

# Arnel L. Aguinaldo, Ph.D., ATC

email: arnelaguinaldo@pointloma.edu

## SUMMARY

Biomechanics professor and engineer with over 15 years of teaching, research, and clinical experience in the fields of gait analysis, kinesiology, athletic training, and bioengineering.

## EDUCATION

**Ph.D., Health and Human Performance**, Concordia University Chicago

Dissertation: Relative contributions of segmental energy in elbow valgus loading during baseball pitching

**M.A., Physical Education** (Biomechanics & Athletic Training), San Diego State University

Thesis: Joint center of pressure with valgus bracing for knee osteoarthritis using a mechanical knee surrogate

**B.S., Bioengineering**, University of California, San Diego

## CERTIFICATIONS

Certified Athletic Trainer (ATC) – NATA Board of Certification #060002343

Basic Life Support (BLS) – American Heart Association

## PROFESSIONAL EXPERIENCE

### Motion Analysis Corporation, Santa Rosa, CA

*December 2015 – present*

#### **Vice President, Applications Engineering, Movement Analysis**

Lead development team in the design and testing of motion capture specific applications in the fields of clinical biomechanics, movement analysis, and sports analysis. Applications aimed at providing solutions using cutting edge 3D motion capture technology for gait analysis, running analysis, baseball pitching, baseball hitting, golf, footwear, and low back assessment. Provide expert information for biomechanical applications of system and software solutions.

*January 2013 – December 2015*

#### **Biomechanics Engineer**

Acted as lead biomechanics support engineer in human movement analysis for global company specializing in passive optical motion capture and analysis. Provided technical and expert consultation support to users in hospitals and universities on hardware and software methods used in biomechanics and gait analysis practice and research both remotely (San Diego) and on-site.

### Point Loma Nazarene University, San Diego, CA

*August 2015 – present*

#### **Assistant Professor, Kinesiology (Tenure-Track)**

#### **Director, Kinesiology Biomechanics Laboratory**

Teach a variety of undergraduate-level and graduate-level courses in the Department of Kinesiology. Mentor students in the Sports Performance concentration of the M.S. Kinesiology program. Direct biomechanics research for the students and faculty of the Department of Kinesiology. Design and

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maintain all aspects of motion analysis and electromyography instrumentation and software in the Kinesiology Laboratory. Advise students on undergraduate and graduate student research in kinesiology and clinical biomechanics.

*August 2013 – June 2015*

**Adjunct Professor, Kinesiology**

Taught hybrid and fully online courses in measurement, evaluation, and statistics in kinesiology.

**San Diego State University, San Diego, CA**

*August 2005 – June 2015*

**Adjunct Professor****School of Exercise and Nutritional Sciences**

Taught various undergraduate and graduate level classes in the School of Exercise and Nutritional Sciences. Courses include biomechanics of human movement, functional human movement, biomechanical measurement techniques, and measurement and evaluation in exercise science.

**California State University - San Marcos, San Marcos, CA**

*Jan 2012 – December 2013*

**Adjunct Professor****Department of Kinesiology**

Taught 3 sections of an undergraduate course on the measurement and evaluation in kinesiology.

**Rady Children's Hospital, San Diego, CA**

*June 2004 – June 2015*

**Director, Center for Human Performance, Inc. (CHP), Motion Analysis Laboratory**

Managed all aspects of research and engineering of the biomechanical research consulting firm. Developed and directed sports performance institute (CHP) in utilizing motion analysis to evaluate sports performance for enhancement and injury prevention. Established research and service based programs in sports medicine and athletic training. Actively pursued and obtained funding from private entities and industry to support ongoing research in sports medicine, footwear biomechanics, and clinical gait analysis. Presented research through journal publications and talks at scientific conferences. Created kinematic model for measuring upper-extremity motion used for the analysis of baseball pitching and the golf swing. Managed orthopedic biomechanics research facility that focused on in-vitro and pre-clinical orthopedic research, specifically in biomechanics of surgical procedures and instrumentation using engineering techniques. Supervised projects related to the materials testing of spinal instrumentation, fracture fixation techniques, casting, ACL reconstruction techniques, and materials on cadaveric and benchtop models.

