

SPORT SCIENCE & MANAGEMENT
SS3326 MOTOR CONTROL AND DEVELOPMENT ACROSS THE LIFESPAN

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|---------------------------|---|-----------------|---|
| Academic Year | 2025-26 | Semester | 1 |
| Course Coordinator | | | |
| Course Code | SS3326 | | |
| Course Title | Motor Control and Development Across the Lifespan | | |
| Pre-requisites | - | | |
| No of AUs | 3 | | |
| Contact Hours | 39 | | |

Course Aims

This course aims to equip you with knowledge of how the brain and muscles coordinate and control the development of motor skills and movement over the lifespan in both healthy development and those with neurodevelopmental or neuromuscular conditions. Through a combination of theory and practical classes, you will appreciate individual differences in motor development and control and some of the research and techniques used to assess motor control. You will also be introduced to the role of exercise on motor development and control over the lifespan.

Intended Learning Outcomes (ILO)

By the end of this course, you should be able to:

1. describe the neuromuscular, sensory-motor, and cognitive processes that underpin motor control across the lifespan.
2. describe the developmental changes in motor control during childhood, adolescence, and ageing.
3. identify motor control problems that present in neuromuscular disorders.
4. explain the role of exercise and neuroplasticity in improving motor control across the lifespan.
5. apply techniques to assess motor control across the lifespan.

Course Content

The following topics will be covered:

1. Neuromuscular, sensory, and cognitive processes that underpin motor control over the lifespan.
2. Developmental changes in motor control from childhood to ageing.
3. Biological and lifestyle factors influencing motor development and control.
4. Motor control changes in neuromuscular conditions.
5. The role of exercise and neuroplasticity in improving motor control over the lifespan.

NTU Competencies & Graduate Attributes

NTU Competencies

| | |
|-------------------|---|
| Character | |
| Competence | √ |
| Cognitive agility | √ |

NTU Graduate Attributes

| | |
|---------------------|---|
| Graduate Attributes | Level (i.e., basic, intermediate, advanced) |
| 1. Collaboration | Intermediate |
| 2. Communication | Advanced |
| 3. Curiosity | Advanced |
| 4. Sense-making | Intermediate |

Assessment (includes both continuous and summative assessment)

| Component | ILO Tested | Weighting | Team/ Individual | Assessment Rubrics |
|-----------------------|------------|-----------|------------------|--------------------|
| 1. Class Test | 1, 2 | 25% | Individual | |
| 2. Group Presentation | 3, 4 | 25% | Individual | Appendix 1, 2 |
| 3. Final Examination | 1-5 | 50% | Individual | |
| Total | | 100% | | |

Formative Feedback

Feedback for learning will be verbally provided during each laboratory class session, where you have the opportunity to demonstrate anatomical and muscular movements and learn techniques and apply yourselves to problems related to each organ system.

For the presentation, you will be provided with written feedback as a group pertaining to your group's performance. Generic verbal and written feedback will be provided to the class for the test and examination.

Learning and Teaching Approach

| Approach | How does this approach support you in achieving the learning outcomes? |
|--------------|--|
| Lectures | Lectures will provide information for key learning concepts and theories and support understanding of key concepts. |
| Laboratories | Laboratories will: <ul style="list-style-type: none">- Give hands-on experiential learning to support key theories and information provided in class.- Provide tasks for you to utilise what you recently learned to solve specific problems. |

| | |
|-----------------|---|
| | <ul style="list-style-type: none"> - Give space and time for small group activities and discussions to allow you to assimilate the content and for sharing learning. - Allow verbal feedback from your instructor on techniques and material. |
| Online Learning | Time will be given for learning from online materials as a part of the flip teaching approach. These materials will support key concepts covered in lectures and laboratories. |

Reading and References

NIE Research and Publications

1. Chai, K. X., Marie Goodwill, A., Leuk, J. S., & Teo, W. P. (2023). Treadmill Walking Maintains Dual-task Gait Performance and Reduces Frontopolar Cortex Activation in Healthy Adults. *Neuroscience*, 521, 148–156. <https://doi.org/10.1016/j.neuroscience.2023.04.012>
2. Teo, W. P., Goodwill, A. M., Hendy, A. M., Muthalib, M., & Macpherson, H. (2018). Sensory manipulation results in increased dorsolateral prefrontal cortex activation during static postural balance in sedentary older adults: An fNIRS study. *Brain and behavior*, 8(10), e01109. <https://doi.org/10.1002/brb3.1109>
3. Goodwill, A. M., Reynolds, J., Daly, R. M., & Kidgell, D. J. (2013). Formation of cortical plasticity in older adults following tDCS and motor training. *Frontiers in aging neuroscience*, 5, 87. <https://doi.org/10.3389/fnagi.2013.00087>

Other Readings and References

4. Latash, M.L., & Singh, T. (2024). *Neurophysiological Basis of Motor Control (3rd Ed.)*. Human Kinetics
5. Haywood, K.M., & Getchell, N. (2020). *Life Span Motor Development (7th Ed.)*. Human Kinetics: Champaign, Illinois.
6. Additional readings will be posted in NTULearn.

