

Robert Rein
Research assistant
Sport Informatics and Sports Games Research
Email: r.rein@dshs-koeln.de
Phone: +49 221 4982-6069



Publications

High +Gz Flight Reduces Cervical 3D Kinematics and Increases Neck Pain in Fighter Pilots

Lingscheid, R., Nuesse, R., Rein, R., Goell, F., Albracht, K. & Braunstein, B., 01.03.2026, In: *Aerospace Medicine and Human Performance*. 97, 3, p. 151-159 9 p.

Effects of speed, gender, and visual wheel modifications on time-to-arrival judgments of cyclists

Millar, S.-K., Noël, B., Geisen, M., Rein, R. & Klatt, S., 2026, In: *Frontiers in Future Transportation*.

Real-Flight Observations of Head and Trunk Movements of Fast Jet Pilots

Lingscheid, R., Albracht, K., Goell, F., Nuesse, R., Rein, R. & Braunstein, B., 10.09.2025, In: *Aerospace Medicine and Human Performance*. 96, 9, p. 810-818 9 p.

A systematic Review of Space Control in Football

Krampe, L., Bassek, M., Raabe, D., Memmert, D. & Rein, R., 04.07.2025, *BOOK OF ABSTRACTS, 30th ECSS Annual Congress*. Rimini: Book of Abstracts

Small-Sided Games the Made-to-Measure Tool? Short-Term Pyramidal Scaling Changes Reveal Players' Collective Spatial Configurations in Relation to Pitch Dimensions

Deuker, A., Bassek, M., Rein, R., Jakobs, J. & Vogt, T., 18.06.2025, *World Congress on Science and Soccer 2025*.

Knee angle reproduction tests: influences of body orientation, movement direction and limb dominance

Wieber, J., Preece, A., Rein, R. & Braunstein, B., 10.06.2025, In: *International journal of sports medicine*. 2025, 6, p. 422-429 8 p.

Person-independent factors affecting active knee angle reproduction tests: a systematic review and meta-analysis

Wieber, J., Reer, R., Rein, R. & Braunstein, B., 28.05.2025, In: *German Journal of Sports Medicine*. 76, 3, p. 108 1 p., 182.

Reference limb selection in active contralateral knee angle reproduction tests two years after anterior cruciate ligament reconstruction: a randomized controlled trial

Wieber, J., Reer, R., Rein, R. & Braunstein, B., 28.05.2025, In: *German Journal of Sports Medicine*. 76, 3, p. 109 1 p., 187.

Automatic Formation Recognition in Handball Using Template Matching

Bassek, M., Memmert, D. & Rein, R., 23.05.2025, In: *Proceedings of the 14th International Symposium on Computer Science in Sport*.

Alterations in Pitch Dimensions Reveal Time-Dependent Effects in Soccer Players' Collective Behavior

Deuker, A., Vogt, T., Rein, R. & Bassek, M., 26.03.2025, *Proceedings of the Motor Skills Acquisition Conference 2025*.

Play to train – Using open play to improve closed skill acquisition in soccer

Rein, R., Meyer, L., Deuker, A. & Braunstein, B., 26.03.2025, *Proceedings of the Motor Skills Acquisition Conference 2025*. Lohja, Finland, 1 p.

Cognitive and Motor Creativity in the Same Task Environment: An Exploratory Study in Pool

Memmert, D., Moraru, A., Mehta, S., Rein, R., Noël, B. & van der Kamp, J., 06.03.2025, In: Creativity research journal.

Cognitive and Motor Creativity in the Same Task Environment: An Exploratory Study in Pool

Moraru, A., Mehta, S., Rein, R., Noël, B., van der Kamp, J. & Memmert, D., 06.03.2025, In: Creativity research journal.

An integrated dataset of spatiotemporal and event data in elite soccer

Bassek, M., Memmert, D., Rein, R. & Weber, H., 01.2025, In: Nature, Scientific Data. 12, 1

Comment on: "A Machine Learning Approach to Concussion Risk Estimation Among Players Exhibiting Visible Signs in Professional Hockey"

Klemp, M. & Rein, R., 2025, In: Sports medicine.

Individual movement patterns in elite para-sprinters are not aligned with IPC classifications

Klein, J., Oepfert, T., Braunstein, B., Rein, R., Schapschröer, M., Alt, T. & Abel, T., 2025, *Book of Abstracts 7th RehabMove Congress*. 7 ed. Groningen, p. 26 1 p.

Interaction Effects Between Possession Status and Percentage: Insights from Modeling Match-Running Performance Across Possession Status in Male Soccer

Pan, P., Rein, R. & Memmert, D., 2025, In: Biology of sport.

The perspective during gestural executions alters hemispherical specialization

Helmich, I., Mueller, S., Rein, R. & Lausberg, H., 2025, In: Behavioural brain research. 480

Frequency and intensity of change of directions in German Bundesliga soccer

Deutsch, J.-P., Donath, L., Braunstein, B. & Rein, R., 14.12.2024, In: SCIENCE AND MEDICINE IN FOOTBALL. 13 p.

Ulkis – Ein universitäres Lehrkonzept für KI in den Sportwissenschaften

Memmert, D., Klemp, M. & Rein, R., 22.07.2024, In: Digitalisierung und Innovation im Sport und in der Sportwissenschaft.

Factors that influence the angular error in active knee angle reproduction tests: A systematic review and meta-analysis

Wieber, J., Müller-Rahmel, L., Reer, R., Rein, R. & Braunstein, B., 01.07.2024, In: Journal of experimental orthopaedics. 11, 3, p. e12091 13 p., e12091.

