

III. DWSD

Do., 27.01.2022:

deco workshop digital # III

Über die Konditionierung
des Tauchers

III. DWSD

deco workshop digital # III Über die Konditionierung des Tauchers:

Inhalt:

- Konditionierung: was ist denn das???
- Experiment von „Schoko-Siggi“
- Aktuelle Experimente von DAN & Kollegen
- In den Tiefen der Statistik ...
- Quellen & Links zum download

- **Konditionierung:** was ist denn das???

→ Beeinflußung des Tauchers; DCS: ja / nein

→ Über chemische / physikalische Verfahren:

→ ASS, ...

→ Vitamine C, E, Q10, ...

→ Polyphenole, ...

→ Hydratation (Flüssigkeitshaushalt: Mineralwasser)

→ Temperatur

→ Vibration

→ Gymnastik

→ und, und, und ...

→ An einem Beispiel:

→ „30 gr. schwarze Bitterschokolade 90 min. vor TG“
folgen 3 Originalfolien von „Schoko-Siggi“ +

→ 2 „Erklär-Bär“ Folien 😊:



23th Capita Selecta Duikgeneeskunde



THE ENDOTHELIAL RESPONSE RELATED TO DIVING WITH SPECIFIC ATTENTION TO THE ROLE OF ANTIOXIDANTS

Sigrid Theunissen

Amsterdam, March the 17th, 2018



NEMO 33



THE ENDOTHELIAL RESPONSE RELATED TO DIVING WITH SPECIFIC ATTENTION TO THE ROLE OF ANTIOXIDANTS

Sigrid Theunissen



„Schoko-Siggi“ auf dem Weg zum AMC 03/2018

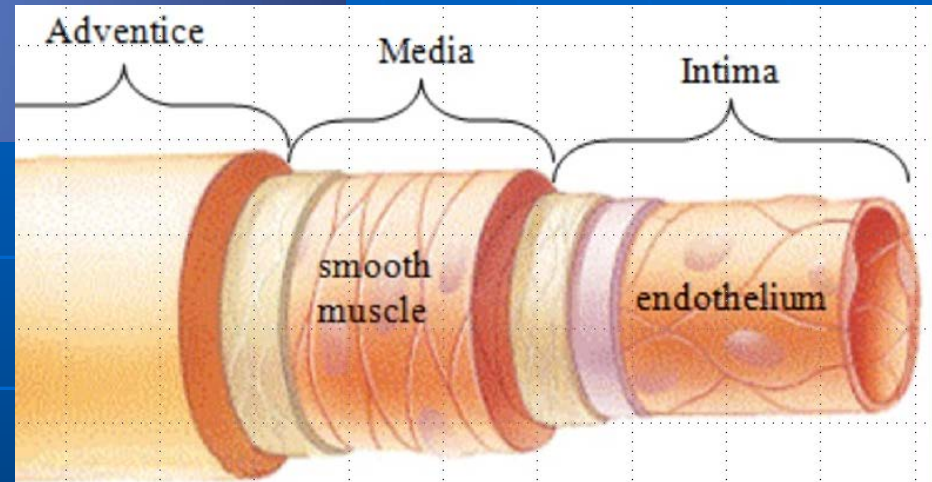
THE ENDOTHELIAL RESPONSE RELATED TO DIVING WITH SPECIFIC ATTENTION TO THE ROLE OF ANTIOXIDANTS

Sigrid Theunissen

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Erklärungen:

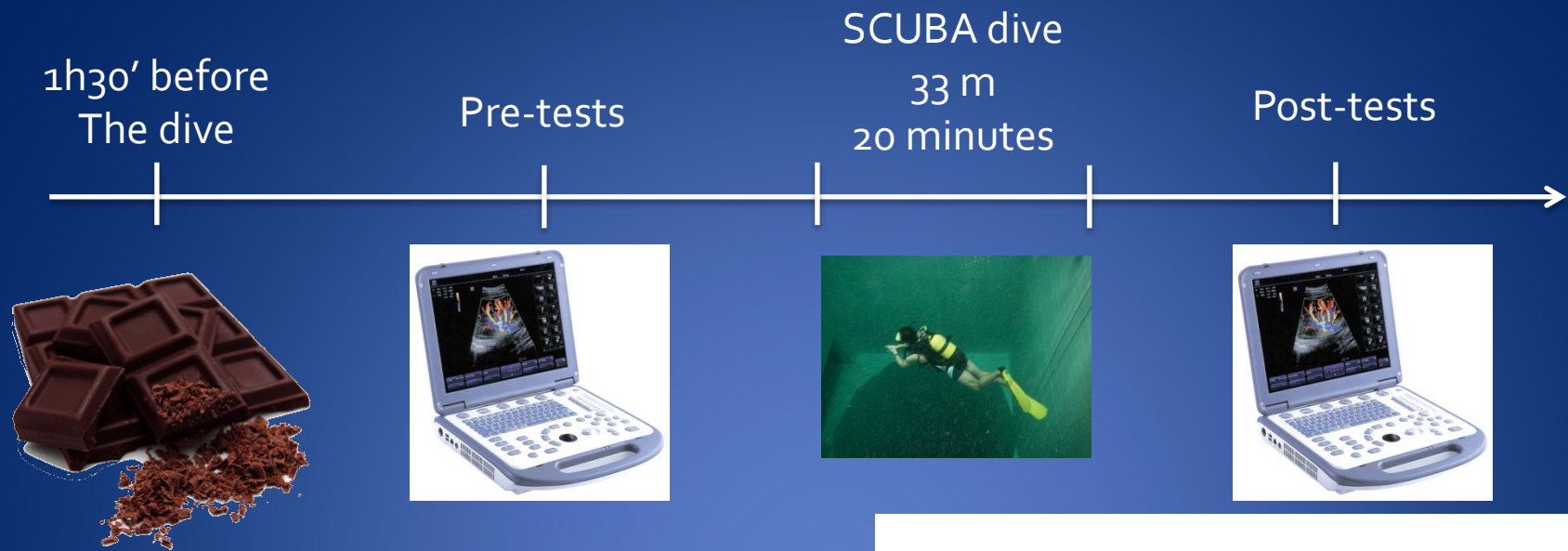
- Endothel:
- Innenwand der Blutgefäße
- diese reagiert auf Inertgasblasen
- Vasoconstriction: Verringerung des Gefäßdurchmessers
- NO: Stickstoff-Monoxid, ROS: Reactive Oxygen Species
- FMD: Flow Mediated Dilation;
- Ausdehnung einer Arterie durch Flüssigkeitsbewegung, wird u.a. durch NO des Endothels hervorgerufen



Antioxidants

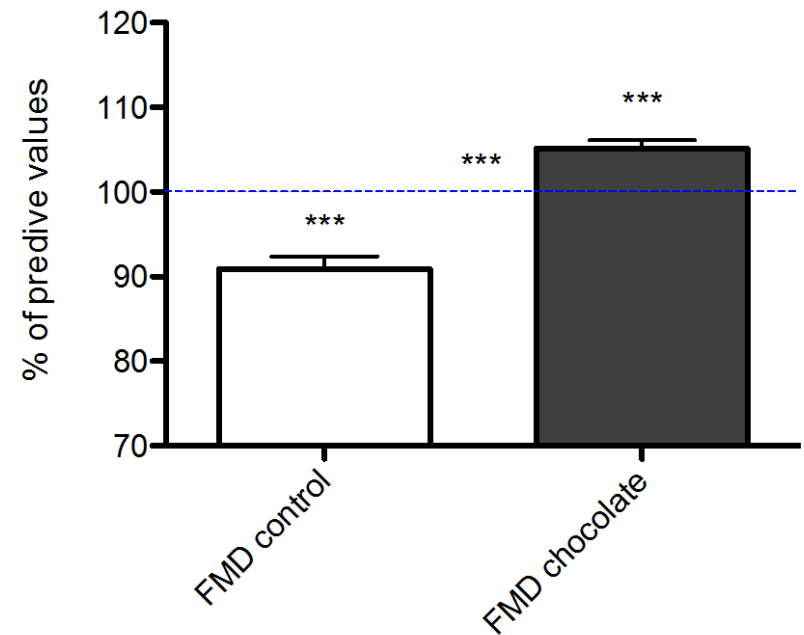
- Polyphenols
 - Prevent degradation of NO by ROS
 - ↘ vasoconstriction
 - ↘ pro-inflammatory responses
- Are found in :
 - Some wines and fruit juices
 - Black and green tea
 - Cocoa -> DARK CHOCOLATE