*March 2000 – Jan 2004*

**Bioengineer, Motion Analysis Laboratory**

Supervised all engineering activities of the lab, including the operation and maintenance of all systems used for kinematic and kinetic analyses, electromyography, energy expenditure, and network/database administration. Developed biomechanical software for kinematics, mechanical work, and data processing. Simultaneously managed multiple research projects in human locomotion, clinical orthopedics, and sports medicine. Served as technical, research, and educational resource for the lab and the Orthopedics department.

**TEACHING EXPERIENCE****Point Loma Nazarene University - Department of Kinesiology****KIN 327 – Applied Biomechanics**

Designed and currently teach an introductory course on the biomechanics of human movement. It aims to provide students with a mix of theoretical concepts and applied problem-solving in various biomechanical applications in human movement. Topics include Newtonian mechanics, kinematic measurement, ground reaction forces, kinetics, gait analysis, and jump analysis.

**KIN 440 – Measurement, Statistics, and Evaluation of Human Performance (Hybrid)**

Designed and currently teach a course to introduce students to measurement techniques and instruments, descriptive and inferential statistics and evaluation procedures used in human performance. Topics include techniques of construction, organization, administration, and interpretation involved in human performance research. The course emphasizes critical evaluation of data using basic statistical techniques and an evaluation of research design in human performance-related studies.

**KIN 605 – Research Methods (Graduate)**

Designed and currently teach an introductory course on general research principles. The course provides an introduction to analyzing data and designing research experiments in exercise and sport science. Topics include: 1) selected techniques and designs used in research, with special emphasis given to planning, conducting, and reporting of research; 2) applied statistical analysis and interpretation of data from the field of exercise and sport science; and 3) ethical issues in scientific research.

**KIN 615 – Biomechanical and Neurological Basis of Human Movement (Graduate)**

Designed and currently teach a course on various kinematic, kinetic, and neuromuscular concepts and how they are used in the qualitative and quantitative analysis of human movement. It is designed for advanced study in 3D motion analysis and electromyography techniques. The intent of this course is to provide students with an extensive knowledge concerning quantitative analysis of human motion and the concepts and equipment to collect objective quantifiable data to be used for clinical or research purposes.

**KIN 650 – Seminar in Kinesiology (Graduate)**

Designed and implemented a course to assist masters-level students in the research process to deepen knowledge in an area of their professional interest. Students are expected to complete and present an original research project including preliminary statistical design, data collection, data analysis, and presentation of results at a department-wide poster session.

**KIN 660 – Directed Readings (Graduate)**

Designed and implemented a course to provide advanced study in the essential research of a specific discipline in Kinesiology. The course aims to provide students with the fundamental skills in reading and evaluating research, including examining research paradigms, critically appraising study design and findings, and determining the practical relevance of the results.

**KIN 699 – Thesis (Graduate)**

Act as committee chair and guide students throughout their thesis projects. Emphasis is placed on design, IRB, subject recruitment, data collection, analysis, interpretation, and presentation of results. Students are required to defend their thesis in front of their committee and peers at the end of the MS Kinesiology program.

**San Diego State University - School of Exercise and Nutritional Sciences**

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**ENS 305 – Measurement and Evaluation in Kinesiology**

Designed and currently teach a course to introduce students to measurement techniques and instruments, parametric statistics, and evaluation procedures used in the assessment of physical activity and human performance. Principles and techniques of organization, administration, and interpretation involved in human performance research. Includes critical evaluation of data using basic statistical techniques and an evaluation of research design in human performance- related studies.