Five-Week, Low-Intensity Blood Flow Restriction Rowing Improves Vo2max in Elite Rowers

Held, S., Rappelt, L., Rein, R., Deutsch, J.-P., Wiedenmann, T. & Donath, L., 14.03.2024, (Electronically/ online published ahead of print) In: Journal of Strength and Conditioning Research. The Official Research Journal of the NSCA.

An Introduction to the Programming Language R for Beginners

Rein, R., 2024, *Computer Science in Sport*. Springer, p. 109 123 p.

Beyond the Pitch: Unveiling the Concave Hull as Soccer's Ecological Niche in Practice Design

Deuker, A., Wittkugel, J., Dublin, Y., Braunstein, B., Rein, R., Davids, K. & Vogt, T., 2024, In: Research Quarterly for Exercise and Sport. p. 1-12 12 p.

Spatio-temporal analysis of 289 world-class 400-meter running performances

Schwarz, Y., Wiedenmann, T., Lemberg, P., Böddeker, K., Christmann, R., Schwarz, A., Rein, R. & Braunstein, B., 2024, *Book of Abstracts of the 29th annual congress of the European College of Sport Science 2024 (ECSS)*. Davison, R., Tsolakidis, E., Thompson, J. L., Ferrauti, A. & Piacentini, M. F. (eds.). Glasgow: European College of Sport Science, p. 639 1 p. 2122

Super Size Soccer - Alterations of pitch dimensions reveal hysteresis in teams' collective behavior

Deuker, A., Bassek, M., Wittkugel, J., Braunstein, B., Rein, R., Raabe, D. & Vogt, T., 2024, *Book of Abstracts of the 29th annual congress of the European College of Sport Science 2024 (ECSS)*. Davison, R., Tsolakidis, E., Thompson, J. L., Ferrauti, A. & Piacentini, M. F. (eds.). European College of Sport Science, p. 21 1 p. 2016

The dual problem of space: Relative player positioning determines attacking success in elite men's football

Raabe, D., Biermann, H., Bassek, M., Memmert, D. & Rein, R., 2024, In: Journal of Sports Science. 42, 19, p. 1821-1830

Effects of body orientation and direction of movement on a knee joint angle reproduction test in healthy subjects: An experimental study

Wieber, J., Brandt, J., Pieper, M., Hirschhäuser, E., Catalá-Lehnen, P., Rein, R. & Braunstein, B., 15.09.2023, In: Technology and health care : official journal of the European Society for Engineering and Medicine. 31, 5, p. 1567-1578 12 p.

Data Processing Strategies to Determine Maximum Oxygen Uptake: A Systematic Scoping Review and Experimental Comparison with Guidelines for Reporting

Nolte, S., Rein, R. & Quittmann, O. J., 21.08.2023, In: Sports medicine (Auckland, N.Z.).

The measurement of the knee joint position sense – Different test settings affecting the resulting angle reproduction error

Wieber, J., Brandt, J., Hirschhäuser, E., Pieper, M., Rein, R., Catala-Lehnen, P., Reer, R. & Braunstein, B., 01.08.2023, In: Physioscience. 20, S01-S34, p. S16 1 p., P14.

Data Processing Strategies to Determine Maximum Oxygen Uptake: A Systematic Scoping Review and Experimental Comparison with Guidelines for Reporting

Nolte, S., Rein, R. & Quittmann, O., 05.07.2023, *eProceedings of the European College of Sport Science (ECSS): 28th Annual Congress of the European College of Sport Science, Explore Enlighten, Perform, 4-7 July 2023, France*. Guilhem, G., Rabita, G., Brocherie, F., Tsolakidis, E., Ferrauti, A., Helge, J. W. & Piacentini, M. F. (eds.). Paris: ECSS

Change of direction demands in German high-performance soccer

Deutsch, J.-P., Rieke, M., Rein, R., Held, S. & Donath, L., 04.07.2023, *Explore, Enlighten, Perform: 28th Annual Congress of the European College of Sport Science, 4–7 July 2023, Book of Abstracts*. Guilhem, G., Rabita, G., Brocherie, F., Tsolakidis, E., Ferrauti, A., Helge, J. W. & Piacentini, M. F. (eds.). Paris, p. 774 1 p.

Effects of body orientation and direction of movement on a knee joint angle reproduction test in healthy subjects: an experimental study

Wieber, J., Brandt, J., Hirschhäuser, E., Pieper, M., Reer, R., Catalá-Lehnen, P., Rein, R. & Braunstein, B., 06.2023, In: German Journal of Sports Medicine. 74, 4, p. 155 1 p., 242, PT-10-008.

Low-intensity climbing with blood flow restriction over 5 weeks increases grip and elbow flexor endurance in advanced climbers: A randomized controlled trial

Held, S., Rappelt, L., Rein, R., Wiedenmann, T. & Donath, L., 11.05.2023, In: European Journal of Sport Science. p. 1-7 7 p.

"Train as you play": Improving effectiveness of training in youth soccer players

Deuker, A., Braunstein, B., Chow, J. Y., Fichtl, M., Kim, H., Körner, S. & Rein, R., 11.05.2023, In: International Journal of Sports Science & Coaching. 10 p.