Protocol / Results:



Chocolate group only

- 2 groups (control and chocolate) of 21 divers ($35,3 \pm 5,9$ years vs $36,8 \pm 6,2$ years)
- Diver 3* CMAS, AOW Padi or licence allowing to dive to 30 msw
- Experience of more than 50 dives
- Never had DCI
- Non – smoker
- Good health, good physical condition



- Aktuelle Untersuchungen von DAN & Kollegen:

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UHM 2013, VOL. 40, NO. 2 – ENDOTHELIAL FUNCTION IN SCUBA AND BREATH-HOLD DIVING

Nitric oxide-related endothelial changes in breath-hold and scuba divers

*S. Theunissen^{1,2}, F. Guerrero², N. Sponsiello^{1,3,4}, D. Cialoni^{1,3,4}, M. Pieri³, P. Germonpré^{1,5}, G. Obeid⁵,
F. Tillmans¹, V. Papadopoulou^{1,6}, W. Hemelryck¹, A. Marroni³, D. De Bels^{1,7}, C. Balestra^{1,3,4}*

¹ Haute Ecole Paul Henri Spaak, Environmental, Occupational & Aging Physiology Lab., Brussels, Belgium;

² Université de Bretagne Occidentale, UFR Sciences et Techniques, Brest, France;

³ DAN Europe Research, Brussels, Belgium;

⁴ DAN Europe, Apnea Task Force, Roseto, Italy;

⁵ Center for Hyperbaric Oxygen Therapy, Military Hospital Queen Astrid, Brussels, Belgium;

⁶ Department of Bioengineering, Imperial College London, London, UK;

⁷ Intensive Care Department, Brugmann University Hospital, Brussels, Belgium

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Original articles

The effect of pre-dive ingestion of dark chocolate on endothelial function after a scuba dive

Sigrid Theunissen, Costantino Balestra, Antoine Boutros, David De Bels, François Guerrero and Peter Germonpré

Abstract

(Theunissen S, Balestra C, Boutros A, De Bels D, Guerrero F, Germonpré P. The effect of pre-dive ingestion of dark chocolate on endothelial function after a scuba dive. *Diving and Hyperbaric Medicine*. 2015 March;45(1):4-9.)

Objective: The aim of the study was to observe the effects of dark chocolate on endothelial function after scuba diving.

Methods: Forty-two male scuba divers were divided into two groups: a control ($n = 21$) and a chocolate group ($n = 21$). They performed a 33-metres deep scuba-air dive for 20 minutes in a diving pool (Nemo 33, Brussels). Water temperature was 33°C. The chocolate group ingested 30 g of dark chocolate (86% cocoa) 90 minutes before the dive. Flow-mediated dilatation (FMD), digital photoplethysmography and nitric oxide (NO) and peroxynitrites (ONOO⁻) levels were measured before and after the scuba dive in both groups.

Results: A significant decrease in FMD was observed in the control group after the dive ($91 \pm 7\%$ (mean $\pm$ 95% confidence interval) of pre-dive values; $P < 0.001$) while it was increased in the chocolate group ($105 \pm 5\%$ of pre-dive values; $P < 0.001$). No difference in digital photoplethysmography was observed between before and after the dives. No variation of circulating NO level was observed in the control group whereas an increase was shown in the chocolate group ($154 \pm 73\%$ of pre-dive values; $P = 0.04$). A significant reduction in ONOO⁻ was observed in the control group ($84 \pm 12\%$ of pre-dive values; $P = 0.003$) whereas no variation was shown after the dive with chocolate intake ($100 \pm 28\%$ of pre-dive values; *ns*).

