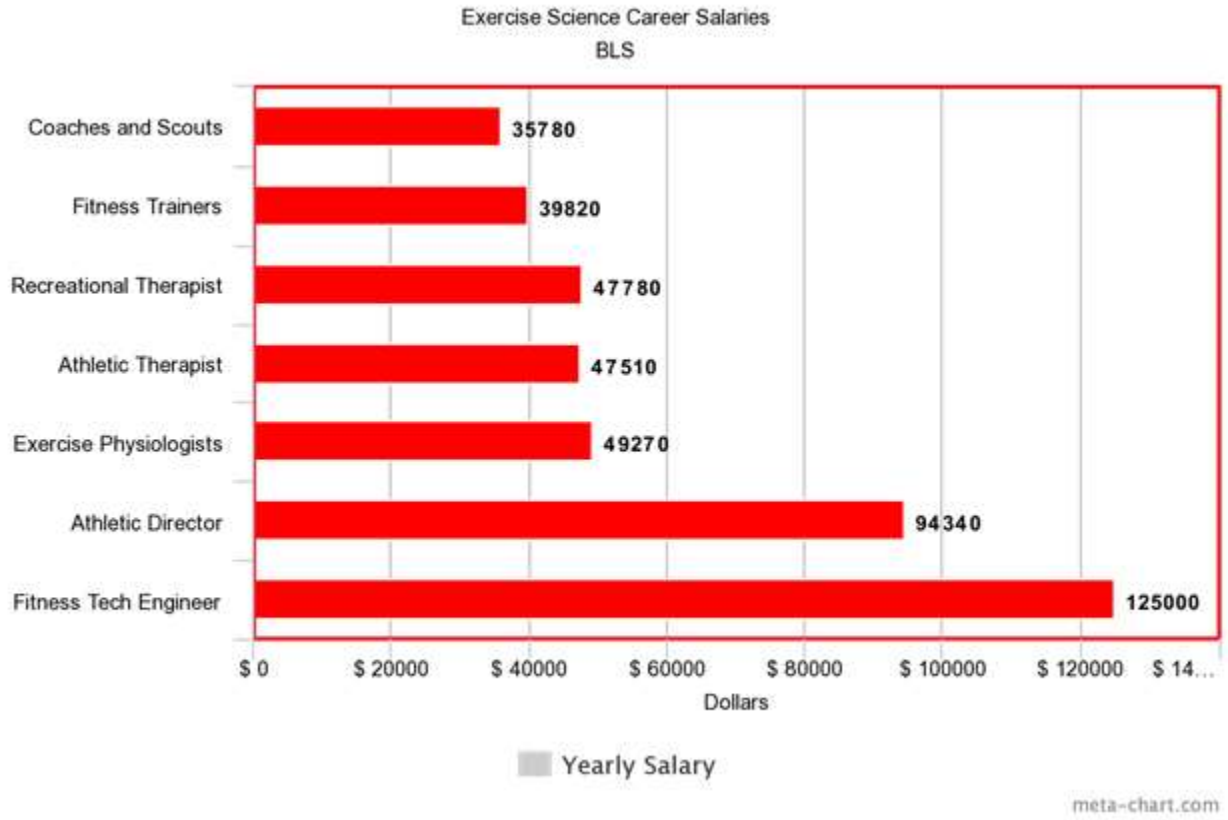


Figure 2: Average annual salaries of fitness professionals "https://www.calu.edu/academics/graduate/masters/exercise-science/exercise-science-careers-jobs-salaries.aspx"

The strength of Lehman's Exercise Science program cannot be understated in the context of improving the neighboring community, and college community's health outcomes. The Bronx is currently ranked number 62 out of 62 counties in health outcomes, which generated a public outcry for the #not62 campaign created by Borough Present Ruben Diez Jr. (https://www1.nyc.gov/site/doh/about/press/pr2016/pr015-16.page). In comparison, Manhattan is ranked 5th, Queens ranked 8th, Brooklyn ranked 17th, and Staten Island ranked 28th. Modifiable diseases are very prevalent in the communities surrounding Lehman College. Many of these diseases can be prevented, and alleviated by exercise and physical activity. In comparison, the Bronx, and specifically the communities surrounding Lehman College, have much higher rates of modifiable diseases (https://www1.nyc.gov/assets/doh/downloads/pdf/data/2018chp-bx5.pdf).