Low-intensity swimming with blood flow restriction over 5 weeks increases VO₂peak: A randomized controlled trial using Bayesian informative prior distribution

Held, S., Rappelt, L., Deutsch, J.-P., Rein, R., Wiedenmann, T., Schiffer, A., Bieder, A., Staub, I. & Donath, L., 06.03.2023, In: European Journal of Sport Science. p. 1-7 7 p.

Time Series Data Mining for Sport Data: a Review

Komitova, R., Raabe, D., Rein, R. & Memmert, D., 17.01.2023, In: International journal of computer science in sport. 21, 2, p. 17-31 15 p.

Analysis of contextualized intensity in Men's elite handball using graph-based deep learning

Bassek, M., Raabe, D., Banning, A., Memmert, D. & Rein, R., 2023, In: Journal of Sports Sciences. 41, 13, p. 1299-1308 10 p.

Analysis of Motion Characteristics and Metabolic Power in Elite Male Handball Players

Memmert, D., Bassek, M., Raabe, D. & Rein, R., 2023, In: *Journal of sports science & medicine*. 22, 2, p. 310-316 7 p.

Analyzing the effect of reduced field sizes on tactical behaviour in 11 versus 11 football practice

Deuker, A., Wittkugel, J., Dublin, Y., Klatt, S., Körner, S., Vogt, T., Braunstein, B., Rein, R. & Klemp, M., 2023, *Book of Abstracts : WCSF Gro*. Groningen: World Congress on Science and Football, p. 240 1 p. P253

Change of direction demands in German high-performance soccer

Deutsch, J.-P., Rieke, M., Rein, R., Braunstein, B. & Bassek, M., 2023, *Book of Abstracts: WCSF Gro*. Groningen: World Congress on Science and Football, p. 139 1 p. O741

Data Processing Strategies to Determine Maximum Oxygen Uptake: A Systematic Scoping Review and Experimental Comparison with Guidelines for Reporting

Nolte, S., Rein, R. & Quittmann, O., 2023, In: *Nature, Scientific Data*.

Direction matters when designing football practice – Investigating the representativeness of possession games via positional data.

Deuker, A., Behm, S., Stapmanns, L., Fay, L., Klemp, M., Braunstein, B., Vogt, T. & Rein, R., 2023, *eProceedings of the European College of Sport Science (ECSS): 28th Annual Congress of the European College of Sport Science, Explore Enlighten Perform, 4-7 July 2023, France*. Paris, 1 p. 775

Eine Einführung in die Programmiersprache R für Einsteiger

Rein, R., 2023, *Sportinformatik: Modellbildung, Simulation, Datenanalyse und Visualisierung*.

Influence of reduced field area on tactical behaviour in 11vs11 football practice games

Wittkugel, J., Deuker, A., Jakobs, J., Braunstein, B., Rein, R. & Vogt, T., 2023, *eProceedings of the European College of Sport Science (ECSS): 28th Annual Congress of the European College of Sport Science, Explore Enlighten Perform, 4-7 July 2023, France*. Guilhem, G., Rabita, G., Brocherie, F., Tsolakidis, E., Ferrauti, A., Wulff Helge, J. & Piacentini, M. (eds.). Paris: European College of Sport Science, 1 p. 1508

Measurement modalities affecting the active angular error in joint position sense tests among healthy knees: - a systematic review and meta-analysis -

Wieber, J., Müller-Rahmel, L., Rein, R., Reer, R. & Braunstein, B., 2023, *Proceedings of the German Exercise Science and Training Conference: GEST:23*. Deutsche Vereinigung für Sportwissenschaft (dvs), 2 p. (Schriften der Deutschen Vereinigung für Sportwissenschaft).

Rondo a case for over-constraining in football practice – Analyzing the representativeness of rondo

Deuker, A., Klemp, M., Rein, R., Körner, S. & Memmert, D., 2023, *Book of Abstracts : WCSF Gro*. Groningen: World Congress on Science and Football, p. 89 1 p. O435

Sprint acceleration of Olympic and Paralympic athletes: A comparative study and cluster analysis across multiple classifications (YIA)

Oepfert, T., Klein, J., Riesterpatt, S., Schapschröer, M., Rein, R. & Braunstein, B., 2023, *Proceedings of the German Exercise Science & Training Conference: GEST:23*. Köln, 2 p.

The evaluation of the video assistant referee from referees' and spectators' perspectives in soccer – A case study of the German Bundesliga.

Schwab, S., Steverding, P. & Rein, R., 2023, In: *Soccer & Society*.

Goal-Directed Behaviour? Enhancing Representativeness In Soccer Training

Deuker, A., Behm, S., Fay, L., Stapmanns, L., Braunstein, B., Klemp, M. & Rein, R., 15.06.2022, *World Congress on Science and Soccer 2022 - Book of Abstracts: WCSS 2022 Booklet; 15, 16 & 17 Jun, 2022, Coimbra, Portugal*. Figueiredo, A., Coelho e Silva, M. J., Favero, T. & Sarmiento, H. (eds.). Coimbra, p. 116 1 p.

Auswirkungen unterschiedlicher Körperorientierungen auf den Kniegelenkwinkel-Reproduktionstest: eine experimentelle Studie

Wieber, J., Brandt, J., Hirschhäußer, E., Pieper, M., Rein, R., Catala-Lehnen, P. & Braunstein, B., 19.05.2022, *eProceedings of the 37th GOTS Annual Congress*. Berlin, Vol. 37. 1 p. GOTS22-19

A meta-analysis on immediate effects of attentional focus on motor tasks performance

Nicklas, A., Rein, R., Noël, B. & Klatt, S., 22.04.2022, In: *International Review of Sport and Exercise Psychology*. p. 1-36 36 p.

