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Mini-Orals

MO-BN09 Motor Control & Learning 2

IS CHUNKING THE EXPLANATION FOR THE BENEFITS OF ANALOGY INSTRUCTIONS IN LEARNING?

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Introduction Analogies or metaphors are often used by coaches to teach new movements. Several studies demonstrated advantages of an analogy instruction, such as robust performance under dual-task conditions (e.g. Liao & Masters, 2001). Yet, the question of how an analogy exactly works is still open. One possible explanation is that an analogy chunks task-specific information into higher-level units, which leaves the learner with less chunks to process during movement execution. The current experiment examined this theory by comparing rule accumulation during learning with performance under dual-task conditions. It was hypothesized that participants who accumulated rules that are subsumable under the analogy would show the benefits of analogy learning in their performance measures. Methods Fifty-one novice participants performed 5 blocks of 20 practice trials in order to learn a table tennis topspin forehand. After each block participants wrote down all the movement-specific rules they were aware of using during learning. After acquisition, the "hand up the mountain" analogy was introduced. Participants were required to perform the task under dual-task conditions (tone-counting), both before and after introduction of the analogy. The rules acquired during learning were rated as subsumable or non-subsumable. On the basis of performance in the first dual-task condition participants were grouped into a Breakdown group (performance decrement in the dual-task more than 5% of single task performance, n=27) and a No Breakdown group (performance in the dual-task equal or better than single task, n=24). The Breakdown group was further split into a Benefit group (more than 5% improvement from first to second dual task performance) and a No Benefit group (less than 5% improvement). Results The Breakdown group reported a significantly lower proportion of subsumable rules compared to the No Breakdown group, $t(49) = -3.33$, $p = .002$. Further, the Benefit group and No Benefit group did not show any differences in number of subsumable rules, $t(25)=0.41$, $p=.69$, and proportion of subsumable rules , $t(25)=0.82$, $p = .42$. Discussion In contrast to our main hypothesis, performance improvements after the introduction of the analogy did not depend on whether the acquired rules were subsumable under the analogy. Therefore, our data does not support the chunking hypothesis of implicit motor learning. Interestingly, a higher proportion of subsumable rules seem to lead to a higher robustness under dual-task conditions, suggesting that these rules are more useful in learning than other rules. References Liao, CM, Masters, RSW. (2001). J Sports Sci, 19, 307–19. Contact tinavanduijn@gmx.ch

CONTEXTUAL INTERFERENCE AND DIFFERENTIAL LEARNING COMPARED IN A GRIP-FORCE–REPRODUCTION TASK

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Introduction Different approaches with changing emphasis on variations have been suggested for successful learning. The Contextual Interference (CI) approach (Battig, 1966) focuses on adding a con(!)text to a to-be-learned task during the training phase and theoretically results in increased learning rates after interfered acquisition phases. The differential learning (DL) approach relies on the rise of fluctuations during phase transitions in dissipative systems (Schöllhorn, 2000). The space of the to-be-learned "text" is given up and enlarged thru increasing fluctuations by adding stochastically self induced perturbations to the test task for improved acquisition and learning rates (Schöllhorn et al., 2013). For a first comparison of these two approaches a force grip experiment from Shea et al. (1990) was adapted. Beside a low (blocked) and a high (random) CI group a third group was added with DL content, which is mainly changing a movement by slight changes of the test movement. Methods 24 subjects (22 male, 2 female; 27.1 ± 3.1 years of age) were randomly assigned to one of three intervention groups (CIL, CIH and DL). Each subject completed three training sessions (TS) with 30 trials in each. The time to recover between each TS was one hour. The ability to head onwards 60% of the individual maximum grip strength was examined in a pre- and a posttest for each TS as well as 24 hours after the last TS (retentiontest). A repeated measurement ANOVA was used to analyze the immediate (pretest – posttest) and outwear effect (retentiontest) of the three intervention groups. Results The three groups developed very differently. Both CI-Groups decreased their performance in the grip strength task during the training phase. By contrast the DL-Group increased its performance in the grip strength task during all training sessions. All groups increased their performance in the retention test. The repeated measurement ANOVA showed significant results ($p=.043$) over the time. The interaction of group and time is not significant ($p=.359$). Moreover the between-subject effect is not significant ($p=.202$). Discussion All groups were able to increase their performance from pre- to retentiontest. The development of the DL group differs distinctively in comparison to the CI groups in the training phase, therefore different mechanisms seem to underly these two learning approaches. References Battig, W. F. (1966). In E. A. Bilodeau (ed.), Acquisition of skill (215–244). Oxford: Academic Press. Schöllhorn, W. I. (2000). Acta Academiae Olympiquae estoniae, (8), 67-85. Schöllhorn, W. I., Hegen, P. & Davids, K. (2012). The Open Sport Science Journal, 5, 100-112. Shea, C. H., Kohl, R. M. & Indermill, C. (1990). Acta Psychology, 73, 145-157. Contact hegenp@uni-mainz.de