Conclusion: Ingestion of 30 g of dark chocolate 90 minutes before scuba diving prevented post-dive endothelial dysfunction, as the antioxidants contained in dark chocolate probably scavenge free radicals.

Key words

Antioxidants, cardiovascular, hyperoxia, nitric oxide, diving research, scuba, circulation

- Aktuelle Untersuchungen von DAN & Kollegen:

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NATURAL PRODUCT RESEARCH, 2015
<http://dx.doi.org/10.1080/14786419.2015.1107062>



SHORT COMMUNICATION

A red orange extract modulates the vascular response to a recreational dive: a pilot study on the effect of anthocyanins on the physiological consequences of scuba diving

C. Balestra^a, F. Cimino^b, S. Theunissen^a, T. Snoeck^c, S. Provyn^c, R. Canali^d, A. Bonina^e and F. Virgili^d

^aEnvironmental and Occupational (Integrative) Physiology Laboratory, Haute Ecole Paul Henri Spaak, Brussels, Belgium; ^bDepartment Farmaco-Biologico, School of Pharmacy, University of Messina, Messina, Italy; ^cDepartment of Experimental Anatomy, Vrije Universiteit Brussel, Brussels, Belgium; ^dCouncil for Agricultural Research and Economics – Food and Nutrition Research Centre (C.R.A. – NUT), Rome, Italy; ^eBionap Ltd, Catania, Italy

ABSTRACT

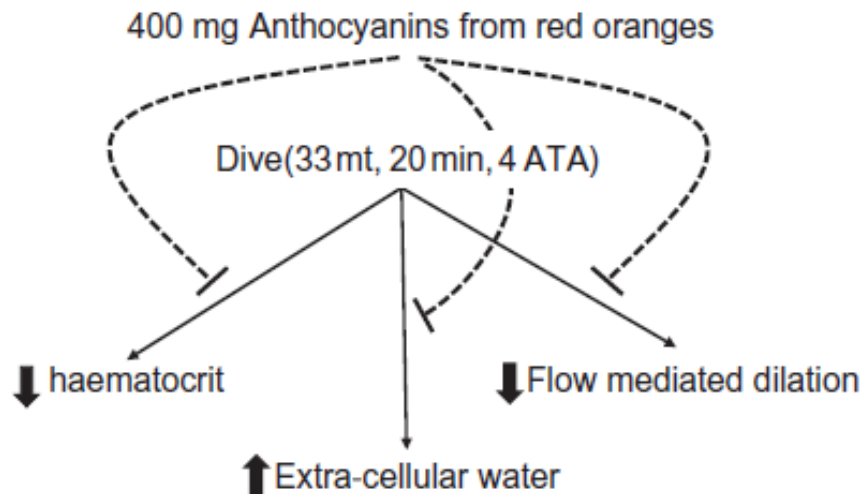
Nutritional antioxidants have been proposed as an expedient strategy to counter the potentially deleterious effects of scuba diving on endothelial function, flow-mediated dilation (FMD) and heart function. Sixteen volunteers performing a single standard dive (20 min at 33 m) according to US Navy diving procedures were randomly assigned to two groups: one was administered with two doses of 200 mg of an anthocyanins (AC)-rich extract from red oranges, 12 and 4 h before diving. Anthocyanins supplementation significantly modulated the effects of diving on haematocrit, body water distribution and FMD. AC administration significantly reduces the potentially harmful endothelial effects of a recreational single dive. The lack of any significant effect on the most common markers of plasma antioxidant capacity suggests that the mechanism underlying this protective activity is independent of the putative antioxidant effect of AC and possibly involves cellular signalling modulation of the response to high oxygen.