A meta-analysis on immediate effects of attentional focus on motor tasks performance

Nicklas, A., Rein, R., Noël, B. & Klatt, S., 22.04.2022, In: *International Review of Sport and Exercise Psychology*.

Speed Rope Skipping: Performance and Coordination in a Four-Limb Task

Lorke, N. A., Keller, S., Rein, R., Zedler, M., Drescher, C., Weil, P., Schwerhoff, M. & Braunstein, B., 23.02.2022, In: *Journal of motor behavior*. 54, 5, p. 599-612 14 p.

Defending in 4-4-2 or 5-3-2 formation? Small differences in footballers' collective tactical behaviours

Low, Z. W. B., Rein, R., Schwab, S. & Memmert, D., 01.02.2022, In: *Journal of Sports Sciences*. 40, 3, p. 351-363 13 p.

Analyzing Collapsibility in Performance Analysis in Sports

Klomp, M., Rein, R. & Memmert, D., 2022, *13th World Congress of Performance Analysis of Sport 2022 & 13th International Symposium on Computer Science in Sport 2022, Wien*.

Analyzing Motion Characteristics and Metabolic Power of Elite Male Handball Players

Bassek, M., Raabe, D., Memmert, D. & Rein, R., 2022, *Book of Abstracts of the 27th Annual Congress of the European College of Sport Science: 30 August-2 September 2022*. Flemming, D., Piacentini, M. F., Wulff, J. H., Calvo Lluch, Á., Saez, E., Pareja Blanco, F. & Tsolakidis, E. (eds.). Sevilla: European College of Sport Science

Coenzyme Q10 Level and Q10 Supplementation in Elite Sports: Effects on Mitochondrial Energy (Performance Fatigue) and Muscle Metabolism (Muscle Damage)

Erpenbach, K., Erpenbach, M. C., Mayer, W., Hoffmann, U., Rein, R. & Mücke, S., 2022, In: *Advances in Orthopedics and Sports Medicine*. 2022, 3, p. 1-7

Extraction of Positional Player Data from Broadcast Soccer Videos

Theiner, J., Gritz, W., Müller-Budack, E., Rein, R., Memmert, D. & Ewerth, R., 2022, *Proceedings: 2022 IEEE Winter Conference on Applications of Computer Vision : WACV 2022*. IEEE, p. 1463-1473 11 p.

floodlight - A high-level, data-driven sports analytics framework.

Raabe, D., Biermann, H., Bassek, M., Wohlan, M., Komitova, R., Rein, R., Kuppens Groot, T. & Memmert, D., 2022, In: *Journal of Open Source Software*. 7, 76, 5 p., 4588.

Match Analysis in 2030

Rein, R., 2022, *Match Analysis: How to Use Data in Professional Sport*. Memmert, D. (ed.). New York: Routledge, p. 268-278 11 p.

Modeling Players' Scanning Activity in Football

Pokolm, M., Rein, R., Müller, D., Nopp, S., Kirchhain, M., Aksum, K. M., Jordet, G. & Memmert, D., 2022, In: *Journal of Sport and Exercise Psychology*. 44, 4

Predictive hospital site selection model using machine learning techniques

Okengwu, U. A., Memmert, D., Rein, R. & Osuigbo, E. N., 2022, In: *African Journals Online*.

How does spectator presence affect football? Home advantage remains in European top-class football matches played without spectators during the COVID-19 pandemic

Wunderlich, F., Weigelt, M., Rein, R. & Memmert, D., 31.03.2021, In: PloS one. 16, 3, p. 1-15 15 p., e0248590.

Collective tactical behaviours in football from positional data

Low, Z. W. B., Rein, R. & Memmert, D., 2021, *Zukunftsperspektiven von Sportinformatik & Sporttechnologie im Leistungs- und Breitensport: spinfortec2020 digital : 13. Symposium der dsv-Sektion "Sportinformatik und Sporttechnologie" vom 24.-25. September 2020 "in Bayreuth"*. Fehr, U. & Werner, V. (eds.). Hamburg: Feldhaus, Edition Czwalina, p. 61-62 2 p. (Schriften der Deutschen Vereinigung für Sportwissenschaft; vol. 291).

Scanning activity in elite youth football players.

Aksum, K. M., Pokolm, M., Bjørndal, C. T., Rein, R., Memmert, D. & Jordet, G., 2021, In: Journal of Sports Sciences. 39, 21, p. 2401-2410 10 p.

The Dirty League: English Premier League provides higher incentives for fouling as compared to other European soccer leagues

Phatak, A., Rein, R. & Memmert, D., 2021, In: JOURNAL OF HUMAN KINETICS. 80, p. 263-276 14 p.

The influence of running performance on scoring the first goal in a soccer match

Klemp, M., Memmert, D. & Rein, R., 2021, *Zukunftsperspektiven von Sportinformatik & Sporttechnologie im Leistungs- und Breitensport : spinfortec2020 digital : 13. Symposium der dsv-Sektion "Sportinformatik und Sporttechnologie" vom 24.-25. September 2020 "in Bayreuth"*. Fehr, U. & Werner, V. (eds.). Hamburg: Feldhaus, Edition Czwalina, p. 86-88 3 p. (Schriften der Deutschen Vereinigung für Sportwissenschaft; vol. 291).

