Altered Reaching Following Adaptation To Optical

The History of Neuroscience in AutobiographyOxford University Press

The Routledge Handbook of Motor Control and Motor Learning is the first book to offer a comprehensive survey of neurophysiological, behavioural and biomechanical aspects of motor function. Adopting an integrative approach, it examines the full range of key topics in contemporary human movement studies, explaining motor behaviour in depth from the molecular level to behavioural consequences. The book contains contributions from many of the world ś leading experts in motor control and motor learning, and is composed of five thematic parts: Theories and models Basic aspects of motor control and learning Motor control and learning in locomotion and posture Motor control and learning in voluntary actions Challenges in motor control and learning Mastering and improving motor control may be important in sports, but it becomes even more relevant in rehabilitation and clinical settings, where the prime aim is to regain motor function. Therefore the book addresses not only basic and theoretical aspects of motor control and learning but also applied areas like robotics, modelling and complex human movements. This book is both a definitive subject guide and an important contribution to the contemporary research agenda. It is therefore important reading for students, scholars and researchers working in sports and exercise science, kinesiology, physical therapy, medicine and neuroscience.

A Support Book for Patients, Caregivers, Families and Friends

Visual Attention and Cognition

Alteration of a Conditioned Avoidance Tendency by a Procedure of Adaptation to the Unconditioned Stimulus

The Pedagogy of Adaptation

Reports of workshops and meetings conducted by the Program.

Speech recognition technology is being

increasingly employed in human-machine interfaces. A remaining problem however is the robustness of this technology to non-native accents, which still cause considerable difficulties for current systems. In this book, methods to overcome this problem are described. A speaker adaptation algorithm that is capable of adapting to the current speaker with just a few words of speaker-specific data based on the MLLR principle is developed and combined with confidence measures that focus on phone durations as well as on acoustic features. Furthermore, a specific pronunciation modelling technique that allows the automatic derivation of non-native pronunciations without using non-native data is described and combined with the previous techniques to produce a robust adaptation to non-native accents in an automatic speech recognition system.

Neurosciences Research Symposium Summaries

Publications and Theses

Aspects of Neural Plasticity (Plasticité

Nerveuse)

Neurosciences Research Program Bulletin

Bibliography on the Control and Management of the Coyote and Related Canids with Selected References on Animal Physiology, Behaviour, Control Methods and Reproduction

Humans are very good at learning to make new movements, whether this is to practice a skill that many other people can perform or to overcome a new situation that they have never encountered. For instance, astronauts learn to maneuver in zero gravity and skydivers learn to precisely control falling with the poise of an acrobat. The same learning is evident in everyday life, as people regularly adjust for the small changes to their movements caused by articles of clothing, such as the additional weight of a watch on the forearm or the differences in gait necessary for many types of shoes. In motor learning research, it has been an open question whether learning a new skill, such as the controlled fall from skydiving, is the same as altering an existing motor skill, such as reaching, to compensate for the weight of a watch. In my dissertation work I have focused on the question of how and why people alter their existing motor skills, a type of learning called adaptation. Adaptation is a specific subset of motor learning that occurs when the sensory outcome of motor commands is systematically altered. In order to induce this adaptation in the laboratory, we manipulate the visual feedback that human participants see when they are performing reaching tasks. It is thought that this type of learning, visuomotor adaptation, is driven by the difference between the feedback that was predicted to occur and the actual feedback. This discrepancy in feedback is known as a sensory prediction error. If present, these errors indicate that the sensorimotor system is not properly calibrated, and future motor commands (and their predicted sensory outcomes) are adjusted to bring the system back into alignment. Adjustments made to the motor commands by this process are historically believed to be independent of other factors that commonly affect learning, such as reward and punishment. It is becoming increasingly accepted, however, that the behavior observed in sensorimotor adaptation tasks may not only be the output of error-based adaptation. In the work that forms my dissertation, we attempted to characterize the effect of three different systems on behavior in visuomotor adaptation tasks. In Chapter 1, we examined savings-upon-relearning in visuomotor adaptation tasks. Savings is the phenomenon of faster relearning after something has been forgotten. Visuomotor adaptation seems to be an ideal form of learning to study savings-upon-relearning, as participants can rapidly learn to compensate for altered visual feedback while also decaying fully to baseline behavior within a single experimental session. Following this "forgetting" of the motor memory, participants can then be re-exposed to the same visual perturbation; savings would be evident if they compensate for the perturbation faster during re-exposure compared to the first learning event. This has been a conundrum for models of sensorimotor adaptation that function solely on sensory prediction errors, as the error size is the same for both learning episodes. If learning was only driven by these errors, it should proceed at the same rate both times. Here we examine the idea that this faster relearning comes from outside of the motor system and is not driven by sensory prediction errors, but rather an impetus to restore good task performance. Specifically, the results indicate that savings comes about because participants learn to implement a cognitive aiming strategy that helps them hit the target again. The difference in the rate of behavioral change arises because participants require time to develop the strategy when first encountering the altered visual feedback, but can then immediately implement it upon re-encountering the altered feedback. In Chapter 2, we attempted to isolate the effects of error-based adaptation with a novel experimental manipulation.