ARTICLE HISTORY

Received 18 March 2015
Accepted 3 October 2015

KEYWORDS

Diving; anthocyanins;
endothelial dysfunction;
flow-mediated dilation;
body water



RESEARCH ARTICLE

Pre-Dive Vibration Effect on Bubble Formation After a 30-m Dive Requiring a Decompression Stop

PETER GERMONPRÉ, JEAN-MICHEL PONTIER,
EMMANUEL GEMPP, JEAN-ERIC BLATTEAU,
STEFAN DENEWETH, PIERRE LAFÈRE, ALESSANDRO MARRONI,
AND COSTANTINO BALESTRA

GERMONPRE P, PONTIER J-M, GEMPP E, BLATTEAU J-E, DENEWETH S, LAFÈRE P, MARRONI A, BALESTRA C. *Pre-dive vibration effect on bubble formation after a 30-m dive requiring a decompression stop*. *Aviat Space Environ Med* 2010; 81:1044-8.

Introduction: The preconditioning of divers to reduce post-dive decompression sickness (DCS) has gained increased interest in diving medical research over the last few years. The beneficial effects of physical exercise, oxygen breathing, hyperbaric exposure, heat exposure, hyperhydration, or nitroglycerin administration before the dive are only a few examples of ongoing research. In this work, we investigated the effects of pre-dive whole-body vibration on post-dive bubble formation. **Methods:** Following French Navy standard dive procedures, 14 healthy male military divers performed 2 identical dives 1 wk apart to 30 m of seawater (msw) for 30 min. One of the dives was randomly preceded by a 30-min whole-body vibration session (frequencies 35-40 Hz) 1 h before the dive. Post-dive bubbles were measured precordially 30, 60, and 90 min after the dive and were graded according to the Kissman Integrated Severity Score (KISS) protocol, with and without knee flexing. Arterial endothelial function was measured before and after vibration using flow mediated dilation (FMD) measurement. **Results:** A significant reduction in bubble scores was observed after the "vibration" dive. **Conclusion:** As there was no observed change in FMD after vibration, we do not believe a nitric oxide mediated mechanism is involved; rather, a mechanical dislodgement or enhanced lymphatic elimination of gas nuclei is hypothesized.

Keywords: scuba diving, decompression sickness prevention, bubble formation, whole-body vibration.

beneficial effects of pre-dive exercise (5,14), oxygen breathing (9), pre-dive hyperbaric sessions (19,24), heat preconditioning (6), hydration (15), and nitric oxide (NO) donor administration (13). Most of these experiments try to influence bubble formation by modifying biophysical or chemical properties of the endothelial surface, on which gas bubbles or nuclei are presumed to be forming. In this paper, we report the possibility of reducing post-dive bubble formation by a short bout of mechanical low-frequency vibrations of the whole body 1 h before the dive.

METHODS

The study protocol was approved by the Academic Ethical Committee of the Brussels Free University and by the French Navy Experimental Ethical Committee. After consent, 14 healthy male military divers (age range: 23-44, mean 29 yr, height: 177 ± 6 cm, weight: 79.44 ± 10.7 kg) participated in this prospective study. All divers were in good health, did not take any medication, and had never suffered from DCS. They performed two identical dives 1 wk apart. Each dive was made in

- Aktuelle Untersuchungen von DAN & Kollegen:

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Whole-body vibration preconditioning reduces the formation and delays the manifestation of high-altitude-induced venous gas emboli

Antonis Elia  | Ola Eiken | Rickard Ånell | Mikael Grönkvist | Mikael Gennser

Division of Environmental Physiology, Swedish Aerospace Physiology Center, KTH Royal Institute of Technology, Stockholm, Sweden

Correspondence

Antonis Elia, Division of Environmental Physiology, Swedish Aerospace Physiology Center, KTH Royal Institute of Technology, Stockholm SE-17165, Sweden.
Email: antonise@kth.se