The porous high-press? An experimental approach investigating tactical behaviours from two pressing strategies in football

Low, B., Rein, R., Raabe, D., Schwab, S. & Memmert, D., 2021, In: Journal of Sports Sciences. 39, 19, p. 2199-2210 12 p.

Balance training monitoring and individual response during unstable vs. stable balance Exergaming in elderly adults: Findings from a randomized controlled trial

Bakker, J., Donath, L. & Rein, R., 01.10.2020, In: Experimental Gerontology. 139, 9 p., 111037.

Almost a lottery: the influence of team strength on success in penalty shootouts

Wunderlich, F., Berge, F., Memmert, D. & Rein, R., 30.07.2020, In: International Journal of Performance Analysis in Sport. 20, 5, p. 857-869 13 p.

A Systematic Review of Collective Tactical Behaviours in Football Using Positional Data

Low, Z. W. B., Coutinho, D., Gonçalves, B., Rein, R., Memmert, D. & Sampaio, J., 02.2020, In: Sports medicine. 50, 2, p. 343-385 43 p.

Better with each throw: a study on calibration and warm-up decrement of real-time consecutive basketball free throws in elite NBA athletes

Phatak, A., Mujumdar, U., Rein, R., Wunderlich, F., Garnica, M. & Memmert, D., 2020, In: German Journal of Exercise and Sport Research. 50, 2, p. 273-279 7 p.

FOUL PLAY: Exploring fouling behavior as an indicator of success in European Elite Football Leagues

Phatak, A., Rein, R. & Memmert, D., 2020, In: spinfortec 2020 digital.

The effect of substitutions on team tactical behavior in professional soccer

Lorenzo-Martínez, M., Rein, R., Garnica Caparrós, M., Memmert, D. & Rey, E., 2020, In: Research Quarterly for Exercise and Sport. 9 p.

"Does 4-4-2 exist?": An Analytics Approach to Understand and Classify Football Team Formations in Single Match Situations

Müller-Budack, E., Theiner, J., Rein, R. & Ewerth, R., 15.10.2019, *MMSports 2019 - Proceedings of the 2nd International Workshop on Multimedia Content Analysis in Sports, co-located with MM 2019: proceedings of the 2nd International Workshop on Multimedia Content Analysis in Sport, October 25, 2019, Nice, France*. Lienhart, R. W., Moeslund, T. B. &

Saito, H. (eds.). New York: The Association for Computing Machinery, p. 25-33 9 p. (MMSports 2019 - Proceedings of the 2nd International Workshop on Multimedia Content Analysis in Sports, co-located with MM 2019).

A tactical comparison of the 4-2-3-1 and 3-5-2 formation in soccer: A theory-oriented, experimental approach based on positional data in an 11 vs. 11 game set-up

Memmert, D., Raabe, D., Schwab, S. R. O. & Rein, R., 01.01.2019, In: PloS one. 14, 1, p. e0210191 12 p., e0210191.

Emergent interpersonal coordination in high-performance association football

Rein, R., 2019, *N.N.*. 1 p.

"Kick it like Ronaldo": a cross-sectional study of focus of attention effects during learning of a soccer knuckle ball free kick technique

Schwab, S. R. O., Rein, R. & Memmert, D., 04.12.2018, In: German Journal of Exercise and Sport Research. 6 p.

Der Einfluss der Lauffleistung bis zum ersten Tor in einem Fußballspiel

Klomp, M., Klein-Soetebier, T. & Rein, R., 17.08.2018, *Instruktion vs. Selbstregulation im Sportspiel: 11. Sportspiel-Symposium der dvs vom 13.-15. September 2018 in Heidelberg*. Plessner, H., Borkenhagen, F., Heim, R. & Roth, K. (eds.). Feldhaus Edition Czwalina, p. 88 1 p. (Schriften der Deutschen Vereinigung für Sportwissenschaft; vol. 273).

Match Analysis, Big Data and Tactics: Current Trends in Elite Soccer

Memmert, D. & Rein, R., 03.2018, In: Deutsche Zeitschrift für Sportmedizin. 69, 3, p. 65-72 7 p.

Ischemic Preconditioning Blunts Eccentric Exercise-Induced Muscle Damage Due To Reduced Oxidative Stress?

Harmsen, J.-F., Franz, A., Mayer, C., Behringer, M., Braunstein, B., Rein, R. & Zilkens, C., 2018, *ISBS Proceedings Archive: 36th Conference of the International Society of Biomechanics in Sports*. International Society of Biomechanics in Sports, 4 p.

"Which pass is better?" Novel approaches to assess passing effectiveness in elite soccer

Rein, R., Raabe, D. & Memmert, D., 21.08.2017, In: Human movement science. 55, Oct., p. 172-181 10 p.

Maybe a tad early for a Grand Unified theory: Commentary on "Towards a Grand Unified Theory of sports performance"

Rein, R., Perl, J. & Memmert, D., 2017, In: Human movement science. 56, Part A, p. 173-175 3 p.

Modelling team games as a dynamic system: status quo and future directions

Rein, R., 2017, *Complex Systems in Sport: book of abstracts*. Barca Innovation Hub, p. 46-47 2 p.

Modulating the focus of attention during soccer free kick training in developmental players using a smartphone app

Schwab, S. R. O., Rein, R., Huber, E., Schröder, Y. & Memmert, D., 2017, *World Conference on Science & Soccer: WCCS*. Université Rennes, p. 164-165 2 p.