OBSERVATIONAL LEARNING OF A BASEBALL PITCH: WHICH KIND OF INFORMATION IS EXTRACTED?

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Introduction A main issue in observational learning is to identify the nature of information extracted by observers from demonstration. Visual perception perspective (Scully & Newell, 1985) proposed that relative motion is picked-up and used for action reproduction. According to visual perception perspective, making salience relative motion information within a demonstration, e.g. by creating point-light or stick-figure displays, would be more effective than a classic video display on observational learning. This proposition was examined in this study by using a Baseball pitch as learning task. Methods Forty one novice female and male adults ($M = 24.2$, $SD = 3.3$ years) were randomly assigned to video, stick-figure, point-light and control groups. Subjects performed 5 familiarization trials, three blocks of 10 acquisition trials, and two retention tests of 5 trials in 10 min and 7 days later. Demonstration groups observed respective videos three

times before each acquisition block. Subjects' performances were independently rated by two experienced Baseball coaches both at level of overall motion and level of individual phases (inter-rater reliability = 0.87). One way and repeated measures ANOVAs were used for statistical analysis ($P < 0.05$). Results Results showed that subjects improved significantly their performance scores from pretest to acquisition phase ($F = 5.54$, $p < .01$), however, regardless of type of model demonstration. Video group performed significantly better than stick-figure group in late retention test ($F = 3.43$, $p < .05$). Analysis of movement phases revealed a significant improvement in stride ($F = 5.12$, $p < .01$), and follow-through ($F = 4.41$, $p < .01$) phases from pretest to acquisition blocks. Moreover, stick-figure group showed a significantly worse performance in late retention test than point-light and video groups in arm cocking ($F = 5.47$, $p < .01$) and arm deceleration ($F = 3.08$, $p < .05$) phases. Discussion The proposition of visual perception perspective was not confirmed by the results, because no superior performance was observed for the subjects in point-light or stick-figure groups over video group. Moreover, lacking a superiority of model observation over no-observation might be due to information the subjects were given prior to pretest and number of times the subjects were presented with model demonstration. Improvements in stride and follow-through phases from pretest to acquisition blocks may indicate that these are most practice demanded phases of the pitch. References Scully, D. M., & Newell, K. M. (1985). Observational learning and the acquisition of motor skills: Toward a visual perception perspective. Journal of Human Movement Studies, 11, 169-186.