**ENS 306 – Biomechanics of Human Movement**

This class was designed to provide students with a mix of theoretical concepts and applied problem-solving in various biomechanical applications in human movement. Emphasis was placed on the basic concepts of kinematics and kinetics of whole body and joint movement.

**ENS 436 – Functional Human Movement**

Advanced course on the biomechanics and pathomechanics of human movement with emphasis on scientific literature to support theories of movement dysfunction. Focus was placed on gait and functional human movement, from an evidence-based perspective, to support rehabilitation processes. This course was intended to prepare the Kinesiology major with an emphasis in Pre-Physical Therapy for professional graduate education or clinical practice in Physical Therapy.

**ENS 603 – Measurement and Evaluation in Exercise Science (Graduate)**

This course aimed to provide students a comprehensive examination of measurement theory and practice as applied to exercise and rehabilitation sciences. Topics included an overview of basic measurement concepts and specific topics in clinical and research settings relevant to exercise and rehabilitation contexts and was designed to assist students in making accurate interpretations of data.

**ENS 610 – Biomechanical Measurement Techniques I (Graduate)**

This course involved the study of 2D and 3D biomechanics with emphasis on theoretical and practical approaches in measuring and evaluating kinematics of human movement.

**ENS 611 – Biomechanical Measurement Techniques II (Graduate)**

This course involved the study of 2D and 3D biomechanics with emphasis on theoretical and practical approaches in measuring and evaluating kinematics and kinetics of human movement. Focus was placed on reliably collecting motion capture and force platform data to perform a kinematic and kinetic evaluation of various forms of human movement.

**ENS 612 – Biomechanical Measurement Techniques III (Graduate)**

The course aimed to provide students a comprehensive examination of the interaction between the neuromuscular system and the biomechanics of human movement. The course focused on the study of neurological function and muscular performance with emphasis on electromyographic analysis of normal and pathological human movement using theoretical concepts and empirical evidence reported in the scientific literature.

**California State University - San Marcos - Department of Kinesiology**

**KINE 403 – Measurement and Evaluation in Kinesiology**

Introductory course on measurement and evaluation that provides students with the principles and techniques of construction, organization, administration, interpretation and evaluation of measuring devices used in kinesiology. The course included critical evaluation of data using basic statistical techniques and an evaluation of research design in kinesiology-related studies.