Participants were exposed to altered visual feedback and, unlike traditional adaptation studies, were fully informed of the nature of this alteration and explicitly told to ignore it. The specific visual feedback manipulation employed is known as a "visual error clamp," where the visual cursor is set to a fixed heading angle. This means that no matter where the participant moves in the workspace, the feedback will always move in this direction instead of the direction of movement. We carefully manipulated the offset of the heading angle for this feedback relative to the direction participants were reaching in order to induce task-irrelevant sensory prediction errors. The only reason participants should adjust for these error clamps is if error-based learning is taking place given that they were told to ignore the feedback. We observed very robust adaptation in response to this manipulation. Surprisingly, the adaptation was consistent with that observed in typical adaptation studies in every way but one: the size of the change in behavior was not related to the size of the error. This is potentially a substantial challenge for theories of error-based adaptation, as they predict that there is either a linear or curvilinear relationship between error size and the magnitude of the adaptive response. In Chapter 3, we explore the consequences that intrinsic biases have on visuomotor adaptation studies. When participants move without visual feedback, they often exhibit individual biases in the direction of their reaches. Here we show that there is a systematic bias for all participants, varying with the reach direction, and that it cannot be fully eliminated through visuomotor adaptation. This is because learning at any given reach direction is not fully independent of learning in other directions given that learning generalizes locally in the workspace. Furthermore if feedback is removed (a common manipulation in adaptation tasks), participants will drift back to this bias over time. If unaccounted for, this systematic bias (or its re-emergence) can be misinterpreted as a learning effect in adaptation tasks. We outline a few experimental and analytical techniques that can help account for this bias in these tasks so that future researchers can study adaptation without this contaminant. Taken together, these studies show that many different processes contribute to the behavior of participants in sensorimotor adaptation tasks. These processes function with considerable independence and affect behavior in response to distinct stimuli. We have made an attempt to dissociate these processes primarily at a psychological level, a critical step for the investigation of the neural underpinnings of such processes. Visuomotor adaptation arises when reaching in an altered visual environment, where one's seen hand position does not match their felt (i.e., proprioceptive) hand position in space. Here, we investigated if proprioceptive training (PT) benefits visuomotor adaptation, and if these benefits arise due to implicit (unconscious) or explicit (conscious strategy) processes. A total of 72 participants were divided equally into 3 groups: Proprioceptive training with feedback (PTWF), Proprioceptive training no feedback (PTNF), and Control (CTRL). The PTWF and PTNF groups completed proprioceptive training (PT), where a participant's hand was passively moved to an unknown reference location and they judged the felt position of their unseen hand relative to their body midline on every trial. The PTWF group received verbal feedback with respect to their response accuracy on the middle 60% of trials. The CTRL group did not complete PT and instead sat quietly during this time. Following PT or time delay, all three groups reached when seeing a cursor that was rotated 30° clockwise relative to their hand motion, followed by a series of no-cursor reaches to assess implicit and explicit adaptation. Results indicated that the PTWF group improved their sense of felt hand position following PT. However, this improved proprioceptive acuity did not benefit visuomotor adaptation, as all three groups showed similar visuomotor adaptation across rotated reach training trials. Visuomotor adaptation arose implicitly, with minimal explicit contribution for all three groups. Thus, these results suggest that passive proprioceptive training with feedback does not benefit, nor hinder, implicit visuomotor adaptation.

Studies in Neurolinguistics

Introduction to Perception

The Graphic Novel

Motor Learning and Adaptation: The Role of Motor Abundance

Investigating the Influence of Proprioceptive

Training on Visuomotor Adaptation

Reaching with altered visual feedback of the hand's position in a virtual environment leads to reach adaptation in the trained hand, and also in the untrained hand (Wang & Sainburg, 2002). In the current study, we asked if reach adaptation in the untrained (right) hand is due to transfer of explicit (i.e., EA; conscious strategy) and/or implicit adaptation (i.e., IA; unconscious) from the left (trained) hand, and if the transfer of EA and IA changes depending on how one is made aware of the visuomotor distortion. We further asked if EA and IA are retained in the trained and untrained hand for 24 hours. Participants (n=60) were evenly divided into 3 groups (Strategy, No-Strategy, and Control). All participants reached to visual targets while seeing a cursor on the screen that was rotated 40°

clockwise relative to their hand motion. Participants in the Strategy group were instructed on how to counteract the visuomotor distortion. The No-Strategy group was not told of the upcoming visuomotor distortion but was later asked to reach while engaging in any strategy they had learned in order to assess EA. Participants in the Control group were also not told of the upcoming visuomotor distortion and were never instructed to engage in any strategy when reaching. EA and IA were assessed in both the trained and untrained hands immediately following rotated reach training, and 24 hours later by having participants reach without the cursor when instructed to: (1) aim so that your hand lands on the target (to assess IA) and (2) use what was learned during training so that the cursor lands on the target (to assess EA + IA; exception of