IMPLICIT MOTOR LEARNING IN YOUTH ELITE SOCCER PLAYERS

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Introduction: Neurocognitive functions such as motor inhibition and attentional skills may underlie success in sports and distinguish between elite and amateur players. One ability that has not been studied in relation to sports performance is the ability to learn motor sequences. The current study investigated implicit and explicit motor learning in elite youth soccer players as compared to amateur soccer players. Method: Thirty-eight youth elite soccer players, and thirty-two amateur soccer players between 10 and 12 years of age performed a serial reaction time task (SRTT) with two sequences of eight keys. One of the sequences must be learned explicitly, the other was implicitly learned. A total of five blocks with 25 trials for both sequences in each block was administered. Differences between implicit and explicit learning were tested using repeated measures analysis of variance with sequence and block as within-subject variables and group as between-group variable. Group differences were tested using two separate repeated measures analysis of variance, with group as between-factor and mean reaction time of each block as dependent variable. Results: No difference across groups was found between implicit and explicit learning ($F(1,68)=.80, p=.53$). Interestingly, youth elite soccer players showed superior reaction times on both the implicit and explicit learning sequence ($F(1,68)=4.9, p<.05$ and $F(1,68)= 3.8, p<.05$, respectively) as compared to amateur soccer players. An interaction effect was found between group and block for the implicit sequence, between block 3 and 4 ($F(1,68)=4.4\ 0, p<.05$) where the elite youth soccer players showed constant performance of the implicit motor sequence and stopped learning, whereas the amateur soccer players were still learning. For the explicit sequence, no interaction effect was found ($F(1,67)=.26, p=.61$), indicating similar learning curves for both groups. Conclusion: Youth elite soccer players outperform youth amateur soccer players on implicit motor learning, and also showed faster reaction times across the SRTT on both sequences. These findings may be important for talent identification in soccer because children with superior implicit learning abilities may learn more rapidly and develop better motor abilities leading to superior sports performance.

EXAMINING THE ROLES OF CONSCIOUS MOTOR PROCESSING AND MOVEMENT SELF-CONSCIOUSNESS IN PERFORMANCE OF A GOLF-PUTTING TASK

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Objective This study investigated the influence of two dimensions of movement specific reinvestment (conscious motor processing and movement self-consciousness) on performance of a golf-putting task during early-learning and late-learning. Background The influence of individual personality differences on performance has been extensively examined in a range of motor skill-learning domains. 'Reinvestment' is a characteristic of personality that has been shown to negatively influence motor-skill performance under pressure (Masters & Maxwell, 2008). The propensity for 'reinvestment' can be quantified using an updated version of the original Reinvestment Scale, the Movement Specific Reinvestment Scale (MSRS). The MSRS has two subscales that represent dimensions of movement specific reinvestment, which reflect an individual's propensity to consciously control movements (conscious motor processing) or to consciously monitor the 'style' of movements (movement self-consciousness). Understanding the unique influence of the dimensions during the different stages of learning may inform development of more fine-tuned training paradigms in sport. Design Participants (n = 30) with no prior experience in golf were recruited to practice 300 golf putts during a learning phase over the course of two days. Methods Trait measures of movement specific reinvestment were obtained from participants using the MSRS. Performance accuracy and quality of performance were assessed on the basis of number of putts holed and consistency of putting strokes, respectively. Multiple regression analyses were conducted to test if conscious motor processing and movement self-consciousness predicted putting accuracy and stroke consistency during early-learning and late-learning. Results Movement self-consciousness, but not conscious motor processing, uniquely predicted putting accuracy during early-learning and late-learning. Higher propensity for movement self-consciousness was associated with greater putting accuracy early and late in learning. Movement self-consciousness, but not conscious motor processing, predicted stroke consistency early in learning such that higher propensity for movement self-consciousness was associated with greater consistency in putting strokes. During late-learning, neither movement self-consciousness nor conscious motor processing predicted stroke consistency. Conclusion The findings suggest that higher propensity for movement self-consciousness is beneficial early and late in learning. A higher propensity for movement self-consciousness seems to be associated with a more consistent style of movement, which benefits performance, especially early in learning. The lack of influence of conscious motor processing on performance during learning will be discussed within the framework of the Theory of Reinvestment. References Masters, R. S. W., & Maxwell, J. (2008). The theory of reinvestment. International Review of Sport and Exercise Psychology, 1(2), 160-183. doi: 10.1080/17509840802287218