**PEER-REVIEWED RESEARCH**

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- Aguinaldo, AL**, and Escamilla, RF. 2018. Relationship of segmental energy flow and elbow valgus load during baseball pitching. *Sports Biomechanics*, under review.
- Darke, JD, Dandekar, EM, **Aguinaldo, AL**, Hazelwood, SJ, Klisch, SM. 2018. Analysis of Game Pitch Count and Body Mass Index as Injury Risk Factors for Youth Baseball Pitchers. *Orthopedic Journal of Sports Medicine*, 6(4), 232596711876565.
- Zamporri, J., and **Aguinaldo, AL**. 2018. The effects of compression tights on dynamic knee motion during a drop vertical jump in female college athletes. *Orthopedic Journal of Sports Medicine*, 6(8), 2325967118789955.
- Slenker, NR, Limpisvasti, O, Mohr, K, **Aguinaldo, AL**, ElAttrache, NS. 2014. Biomechanical comparison of the interval throwing progression and baseball pitching: Upper extremity stresses in training and rehabilitation. *American Journal of Sports Medicine*, 42(5), 1226-32.
- Luker, KR, **Aguinaldo, AL**, Kenney, D, Cahill-Rowley, K, Ladd, AL. 2014. Functional task kinematics of the thumb carpometacarpal joint. *Clinical Orthopedics and Related Research*, 472(4), 1123-9.
- Unfried, B, **Aguinaldo, AL**, Cipriani, D. 2013. What is the Influence of Cambered Running Surface on Lower Extremity Muscle Activity? *Journal of Applied Biomechanics*, 29(4), 421-7.
- Aguinaldo, AL**, and Chambers, HG. 2009. Correlation of throwing mechanics with elbow valgus load in adult baseball pitchers. *American Journal of Sports Medicine*, 37(10), 2043-2048.
- Aguinaldo, AL**, Buttermore, J, and Chambers, HG. 2007. Effects of upper trunk rotation on shoulder joint torque between baseball pitchers of various levels. *Journal of Applied Biomechanics*, 23, 42-51.
- Aguinaldo, AL**, Clapper, M, Fithian, D, Paxton, L, Chambers, HG, and Sutherland, DH. 2006. Comparison by motion analysis of non-operative vs. operative treatment of Achilles Tendon ruptures. *Gait & Posture*, 24(S2), 228-230. (presented in part at the JEGM 2006, Amsterdam, Netherlands)
- Aguinaldo, AL**, Wyatt, MP, Sutherland, DH, Chambers, HG, 2004. Mechanical work performed on the body center of mass during walking in typical children and children with spastic diplegia. *Developmental Medicine and Child Neurology*, 46(S99): 23.
- Aguinaldo, AL**, Wyatt, MP, Chambers, HG, Sutherland, DH, 2003. Accuracy of the functional method in locating the joint center of the abnormal hip. In: *Proceedings of the Eighth Gait and Clinical Movement Analysis Meeting*. University of Delaware (Nominated for Best Paper Award)
- Aguinaldo, AL**, and Mahar, AT, 2003. Impact loading in running shoes with cushioning column systems. *Journal of Applied Biomechanics*, 19(4), 353-360.
- Aguinaldo, AL**, Mahar, AT, Litavish, MJ, and Morales, AO. 2002. Ground reaction forces in running shoes with two types of cushioning column systems. In K.E. Gianikellis (Ed.), *Proceedings of the XXth International Symposium on Biomechanics in Sports, Caceres, Spain* (pp. 592-595).
- Aguinaldo, AL**, Litavish, MJ, and Morales, AO. 2002. Comparison of transient force attenuation between three types of heel cushions used in athletic footwear. *Gait & Posture*, 16(S1), 100-101.
- Aguinaldo, AL** and Quigley, E. 2001. Influence of an electronic prosthetic knee on the kinematics of transfemoral amputee gait. *Gait & Posture*, 13(3), 298-299.

**PRESENTATIONS AND LECTURES**

Podium Presenter, "Relationship of segmental energy flow and elbow valgus load during baseball pitching," American Society of Biomechanics Meeting, Rochester, MN, August 10, 2018.

Podium Presenter, "Segmental power analysis of elbow valgus load during baseball pitching," World Congress of Biomechanics Meeting, Dublin, Ireland, July 10, 2018.

Invited Lecturer, "Biomechanical Implications of Injury Prevention and Performance in Baseball," MAC3D Seminar, NAC Image Technology, Tokyo, Japan, October 6, 2017.

Podium Presenter, "The effects of compression tights on dynamic knee motion during a drop vertical jump in female college athletes," International Society of Biomechanics in Sports Meeting, Cologne, Germany, June 18, 2017.

Invited Lecturer, "Elbow Pitching Biomechanics and UCL Injury Risk Factors in Adult and Youth Pitchers," American Physical Therapy Association Combined Sections Meeting, Indianapolis, IN, February 5, 2015

Guest Lecturer, "An Introduction to Motion Analysis," Statics and Dynamics undergraduate class, Department of Bioengineering, University of California, San Diego, CA, February 16, 2012

Invited Speaker, "Clinical Gait Analysis," Grand Rounds, Department of Orthopedics, University of California San Diego Medical Center, San Diego, CA, September 14, 2011.

Keynote Speaker, "Sports Biomechanics and Motion Analysis," Educational Dinner Symposium, National Association of Orthopedic Nurses, San Diego, CA, September 8, 2010.

Invited Speaker, "How Trunk Rotation and Arm Slot Affect Arm Torque during Pitching," American Sports Medicine Institute Annual Injuries in Baseball Meeting, Houston, Texas, January 25, 2009.