Understanding hysteresis in discrete multi-articular action performed by skilled and novice table tennis players

Rizal, W., Chow, J. Y. & Rein, R., 2017, *15th ITTF Sports Science Congress*. Fuchs, M., Kondrič, M. & Lames, M. (eds.). International Table Tennis Federation, p. 44 1 p.

Using generalized Voronoi-cells to calculate space control in soccer

Rein, R., Bajorat, A., Ewers, M. & Memmert, D., 2017, *World Conference on Science & Soccer*. Université Rennes, p. 139 1 p.

Big data and tactical analysis in elite soccer: future challenges and opportunities for sports science

Rein, R. & Memmert, D., 24.08.2016, In: Springerplus. 5, 1, p. 1410 13 p.

Big Data im Profi-Fußball: Analyse von Positionsdaten der Fußball-Bundesliga mit neuen innovativen Key Performance Indikatoren

Memmert, D., Raabe, D., Knyazev, A., Franzen, A., Zekas, L., Rein, R., Perl, J. & Weber, H., 2016, In: Leistungssport. 46, 5, p. 21-26 13 p.

Calculating space control in association soccer through individualized Voronoi-cells using historic performance data
Rein, R., Bajorat, A., Ewers, M. & Memmert, D., 2016, *dvs-Computer Science in Sport Symposium: Jahrestagung der dvs-Sektion sportinformatik 2016 in Magdeburg*. Shaker Verlag, p. 18-22 5 p. (Berichte aus der Sportwissenschaft).

Co-speech hand movements during narrations: What is the impact of right vs. left hemisphere brain damage?
Hogrefe, K., Rein, R., Skomroch, H. & Lausberg, H., 2016, In: *Neuropsychologia*. 93, Part A /Dec., p. 176-188 13 p.

Evaluation of changes in space control due to passing behavior in elite soccer using Voronoi-cells
Rein, R., Raabe, D., Perl, J. & Memmert, D., 2016, *Proceedings of the 10th International Symposium on Computer Science in Sports (ISCSS)*. Chung, P., Soltoggio, A., Dawson, C., Meng, Q. & Pain, M. (eds.). Springer International Publishing, p. 179-183 5 p. (Advances in Intelligent Systems and Computing; vol. 392).

Hemispheric specialization in gesture production
Lausberg, H., Skomroch, H., Rein, R. & Hogrefe, K., 2016, *7th International Society for Gesture Studies: Book of abstracts*. International Society for Gesture Studies, p. 52 1 p.

Innovative Leistungsindikatoren im Profifußball auf der Basis von Positionsdaten
Memmert, D., Raabe, D., Knyazev, A., Franzen, A., Zekas, L., Rein, R., Perl, J. & Weber, H., 2016, In: *IMPULSE-Das Wissenschaftsmagazin der Deutschen Sporthochschule Köln*. 21, 2, p. 14-21 8 p.

Just play it - Innovative, international approaches to games: Die 6. Internationale Teaching Games for Understanding Konferenz (TGfU) trifft das 10. dvs-Sportspiel-Symposium vom 25.–27. Juli 2016 an der Deutschen Sporthochschule Köln
Furley, P. (Publisher), Fasold, F. (Publisher), Hüttermann, S. (Publisher), Klein-Soetebier, T. (Publisher), Kreitz, C. (Publisher), Noel, B. (Publisher), Rein, R. (Publisher) & Memmert, D. (Publisher), 2016, Hamburg: Feldhaus, Edition Czwalina. 353 p. (Schriften der Deutschen Vereinigung für Sportwissenschaft ; vol. 258)

Measuring interpersonal coordination: A selection of modern analysis techniques
Rein, R., 2016, *Interpersonal coordination and performance in social systems*. Passos, P., Chow, J. Y. & Davids, K. (eds.). London: Routledge, p. 277-293 17 p.

Winning at home - Does home advantage depend on proficiency level?
Klein-Soetebier, T., Rein, R., Reuter, E.-M. & Memmert, D., 2016, *Spitzenleistung und Sportpsychologie: der Weg zu Olympia: Abstractband zur 48. asp-Jahrestagung, 05.-07. Mai 2016 in Münster*. Halberschmidt, B., Dreiskämper, D., Utesch, T., Tietjens, M., Staufenbiel, K., Schücker, L., Kolb, M., Querfurth, S., Mentzel, S., Hill, A., Raue, C. & Strauß, B. (eds.). Arbeitsgemeinschaft für Sportpsychologie, p. 73 1 p.

EasyDIAG: A tool for easy determination of interrater agreement
Holle, H. & Rein, R., 09.2015, In: *Behavior research methods*. 47, 3, p. 837-847 11 p.

Brain oxygenation patterns during the execution of tool use demonstration, tool use pantomime, and body-part-as-object tool use
Helmich, I., Holle, H., Rein, R. & Lausberg, H., 04.2015, In: *International journal of psychophysiology : official journal of the International Organization of Psychophysiology*. 96, 1, p. 1-7 7 p.

Age-related changes in prefrontal neural activation during dual-task walking: an approach using
Beurskens, R., Helmich, I., Rein, R. & Bock, O. L., 2015, *Age-related changes in prefrontal activity during walking in dual-task situations: A fNIRS study*. Elsevier, Vol. 3. p. 122-128

Der Einfluss von Instruktionen auf die Bewegungsstabilität und Hirnaktivierung bei bimanualen Bewegung: Eine kombinierte fNIRS-Motion-Capture-Studie
Rein, R., 2015.

Evaluation of changes in space control due to passing behaviour in elite soccer using Voronoi-cells
Rein, R., Raabe, D., Perl, J. & Memmert, D., 2015.