Control group). Results revealed that the groups differed with respect to the extent of reach adaptation achieved when initially training with the rotated cursor, such that the Strategy group had greater EA and less IA compared to the No-Strategy group in the trained hand. Unexpectedly, the Control group also showed less IA compared to the No-Strategy group, but was similar to the Strategy group. For both the Strategy and No-Strategy groups, EA was transferred between hands and was retained over time. While the extent of IA varied between groups in the trained (left) hand immediately following reach training trials, significant transfer of IA was not found in any of the three groups. Retention of IA was observed in the trained hand but decayed over testing days. Together, these results suggest that while initial EA and IA in the trained hand is

dependent on how one is made aware of the visuomotor distortion, transfer and retention of visuomotor adaptation is driven almost exclusively by EA, regardless of instructions provided.

The goal of this book is to put together some of the main interdisciplinary aspects that play a role in visual attention and cognition. The book is aimed at researchers and students with interdisciplinary interest. In the first chapter a general discussion of the influential scanpath theory and its implications for human and robot vision is presented. Subsequently, four characteristic aspects of the general theme are dealt with in topical chapters, each of which presents some of the different viewpoints of the various disciplines involved. They cover neuropsychology, clinical neuroscience, modeling, and

applications. Each of the chapters opens with a synopsis tying together the individual contributions.

Adaptation to Psychological Stress in Sport

Robust Adaptation to Non-Native Accents in Automatic Speech Recognition

LLBA

Adaptation of Trees to Climate Change: Mechanisms Behind Physiological and Ecological Resilience and Vulnerability

Adapting to Altered Sensory Environments

A selection of annotated references to unclassified reports and journal articles that were introduced into NASA scientific and technical information system and announced in Scientific and Technical

Aerospace Reports (STAR), International Aerospace Abstracts (IAA).

This collection of essays focuses on numerous contexts to emphasize why film adaptations matter to students of literature. Written by specialists in a variety of fields, ranging from film, radio, theater, and even language studies, it is the first such volume devoted exclusively to teaching adaptations from a practical, teacher-centered angle.

Colloque, Lyon-Pérouges, 11-12 Avril 1975

The Body Senses and Perceptual Deficit

Aerospace Medicine and Biology

Bimanual Transfer and Retention of Visuomotor

Adaptation is Driven by Explicit Processes
Animal Behaviour

A stroke is a devasting occurence in the life of a family. After damage is assessed, the patient, family emembers, caregivers, doctors and friends collaborate on rehabilitation. It is important to understand what kind of stroke the patient suffered and what kinds of physical, neural and nutritional therapies can help to restore normal functioning. This entry in North Atlantic's Family Health Series is a guide to the causes and consequences of a stroke. It outlines a systematic plan to help restore normal living developed by healthcare professionals active in Australia stroke support groups. They are joinded by a Feldenkrais practitioner and a naturopathic physician who describe bodywork and nutritional approaches *to complement conventional medicine. After a Stroke will help you understand limitations, effects and recovery prognosis of different kinds of strokes; locate movement therapies and body work to stimulate and re-educate the brain and neural-limb coordination; organize a "health team" blending the best of current orthodox medicine with the bext of traditional, natural therapies; and chart daily patient progress with worksheets, charts and tables.*

This is a collection of autobiographical essays by notable senior scientists who discuss the major events that shaped their discoveries and their influences, as well as the people who inspired them and helped shape their careers as neuroscientists.

The Study of Influenza

Society for Neuroscience Abstracts
Annual Review of Psychology
Webvision
Perceptual Modification

For research workers, teachers, and students. Aims and methods. The study of causation. The development of behaviour. Evolution.

Routledge Handbook of Motor Control and Motor Learning
After a Stroke
Woodworth & Schlosberg's Experimental Psychology
Volume 23, 27th Annual Meeting, New Orleans, La., October 25-30, 1997

The History of Neuroscience in Autobiography

My first study attempted to determine the effects of practicing a novel motor task on the use of motor abundance over the course of learning. The experiment had naive subjects practice throwing a Frisbee at a target from a well-controlled initial position. Joint configuration variance was partitioned with respect to hand/Frisbee movement along a straight path to the target (typically referred to as movement extent in reaching studies), movement orthogonal to the path (movement direction), hand path velocity, and the hand's

orientation to the target. With practice, both VUCM and VORT decreased with respect to all of the above performance variables. The decrease in VUCM was smaller than the decrease in VORT, however, when analyzed with respect to the control of movement direction and the hand's orientation to the target. Thus, the proposed UCM control law evolved selectively with learning (i.e., VUCM " V ORT) to provide greater consistency of performance variables whose control are apparently more important to task success.

Publishes original critical reviews of the

significant literature and current developments in psychology.
Information Circular
Publication
A Theory of Intelligent Behavior
The Role of Multiple Learning Systems in Sensorimotor Adaptation of Human Reaching
A Synthesis of Ethology and Comparative Psychology