Invited Lecturer, "A Comparison by Motion Analysis of ACL Reconstruction with a Patellar Tendon versus a Hamstring Tendon Autograft," Visiting Professor, Rady Childrens Hospital San Diego, April 17, 2008.

Guest Lecturer, "An Introduction to Motion Analysis," Statics and Dynamics undergraduate class, Department of Bioengineering, University of California, San Diego, CA, February 25, 2008

"Effects of sequential body motion on elbow valgus load during baseball pitching," Major League Baseball Winter Meetings, Orlando, FL, December 3, 2006.

Invited Lecturer, "Distal Upper Extremity Kinematic Modeling," Upper Extremity Symposium, Shriners Hospital for Children, Philadelphia, PA, July 21, 2006.

Visiting Professor, "Pitching Biomechanics," Department of Biomedical Engineering, Johns Hopkins University, Baltimore, MD, April 1, 2005.

Visiting Professor, "Injury Implications in Overhand Throwing," Chicago Memorial Medical Center, Chicago, IL, November 19, 2004.

Invited Lecturer, "Upper Extremity Kinematics," Upper Body Symposium, Gait and Clinical Movement Analysis Society Annual Meeting, Lexington, KY, May 2004.

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“Functional Gait Limitations and Treatment of the Knee in Patients with Cerebral Palsy: Knee Biomechanics,” American Academy of Cerebral Palsy and Developmental Medicine

- 56<sup>th</sup> Annual Meeting, New Orleans, LA, September, 2002
- 54<sup>th</sup> Annual Meeting, Toronto, Canada, September, 2000.

**FUNDING**

Kinematics and kinetics during gait on a Computer Assisted Rehabilitation Environment (CAREN)	\$35,000 – U.S. Department of Defense (2010-2012) Role: Government Contract Award Recipient
Motion Analysis of the Easy Spirit Anti-Gravity Walking Shoe	\$19,000 – Jones Apparel Group (2010) Role: Principal Investigator; Designed protocol, organized budget, wrote and submitted proposal
Comparative Analysis of Toning Shoes on Walking Kinematics and Kinetics	\$60,000 – ACI International (2009-2010) Role: Principal Investigator; Designed protocol, organized budget, wrote and submitted proposal
Effects of Sequential Body Motion on Elbow Valgus Load during Baseball Pitching	\$150,000 – Major League Baseball Medical Advisory Committee (2005-2008) Role: Principal Investigator; Designed protocol, organized budget, wrote and submitted proposal
A Comparison by Motion Analysis of ACL Reconstruction with a Patellar Tendon versus a Hamstring Tendon Autograft	\$88,201 – Orthopedic Research & Education Foundation Grant (2003-2005) Role: Research Coordinator; Designed protocol, organized budget, wrote and submitted proposal
Impact Forces and Rearfoot Motion During Running in Shoes with Integrated Cushioning and Motion Control Systems	\$41,580 – Oakley, Inc. (2002-2003) Role: Principal Investigator; Designed protocol, organized budget, wrote and submitted proposal
Impact Loading in Running Shoes with Cushioning Column Systems	\$16,700 – LL International, LLC (2001-2002) Role: Principal Investigator; Designed protocol, organized budget, wrote and submitted proposal

**PROFESSIONAL ASSOCIATIONS**

- Member - Editorial Board, American Journal of Sports Medicine (2012-)
- Member - Editorial Board, Journal of Biomechanics (2004-2010)
- Member - Editorial Board, Gait & Posture (2003-2006)
- Member - National Athletic Trainers' Association (2006-)
- Member - International Society of Biomechanics in Sports (2001-)
- Member - Communications Committee, Gait and Clinical Movement Analysis Society (2001-2002)
- Member - Gait and Clinical Movement Analysis Society (2001-2011)
- Member - Whitaker Institute of Biomedical Engineering of UC San Diego (1998-2001)