According to a NYC community health survey, the prevalence of obesity in the surrounding communities was 34% compared to 24% NYC wide, diabetes was 16%

compared to 11% NYC wide, and hypertension was 37% compared to 28% NYC wide. While there are many factors contributing to the poor health outcomes of the Bronx, and specifically Lehman College's surrounding communities, the primary contributors are modifiable by exercise and physical activity both in terms of severity and prevalence. These factors, and the direction of #not62, illustrate both the importance of having an established university-level exercise science program in the Bronx. As the only senior CUNY college in the Bronx, Lehman College, and specifically the exercise science program, has an extremely useful, impactful and strongly needed role in bettering the health outcomes of the Bronx.

Weaknesses

While the Lehman College Exercise Science program boasts several strengths, there are some weaknesses which cannot be overlooked. First, and foremost is the scarcity of resources for both students and faculty members. These resources include the need for additional faculty lines, and funding for improving and effectively utilizing the Human Performance Lab. To illustrate the extreme need for more resources, the exercise science program currently has 338 undergraduate students, and 4 full time faculty members. The student to faculty ratio for the program is approximately 1 full time faculty to 85 students, which demonstrates an extreme discrepancy compared to the ratios at Lehman, CUNY and those reported nationwide. To highlight these discrepancies, the Lehman College ratio is 1 full time faculty member to 16 students (https://www.lehman.edu/lehman-legacy/lehman-facts.php), and CUNY wide is 1 full time faculty to 14 students which is consistent with the nationwide average. Unfortunately, this represents 84% more students per full time faculty member in the Exercise Science program, which can both reduce the effectiveness of advising, teaching and research, as well as limiting our ability to advance the college's 90x30 initiative. Furthermore, resources such as lab space and classroom space have also become scarce with the continual growth of the program, and current and future potential for growth. With the growth of the program since 2014 from 132 students to the current 338, representing a 113% growth, lab space, classroom space and funding are current weaknesses in which the program continually and successfully resolves overtime.

External Opportunities

Even with the current weaknesses of the program, external opportunities, collaborations and funding for both faculty and the program have extreme potential. Currently two of the Exercise Science program faculty members are serving on a multi-state research collaboration consisting of 22 member institutions across the US. This collaboration provides current, and future potential for faculty, and student collaboration, funding, and both program and Lehman wide growth in ways of improving student networking, and engagement in both research and their community. In addition, there is significant potential for collaboration with the #not62 campaign, which can provide program and individual student growth with potential job opportunities and furthering the reach and growth of the Exercise Science program. Currently, there are 15 partnering programs for the #not62 campaign (https://www1.nyc.gov/site/doh/about/press/pr2016/pr015-16.page), which can be potential sources of opportunity. Moreover, the Exercise Science program has potential to become a partner to further the goals of improving wellness, preventing disease, and improving the quality of life of the surrounding communities. Additionally, the CATCH program of Montefiore hospital, which is a nearby nationally ranked hospital, focuses on improving community health through exercise and lifestyle, thus providing opportunity for both students and faculty. Current faculty are also actively involved in both the American College of Sports Medicine (ACSM) and the National Strength and Conditioning Association (NSCA), which are two of the leading exercise science-related organizations. These organizations provide opportunity for scholarship, grants, collaboration, networking opportunities, and job potential for both students and faculty.

External Obstacles

Some of the greatest external obstacles are in ways of competitiveness for grants, funding, collaboration of opportunity within the field. While many of these can be plentiful, there can be a difficulty in obtaining grants and scholarships for applicants. This can create a circumstance where students and faculty can be at a disadvantage due to the volume of applicants to opportunity. However, there is still great optimism that the Exercise Science program, its faculty, and students can and will overcome these obstacles; the importance and demand of the program illustrates the priority for it to be properly resourced and supported.

Forecast for the field Exercise Science

With the national shift to preventative measures to disease, the field of exercise science will continue to grow significantly over time. According to the U.S Bureau of Labor Statistics, Exercise Science related careers are expected to grow between 11% and 29% by 2029 depending on the career path. As such, the field is on track to experience greater growth than many other fields and occupational areas.