Investigation of Phase Transition Point Phenomena in Novice Participants over a Period of Practice: A Comparison with Skilled Behaviour

Zakariah, W. R. W., Chow, J. Y. & Rein, R., 2015.

Age-related changes in prefrontal activity during walking in dual-task situations: a fNIRS study

Beurskens, R., Helmich, I., Rein, R. & Bock, O. L., 01.06.2014, In: International journal of psychophysiology : official journal of the International Organization of Psychophysiology. 92, 3, p. 122-128 7 p.

Hemispheric differences of motor execution: a near-infrared spectroscopy study

Helmich, I., Rein, R., Niermann, N. & Lausberg, H., 01.01.2013, In: Advances in experimental medicine and biology. 789, p. 59-64 6 p.

Coordination strategies used in stone knapping

Rein, R., Bril, B. & Nonaka, T., 2013, In: American Journal of Physical Anthropology. 150, 4, p. 539-50 12 p.

Differential cortical mechanisms of tool use related gesture production

Helmich, I., Holle, H., Rein, R. & Lausberg, H., 2013, *Functional Near Infrared Spectroscopy Conference, University College London, 26.-28.10.2012: abstract book*. p. 182 2 p.

Effects of different instructional constraints on task performance and emergence of coordination in children

Chow, J. Y., Koh, M., Davids, K., Button, C. & Rein, R., 2013, In: European Journal of Sport Science. 14, 3, p. 224-32 9 p.

Ergonomic Factors in Industrial Welding.

Rein, R., Feodoroff, B., Biallas, B. & Wilke, C., 2013, *Book of abstracts. 18th annual ECSS Congress of the European College of Sport Science*. p. 178 1 p.

Ergonomische Faktoren bei industriellen Schweißarbeiten

Biallas, B., Rein, R., Feodoroff, B., Wilke, C. & Froböse, I., 2013, *33. Internationaler Kongress für Arbeitsschutz und Arbeitsmedizin*.

Gender Differences in Hand Movement Behavior

Skomroch, H., Petermann, K., Helmich, I., Dvoretzka, D., Rein, R., Kim, Z.-H., Sassenberg, U. & Lausberg, H., 2013, *Tilburg Gesture Research Meeting*. 2 p.

Interpersonal synchronization in a triadic ball bouncing task

Rein, R. & Kleinknecht, C., 2013, *XXVIIIth International Conference on Perception and Action: Book of abstracts*. Passos, P. (ed.). Edições FMH, 1 p.

Prefrontal neural activation during dual-task walking in old-age: a fNIRS study

Bock, O. L., Beurskens, R., Helmich, I. & Rein, R., 2013, *International Conference on Aging & Cognition*.

Speakers Adapt their Hand Movement Behaviour to the Content of Visual Stimuli

Hogrefe, K., Rein, R. & Skomroch, H., 2013, *Understanding Body Movement. A Guide to Empirical Research on Nonverbal Behaviour. With an Introduction to the NEUROGES Coding System*. Lausberg, H. (ed.). Frankfurt, M.: Peter Lang, p. 225-238 14 p.

The Modified Cohen's Kappa: Calculating Interrater Agreement for Segmentation and Annotation

Holle, H. & Rein, R., 2013, *Understanding Body Movement. A Guide to Empirical Research on Nonverbal Behaviour. With an Introduction to the NEUROGES Coding System*. Lausberg, H. (ed.). Frankfurt, M.: Peter Lang, p. 261-278 19 p.

Using 3D Kinematics for the Analysis of Hand Movement Behaviour: A Pilot Study and some Further Suggestions

Rein, R., 2013, *Understanding Body Movement. A Guide to Empirical Research on Nonverbal Behaviour. With an Introduction to the NEUROGES Coding System*. Lausberg, H. (ed.). Frankfurt, M.: Peter Lang, p. 169-192 24 p.

Movement variability in virtual-reality welding

Rein, R., Feodoroff, B., Biallas, B. & Wilke, C., 06.2012, In: *Gait & posture*. 36, Supplement 1, p. 100-101

Age-related differences in neural activity while dual-task walking: a fNIRS study

Beurskens, R., Helmich, I., Rein, R. & Bock, O. L., 2012.

Der Einfluss von psychosozialen Faktoren auf die Bewegungssynchronisation in Kleingruppen

Kleinknecht, C., Michels, J. & Rein, R., 2012, *Sportpsychologische Kompetenz und Verantwortung: 44. Jahrestagung der Arbeitsgemeinschaft für Sportpsychologie (asp) vom 17.-19. Mai 2012 in Kiel/Oslo*. Sportpsychologie, A. F. (ed.). Feldhaus, p. 98 1 p.

Functional mastery of percussive technology in nut-cracking and stone-flaking actions: experimental comparison and implications for the evolution of the human brain

Bril, B., Smaers, J., Steele, J., Rein, R., Nonaka, T., Dietrich, G., Biryukova, E., Hirata, S. & Roux, V., 2012, In: *Philosophical Transactions Of The Royal Society B, Biological Science*. 367, 1585, p. 59-74

Hemispheric differences in hand movement behaviour

Helmich, I., Rein, R., Pricci, A. & Lausberg, H., 2012, *ISOTT 2012, Bruges, Belgium, 19-23 August 2012*.