Funding information

Swedish Armed Forces, Grant/Award Number: 9220919

Edited by: Michael White

Abstract

Rapid decompression may give rise to formation of venous gas emboli (VGE) and resultantly, increase the risk of sustaining decompression sickness. Preconditioning aims at lowering the prevalence of VGE during decompression. The purpose of this study was to investigate the efficacy of whole-body vibration (WBV) preconditioning on high-altitude-induced VGE. Eight male subjects performed, on separate days in a randomised order, three preconditioning strategies: 40-min seated-rest (control), 30-min seated-rest followed by 150 knee-squats performed over a 10-min period (exercise) and 30-min WBV preceded by a 10-min seated-rest. Thereafter, subjects were exposed to an altitude of 24,000 ft (7315 m) for 90 min whilst laying in a supine position and breathing 100% oxygen. VGE were assessed ultrasonically both during supine rest (5-min intervals) and after three fast, unloaded knee-bends (15-min intervals) and were scored using a 5-grade scale and evaluated using the Kisman Integrated Severity Score (KISS). There was a significant difference in VGE grade ($P < 0.001$), time to VGE manifestation ($P = 0.014$) and KISS score following knee-bends ($P = 0.002$).

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Article

Effect of Water Amount Intake before Scuba Diving on the Risk of Decompression Sickness

Kil-Hyung Han ¹, Gwang-Suk Hyun ¹, Yong-Seok Jee ^{2,*} and Jung-Min Park ^{1,*}

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Abstract: *Background and objective:* The aim of this study was to investigate the influence of pre-hydration levels on circulating bubble formation for scuba divers and to evaluate the appropriate volume of water intake for reducing the risk of decompression sickness (DCS). *Materials and Methods:* Twenty scuba divers were classified into four groups according to the volume of water taken in before scuba diving as follows: no-water-intake group (NWIG), 30%-water-intake group (30WIG), 50%-water intake group (50WIG), and 100%-water-intake group (100WIG). We measured the circulating bubbles using movement status by Doppler on the right and left subclavian veins and precordial regions at pre-dive, post-dive, and 30 min after diving to a depth of 30 m for a duration of 25 min at the bottom. *Results:* Participants belonging to the 30WIG showed the lowest frequency, percentage, and amplitude of bubbles and consequently the lowest bubble grade in the left and right subclavian veins and precordial region at post-time and 30 min after diving. *Conclusions:* It can be inferred that pre-hydration with 30% of the recommended daily water intake before scuba diving effectively suppressed the formation of bubbles after diving and decreased the risk of DCS.

Citation: Han, K.-H.; Hyun, G.-S.; Jee, Y.-S.; Park, J.-M. Amount-Effect of Water Intake before Scuba Diving on the Risk of Decompression

Keywords: scuba diving; water intake; decompression sickness; bubble

- In den Tiefen der Statistik:
 - Über „**power**“ (Güte, Trennschärfe) und:
 - *Wieviele Versuchskaninchen brauche ich?*
 - **Szientometrie:** wie (un-)zuverlässig ist die medizinische Forschung?
 - „Misuse of statistics is unethical, as well it is shoddy Science“! (Zitat, von Douglas G. Altman)

die vielen Schwächen tauchmedizinischer Veröffentlichungen

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SZIENTOMETRIE WIE (UN)ZUVERLÄSSIG IST DIE FORSCHUNG?

Viele wissenschaftliche Arbeiten lassen sich nicht reproduzieren.
Schon ist von einer Vertrauenskrise die Rede. Doch wer
mit pauschalen Urteilen um sich wirft, macht es sich zu einfach.