Changes Since Last Review

Since our last review, the Exercise Science program grew by 113% in student enrollment, hired 2 new full-time faculty members and went from 2 adjunct faculty members to a consistent number of faculty of 7 adjuncts. The program has successfully achieved several of its goals within the last 5 years, which included hiring more faculty members, expanding the Human Performance Lab for both research and education, and the creation of the M.S program in Human Performance & Fitness. Furthermore, the program has streamlined course syllabi, textbook usage, grading practices and consistency across courses for each instructor and future instructors. In addition, more effective and efficient use of educational materials including technology and textbook usage has significantly increased and improved over the past 5 years.

Plan and timeline for the next 5 years

1. Hire new faculty members
2. Hire a CLT for the Human Performance Lab
3. Hire a Secretarial Assistant
4. Enlarge the Human Performance Lab (Space & Equipment)
5. Developing PhD program in Exercise Science

Appendix A

Samples of Recent Publications from Our Group

- Schoenfeld, B.J., Alto, A., Grgic, J., Tinsley, G., Haun, C., Campbell, B., Escalante, G., Sonmez, G.T., Cote, G., Francis, A., Trexler, E. (2020). Alterations in body composition, resting metabolic rate, muscular strength, and eating behavior in response to natural bodybuilding competition preparation: A case study. *Journal of Strength and Conditioning Research*, doi: 10.1519/JSC.0000000000003816. [Epub ahead of print]
- Schoenfeld, B.J., Vigotsky, A., Grgic, J., Haun, C., Contreras, B., Delcastillo, K., Francis, A., Cote, G., Alto, A. (2020). Do the anatomical and physiological properties of a muscle determine their adaptive response to different loading protocols? *Physiological Reports*, *8*(9), e14427
- Schoenfeld, B.J., Grgic, J., Contreras, B., Vigotsky, A., Delcastillo, K., Alto, A., De Souza, E. (2019). To flex or rest: The effects of adding no-load isometric actions to the inter-set rest period in resistance training on muscular adaptations. *Frontiers in Physiology,* doi: 10.3389/fphys.2019.01571
- Schoenfeld, B.J., Contreras, B., Krieger, J., Grgic, J., Delcastillo, K., Belliard, R., Alto, A. (2019). Resistance training volume enhances muscle hypertrophy but not strength in trained men. *Medicine and Science in Sports and Exercise*, 51(1):94-103
- Schoenfeld, B.J., Vigotsky, A., Contreras, B., Winkleman, N., Larson, R., Alto, A., Golden, S., Paoli, A. (2018). Differential effects of attentional focus strategies during long-term resistance training. *European Journal of Sport Science,* 18(5):705-712
- Schoenfeld, B.J. (2017). Non-steroidal anti-inflammatory drugs may blunt more than pain. *Acta Scandinavia,* 222(2), doi: 10.1111/apha.12990.
- Morton, R.W., Murphy, K.T., McKellar, S.R., Schoenfeld, B.J., Henselmans, M., Helms, E., Aragon, A.A., Devries, M.C., Banfield, L., Krieger, J.W., Phillips, S.M. (2017). A systematic review, meta-analysis and meta-regression of the effect of protein supplementation on resistance training-induced gains in muscle mass and strength. *British Journal of Sports Medicine,* 52(6):376-384
- Schoenfeld, B.J., Ogborn, D., Kreiger, J.W. (2016). The effects of resistance training frequency on muscle hypertrophy: a meta-analysis. *Sports Medicine.* 46(11), 1689-1697.
- Schoenfeld, B.J., Contreras, B., Vigotsky, A., Ogborn, D., Fontana, F., Sonmez, G.T. (2016). Upper body muscle activation during low- versus high-load resistance exercise in the bench press. *Isokinetics and Exercise Science.* 24, 217–224
- Schoenfeld, B.J., Contreras, B., Ogborn, D., Galpin, A., Krieger, J., Sonmez, G.T. (2016). Effects of varied versus constant loading zones on muscular adaptations in well-trained men. *International Journal of Sports Medicine,* 37(6), 442-7

Appendix B

Sample of Publication That Included Student Research Assistants

OPEN

Resistance Training Volume Enhances Muscle Hypertrophy but Not Strength in Trained Men