Course Policies and Student Responsibilities

(1) General

You are expected to complete all assigned pre-class readings and activities, attend all classes – lecture and laboratory – punctually, submit all scheduled assignments and take tests by due dates. You are not allowed to swap laboratory groups without express permission from the course coordinator. You are expected to take responsibility to follow up with course notes, assignments and course-related announcements for sessions they have missed. You are expected to participate in all discussions and class activities unless there is a valid medical reason not to do so.

(2) Absenteeism

Absence from class without a valid reason will affect your overall course grade. Valid reasons include falling sick, supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

If you miss a lecture, you must inform the course instructor via email prior to the start of the class.

(3) Absence Due to Medical or Other Reasons

If you are sick and not able to complete a test or submit an assignment, you have to submit the original Medical Certificate (or another relevant document) to the Sport Science & Management (or Home School) administration to obtain official leave. Without this, the missed assessment component will not be counted towards the final grade. There are no make-ups allowed.

(4) Attire and safety

You are expected to participate in practical laboratory activities. Some of these activities involve exercise. You are expected to wear appropriate attire for participation, obey laboratory safety rules, and take appropriate care of and return all equipment after use.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognise your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion, and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [NTU Student Academic Integrity Policy and Procedures link](#) in the Student Portal for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Special note: Generative AI tools will be allowed to the extent stipulated for each assignment in the assignment instructions, and any such use must be duly referenced or disclosed.

Course Instructors

| Instructor | Office Location | Phone | Email |
|------------|-----------------|-------|-------|
| TBA | | | |

Planned Weekly Schedule

| Week | Topic | ILO | Readings/ Activities |
|------|-----------------------------------|-----|---------------------------|
| 1 | Neuromuscular control of movement | 1 | Latash & Singh, Chapter 5 |

| | | | |
|-------------|---|------|--|
| 2 | Cognitive control of movement | 1 | Latash & Singh, Chapters 8-11 |
| 3 | Sensory-motor integration of motor control | 1 | Latash & Singh, Chapter 29 |
| 4 & 5 | Developmental changes in motor control – from infancy to ageing | 2 | Latash & Singh, Chapters 32, 33 |
| 6 & 7 | Factors affecting motor control and development | 2 | Latash & Singh, Chapter 21 |
| Recess Week | | | |
| 8 | Class test | 1, 2 | |
| 9 | Motor control changes in common neuromuscular conditions | 3-5 | Latash & Singh, Chapters 35-40 (as assigned) |
| 10 | The role of neuroplasticity in motor control over the lifespan | 4, 5 | Latash & Singh, Chapter 41 |
| 11 | The role of exercise in motor control over the lifespan | 4, 5 | NTU learn reading |
| 12 | Research applications in motor control and development | 4, 5 | NTU learn reading |
| 13 | Group presentations | 3, 4 | |

Appendix 1: Assessment Criteria for Group Presentation (25% of Final Grade)

| | A+, A, A- | B+, B | B-, C+, C | D+, D | F |
|---|--|--|---|--|---|
| Quality of presentation (max 20) | Information provided clearly answers the question set out. Presentation is clear, and the flow is coherent and logical. Pace is appropriate. | Information mostly answers the question set. Presentation is mostly clear, and the flow is generally coherent and logical. | There are weaknesses or absences in the information provided, and the flow of the presentation is unclear at times. | Much of the information provided does not answer the question, and the flow is difficult to understand. | Little relevant information and unclear flow. |
| Understanding of material (max 40) | Able to clearly demonstrate and thoroughly explain the question/material. Able to answer questions in a poised and articulate manner with high confidence. | Good demonstration and explanation of the question/material. Able to answer most of the questions clearly and with confidence. | Clear but basic demonstration and explanation of the question/material. Able to answer some of the questions clearly but lacks confidence at times. | Poor demonstration and weak explanation of the question/material. Has difficulty answering questions and lacks confidence. | Unable to demonstrate or explain the question/material. Unable to answer questions. |
| Use of technology (max 10) | Uses relevant technology very well to supplement and enhance the quality of presentation. | Good use of technology to improve the presentation. | Some use of technology to help improve the presentation. | Little use of relevant technology in the presentation. | No clear use of technology in the presentation. |
| Communication and teamwork* (max 20) | Communication is very clear and easy to understand. All members of the team make active contributions. | Communication is clear and easy to understand most of the time. Most members of the team make good contributions. | Communication is unclear at times. Varied contributions of different team members. | Communication is unclear and there and difficult to understand. Most contributions are provided by a single team member. | Communication is unclear and not possible to understand. No team member makes an active contribution. |

*All individuals within the group are expected to contribute to work involved in the planning, data collection and output. An individual's score may vary from that of the team based on feedback and observations in this area.

Appendix 2: Peer Evaluation Component for Presentation

For the peer evaluation component, group members within each group will be asked to rate each of their peers, and the score received for each group member will be the average of the scores from their peers' round to the nearest integer (e.g., student gets a score of 9, 8 and 8, respectively from the 3 other group members and will receive a score of 8 (average of 8.3)).

| Marks | 10, 9 | 8, 7 | 6, 5 | 4, 3 | 2, 1, 0 |
|---|---|---|---|--|--|
| Peer Evaluation (10 max) | Excellent work; was a crucial component of the group's success. | Very strong work; contributed significantly to the group. | Sufficient effort; contributed adequately to the group. | Insufficient effort; met minimal standards of the group. | Little or weak effort; was detrimental to the group. |

NB: Numeric scores for peer review do not necessarily align with the letter grade categories.