» [spektrum.de/artikel/1432742](https://www.spektrum.de/artikel/1432742)

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die vielen Schwächen tauchmedizinischer

Veröffentlichungen

- Doppel-Blind Studie?
 - Kontrollgruppe?
 - Multi-Kollinearität?
 - Biometrie der Probanden?
 - mangelnde „power“ (= Güte)??
 - Anzahl der Probanden (N) ???
 - Anzahl Tauchgänge (n) ????
-
- Wunsch von Haldane et al. : > 30 Ziegen pro TG-Profil
 - Vorschläge ISO / CERN etc.: $N * n > 300$!!!
 - Vorschlag David D.: $N > 50$ bei Doppler-Messungen

(Quelle: Doolette DJ, Gault KA, Gutvik CR. Sample size requirement for comparison of decompression outcomes using ultrasonically detected venous gas emboli (VGE): power calculations using Monte Carlo resampling from real data. Diving and Hyperbaric

Medicine. 2014 March;44(1):14-19 ■)

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am Bsp.: Donald Ox-Tox

- Doppel-Blind Studie: Nö
- Kontrollgruppe: keine
- Multi-Kollinearität: unbekannt
- Biometrie der Probanden: na ja ...
- Anzahl der Probanden: $N = 1$
- Anzahl Tauchgänge: $n = 19$
- D.h.: $N * n = 1 * 19$ ☹

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Zitat:



hypotheses.³⁹ Thirdly, the most important need is not to change statistical paradigms but to improve the quality of studies by increasing sample size and precision of measurement.

Quelle: *BMJ* 2001;322:226–31

Sifting the evidence—what's wrong with significance tests?

Jonathan A C Sterne, George Davey Smith

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Zitat:



are incorrect. Conflicting results from similar studies can often be attributed to varying degrees of statistical competence.¹²⁻¹⁴
The ethical implications of publishing research containing

Quelle:

Statistics and ethics in medical research

Misuse of statistics is unethical

DOUGLAS G ALTMAN

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Medicine and Mathematics

Statistics and ethics in medical research

V—Analysing data

DOUGLAS G ALTMAN

The incorrect analysis of data is probably the best known misuse of statistical methods, largely due to a series of reviews¹⁻³ that have shown how common such errors are in published papers. Nevertheless, these mistakes, which tend to be in the

applies to the form of
observed and expected
compare observed n
leukaemia (0, 1, 2,

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Zitat:

... ca. 52 % mit Fehlern ... !

→ 5 Studien, 1965 -1980, aller englischsprachigen
Veröffentlichungen im Bereich Medizin

Quelle: Altman, Douglas G.:
BMJ, 282, 01/1982, p. 45

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Quelle:

n =
ca.
180 !!!

1336

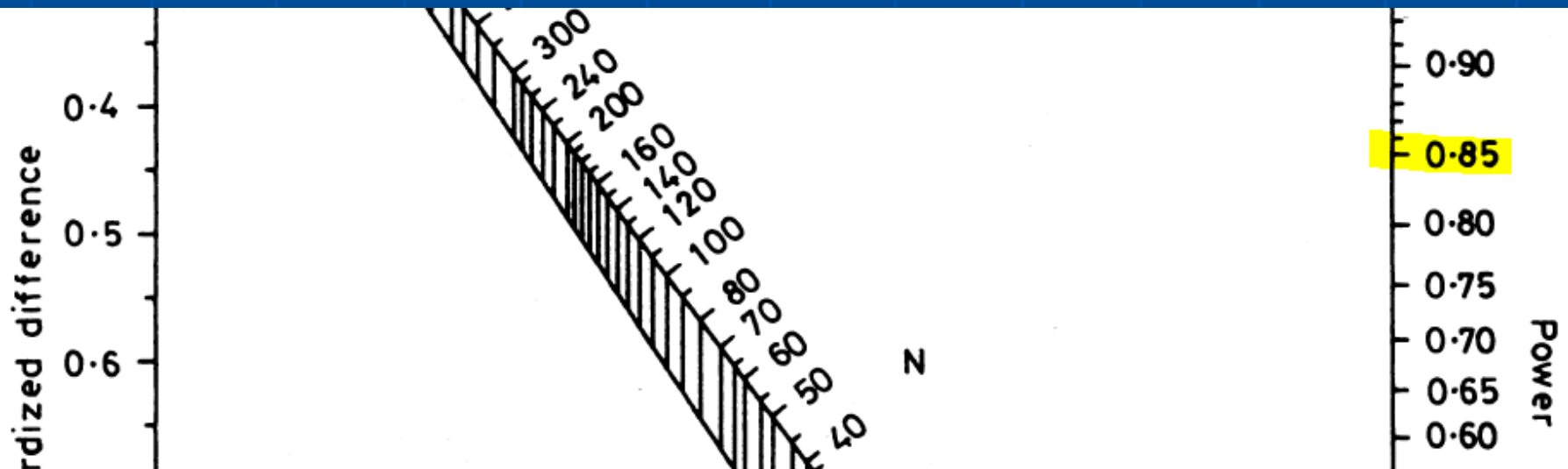
BRITISH MEDICAL JOURNAL VOLUME 281 15 NOVEMBER 1980