BRAD J. SCHOENFELD[1], BRET CONTRERAS[2], JAMES KRIEGER[3], JOZO GRGIC[4], KENNETH DELCASTILLO[1], RAMON BELLIARD[1], and ANDREW ALTO[1]

[1]*Department of Health Sciences, CUNY Lehman College, Bronx, NY;* [2]*Sport Performance Research Institute, AUT University, Auckland, NEW ZEALAND;* [3]*Weightology, LLC, Redmond, WA; and* [4]*Institute for Health and Sport (IHES), Victoria University, Melbourne, AUSTRALIA*

higher-volume group resulted in greater gains in muscular endurance. Given that the Radaelli et al. (21) study included untrained individuals and their training program lasted for 6 months, the comparison of their results with the results of the present study remains limited. Also, in the present study, we assessed only upper-body muscular endurance. Therefore, these results cannot necessarily be generalized to the lower-body musculature. Future work among trained individuals on this topic is warranted.

Limitations. The study had several limitations that must be taken into account when attempting to draw evidence-based inferences. First, all subjects reported performing multiset routines before the onset of the study and a majority did not regularly train to momentary failure. It is unclear how the novelty of altering these variables affected the respective groups. Second, the upper-body musculature was trained exclusively with multijoint exercises. These exercises involve extensive involvement of the elbow flexors and elbow extensors, as shown in the significant arm muscle hypertrophy achieved with their consistent use (28,29). Indeed, research indicates similar changes both in upper arm MT and circumference when performing multijoint versus single-joint exercises in untrained and trained individuals, respectively (30,31). That said, it remains possible that single-joint exercises for the arm musculature may become more important to hypertrophy when training with low volumes; further study on the topic is warranted. Third, measurements of MT were obtained only at the mid-portion of the muscle belly. Although this region is often used as a proxy of the overall growth of a given muscle, research indicates that hypertrophy manifests in a regional-specific manner, with greater gains sometimes seen at the proximal and/or distal aspects (32,33). Although it is possible that differences in

CONCLUSIONS

The present study shows that marked increases in strength can be attained by resistance-trained individuals with just three 13-min sessions per week, and that gains are similar to that achieved with a substantially greater time commitment when training in a moderate loading range (8–12 repetitions per set). This finding has important implications for those who are time-pressed, allowing the ability to get stronger in an efficient manner, and may help to promote greater exercise adherence in the general public. Alternatively, we show that increases in muscle hypertrophy follow a dose-response relationship, with increasingly greater gains achieved with higher training volumes. Thus, those seeking to maximize muscular growth need to allot a greater amount of weekly time to achieve this goal. Further research is warranted to determine how these findings apply to resistance individuals in other populations, such as women and the elderly. Volume does not appear to have any differential effects on measures of upper-body muscular endurance.

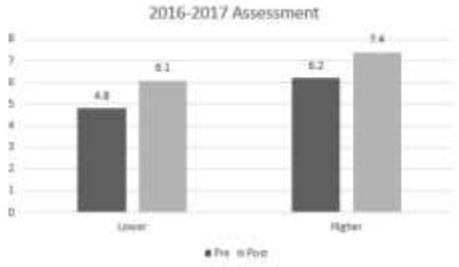
The authors would like to extend our heartfelt thanks to the following research assistants, without whom this study could not have taken place: Patricia Fuentes, Sharnel Jaime, Andriy Kopy, Francis Turbi, Christian Morales, Paco Almanzar, Chris Morrison, Lesia Bosky, Chaochi Lee, Elena Edwards, Shailyn Mock, Laila Nasr, Antuane Stewart, Miguel Villafane, Sola Lee, Joseph Olivero, Marisela Santana, Chisneco Fonte, Jonathan Mejia, Martin Bueno, Kevin Carranza, MaChrie Dampier, Mark Cafe, Jason Rosa, Abdul Pessley, Jonathan Davila, Griselda Acevedo and Maria Hernandez. The authors also wish to thank Dymatize Nutrition for supplying the protein supplements used in the study. Finally, the authors are grateful to Andrew Vigotsky for his advice and recommendations on the statistical analyses. The results of this study are presented clearly, honestly, and without fabrication, falsification, or inappropriate data manipulation, and do not constitute endorsement by ACSM.