Measurement Methods to Analyze Changes in Coordination During Motor Learning from a Non-linear Perspective

Rein, R., 2012, In: *The Open Sports Science Journal*. p. 36-48

Studying welding ergonomics in novice and expert welders using virtual welding

Rein, R., Feodoroff, B., Biallas, B. & Wilke, C., 2012, *2nd International Technical Conference Welding Trainer, Duisburg, Germany*.

Wissenschaftliche Analyse von Bewegungsmustern beim industriellen Schweißen im Hinblick auf einen langfristigen Gesundheitsschutz

Feodoroff, B., Rein, R., Biallas, B. & Wilke, C., 2012, *DVS Congress 2012, Saarbrücken, Germany*.

Beanspruchung von virtuellem Schweißen bei Anfängern und Fortgeschrittenen

Feodoroff, B., Rein, R., Biallas, B. & Wilke, C., 2011.

Brain oxygenation in gesture production. Differences between tool use demonstration, tool use pantomimes and body-part-as-object.

Helmich, I., Holle, H., Rein, R. & Lausberg, H., 2011, *11th International Conference on Cognitive Neuroscience (ICON XI), 25-29 September 2011, Mallorca, Spain*.

Spontaneous interpersonal coupling during a ball bouncing task

Kleinknecht, C. & Rein, R., 2011, *Embodiment: Wahrnehmung - Kognition - Handlung*. Heinen, T., Milek, A., Hohmann, A. T. & Raab, M. (eds.). Hundt Druck, p. 264-265

Decreasing movement variability with increasing skill level in a complex tool-use task

Rein, R., Nonaka, T. & Bril, B., 2010, *4th Conference of the International Society for Gesture Studies, European University Viadrina Frankfurt(Oder), Germany*.

Gesture production in the right and left hemispheres during narration of short movies

Skomroch, H., Rein, R., Hogrefe, K., Goldenberg, G. & Lausberg, H., 2010, *4th Conference of the International Society for Gesture Studies, European University Viadrina Frankfurt(Oder), Germany*.

How do stone knappers predict and control the outcome of flaking? Implications for understanding early stone technology

Nonaka, T., Bril, B. & Rein, R., 2010, In: *Journal of Human Evolution*. 59, p. 155-167

Investigation of discrete, degenerate actions from a dynamical systems perspective exemplified by a table-tennis task
Chow, J. Y., Rein, R., Rizal, W. & Koh, M., 2010, *3rd International Congress of Complex Systems in Medicine and Sport, Kaunas, Lithuania*.

Projects

Datenbasierte Ansätze zur Analyse von Fußballspielen aus der e-science Perspektive

Memmert, D. (Project manager), Rein, R. (Project manager), Wunderlich, F. (Project manager), Moura, F. (Project staff), Pereira Santiago, P. R. (Project staff) & da Silva Torres, R. (Project staff)
01.01.20 → ...

DFG Neuronale Netze

Memmert, D. (Project manager), Perl, J. (Project manager), Grunz, A. (Project staff), Endler, S. (Project staff), Schmidt, A. (Project staff), Balague, N. (Project partner), Hristovski, R. (Project partner), Rein, R. (Project manager) & Ewers, M. (Project staff)
01.01.08 → 31.12.16

Estimation of activity induced energy expenditure using thigh-worn accelerometry and machine learning approaches

Lendt, C. (Project manager), Rein, R. (Project supervisor) & Stewart, T. (Project partner)
01.03.23 → 31.05.24

floodlight – Rahmenbedingungen für datenbasierte Sportspielanalyse

Memmert, D. (Project manager), Bassek, M. (Project staff), Raabe, D. (Project staff), Banning, A. (Project staff), Rein, R. (Project staff), Biermann, H. (Project staff), Wieland, F.-G. (Project staff), Timmer, J. (Project staff), Phatak, A. (Project staff) & Nabben, R. (Project staff)
01.01.21 → 31.12.24

How does spectator presence affect football?

Wunderlich, F. (Project manager), Weigelt, M. (Project manager), Rein, R. (Project manager) & Memmert, D. (Project manager)

ITSR: Integrative Team Sport Research

Braunstein, B. (Founder), Deuker, A. (Project supervisor), Bassek, M. (Project staff), Wittkugel, J. (Project staff), Raabe, D. (Business Angel), Müller, C. (Founding Angel), Vogt, T. (Project manager) & Rein, R. (Founder)
01.01.20 → ...

Learning curves underlying skill acquisition in table tennis

Rein, R. (Project manager) & Klein-Soetebier, T. (Project manager)
18.07.24 → 17.07.25

Mind in motion

Bock, O. L. (Project manager), Hubbard, A. L. (Project manager), Lausberg, H. (Project manager), Liepelt, R. (Project manager), Löffler, J. (Project manager), Memmert, D. (Project manager), Mierau, A. (Project manager), Musculus, L. (Project manager), Raab, M. (Project manager), Rein, R. (Project manager), Schneider, S. (Project manager), Strüder, H. (Project manager) & Zijlstra, W. (Project manager)
01.01.18 → ...

LTC2Pub: Publications based on LTC (Master) teaching by Team Reinstein

Braunstein, B. (Project manager) & Rein, R. (Project manager)
01.10.17 → ...

Simulation komplexer Umwelten am Beispiel des Hochleistungs-Fußballs

Memmert, D. (Project manager) & Rein, R. (Project manager)
01.01.18 → ...

Wie wirkt sich die Anwesenheit von Zuschauern auf den Fußball aus?

Wunderlich, F. (Project manager), Weigelt, M. (Project manager), Rein, R. (Project manager) & Memmert, D. (Project manager)