Medicine and Mathematics

Statistics and ethics in medical research

III How large a sample?

DOUGLAS G ALTMAN



- In den Tiefen der Statistik:

- Über „**power**“ (Güte, Trennschärfe) und:
- *Wieviele Versuchskaninchen brauche ich?*
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→ „**We are talking here about thermal noise!**“
Zitat, Sir Ronald A. Fisher

→ „**Medizinische Veröffentlichungen sind schamlose Ausbeutungen von Mittelwert & Standardabweichung**“

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Costantino Balestra
Peter Germonpré

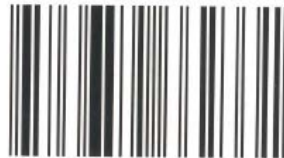
The Science of Diving

Things your instructor never told you

 **LAMBERT**
Academic Publishing

The editors and authors of this book are a cadre of scientists and physicians with broad experience and knowledge of diving physiology and decompression theory. As is often the case, it requires a group effort to succeed in advancing practical knowledge. The colloquialism "the whole is greater than the sum of its parts" is often true and the PHYPODE Research Group epitomizes this concept. By logically grouping the various elements of diving science and medicine with provocative "food for thought" sections the text offers valuable lessons to those interested in the current state of diving. Despite nearly 170 years of research, the fundamental nature of decompression stress remains elusive. As is well outlined in this book, great advances have been made to the practical elements allowing for safe diving. Nonetheless, there are glaring voids of knowledge related to the nature of bubble nucleation, its consequences and methods to ameliorate risk. The synergy exhibited in this text not only provides a foundation for what is known, it offers a glimpse of where research is taking us. — Professor Stephen R. Thom, Dept. of Emergency Medicine, University of Maryland School of Medicine

Editors: Costantino Balestra - Full-time Professor & Head of the Integrative Physiology Lab at the Haute Ecole Paul Henri Spaak; and Peter Germonpré - Medical Director of the Centre for Hyperbaric Oxygen Therapy of the Military Hospital Brussels, Belgium. Co-editors: M. Rozložník, P. Buzzacott, D. Madden. European Underwater and Baromedical Society.



978-3-659-66233-1

III. DWSD: Über die Konditionierung des Tauchers, weitere Quellen:

Originalausgabe:

[170] Balestra, Constantino; Germonpre, Peter (ed.)
The Science of Diving: Things your instructor
never told you (2015) Lambert Academic Publishing,
ISBN: 978-3-659-66233-1

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http://www.divetable.eu/BOOKS/170_cover.pdf

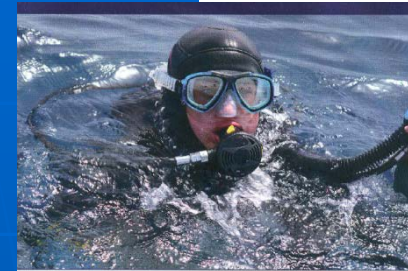
→ und auch noch da:

http://www.divetable.eu/BOOKS/170_toc.pdf

Kostenlose (Voll-)Version für Taucher;
d.h. [170], aber eben einfacher geschrieben:

http://www.divetable.eu/221_main.pdf

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Costantino Balestra
Peter Germonpre

The Science of Diving

Things your instructor never told you