This study was supported by a PSC CUNY grant from the State of New York.

The authors declare no conflicts of interest.

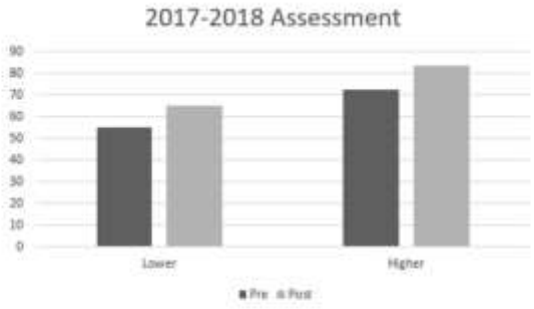
Appendix C

Assessment Results 2016-17



Appendix D

Assessment Results 2017-18



Appendix E

Assessment Instrument 2017-18

The following questions are designed to test your knowledge of the various energy systems and their relationship to exercise performance. Please choose the best answer for each question:

1. A 1-repetition maximum bench press would primarily involve which energy system?
    a. ATP-PCr
    b. Fast glycolysis
    c. Slow glycolysis
    d. Beta-oxidation
2. Aerobic metabolism takes place in the _____
    a. Cytosol
    b. Mitochondria
    c. Lipid bilayer
    d. Ribosomes
3. How many ATP are created during fast glycolysis?
    a. 1- 2
    b. 2 - 3
    c. 3 - 4
    d. 6 - 8
4. The use of fat for fuel is carried out by _____
    a. ATP-PCr
    b. Fast glycolysis
    c. Slow glycolysis
    d. Beta-oxidation
5. The anaerobic breakdown of carbohydrate ultimately results in the production of _____
    a. Acetyl-CoA
    b. Mitochondria
    c. Lactic acid
    d. Cholesterol
6. True or false: Fat can only be metabolized aerobically?
    a. True
    b. False
7. Stored ATP can fuel work for approximately _____
    a. 2-3 seconds
    b. 15-20 seconds
    c. 60 seconds
    d. Several hours
8. True or false: If one energy system is active, the others will necessarily be inactive?
    a. True
    b. False
9. The point at which there is an abrupt increase in blood lactate levels is called the _____
    a. Burn point
    b. Lactate accumulation byproduct
    c. Lactate high point
    d. Lactate threshold
10. Type IIa fibers are associated with the _____
    a. Aerobic system
    b. Anaerobic system
    c. Both A and B
    d. Neither A nor B

Appendix F

Results from Assessment Instrument 2019-20

EXS data

This analysis combines all of the data from all of the programs.

The first section asked everyone a set of questions. The stem for the questions was
Thinking about your internship experience this semester, please say how strongly you agree or disagree with each statement.
In these questions the person who supervised you at your internship site is called your supervisor. The person who taught any Lehman course associated with the intership is called your professor.

```
##
##
##  I learned a lot about my chosen profession.
##  Values                    Freq Percent
##  Strongly Agree            7    53.8
##  Agree                     5    38.5
##  Neither agree nor disagree 1   7.7
##  Disagree                  0    0
##  Strongly Disagree         0    0
##  Total                     13   100
##
##
##  My internship supervisor was very professional.
##  Values                    Freq Percent
##  Strongly Agree            9    69.2
##  Agree                     3    23.1
##  Neither agree nor disagree 1   7.7
##  Disagree                  0    0
##  Strongly Disagree         0    0
##  Total                     13   100
##
##
##  My professor provided the support I needed to be successful.
##  Values                    Freq Percent
##  Strongly Agree            8    61.5
##  Agree                     3    23.1
##  Neither agree nor disagree 1   7.7
##  Disagree                  0    0
##  Strongly Disagree         1    7.7
##  Total                     13   100
##
##
##  Class meetings helped me succeed in my internship.
##  Values                    Freq Percent
##  Strongly Agree            5    38.5
##  Agree                     3    23.1
##  Neither agree nor disagree 1   7.7
##  Disagree                  2    15.4
##  Strongly Disagree         2    15.4
##  Total                     13   100.1
##
##
##  Class assignments and readings helped me in my internship.
```