Abstract: High-resolution live cell imaging during mechanical vibration loading
Utilizing a specially designed vibration stimulator for real-time live cell imaging in mechanotransduction research

General information
State: Published
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Computational Biophysics and Imaging Group
Authors: Halonen, H., Ihalainen, T., Hyttinen, J.
Number of pages: 1
Publication date: 26 Oct 2017
Peer-reviewed: Unknown
Keywords: mechanotransduction, Vibration, Mechanical stimulation, epithelial cell

Ecosystem approach on medical game development: The relevant actors, value propositions and innovation barriers
This paper explores the medical game ecosystem and reveals the reciprocal value propositions of the relevant actors of medical game ecosystems, as well as barriers that may be complicating or hindering realization of the value propositions. The case comprises an emerging medical game ecosystem in Finland in the traumatic brain injury (TBI) rehabilitation context. This study presents 12 actor groups, their value propositions, and the barriers between the actors. This paper gives a comprehensive view of the actual medical game ecosystem that is needed to utilize the full potential of gamification and serious games in the health care sector

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Industrial and Information Management, Research group: Center for Innovation and Technology Research, University of Vaasa
Authors: Litovuo, L., Makkonen, H., Aarikka-Stenroos, L., Luhtala, L., Mäkinen, S.
Number of pages: 10
Publication date: 20 Sep 2017

The Duke treadmill score in assessing the prognosis of patients tested with bicycle ergometer
Introduction: The Duke Treadmill Score (DTS) is a weighted index combining treadmill exercise time, maximum ST-segment deviation and exercise-induced angina (DTS = Exercise time – [5 x Max ST-deviation]) – [4 x Angina index]). DTS is one of the most widely studied and clinically used prognostic parameter in treadmill exercise testing, albeit the prognostic capability of DTS independently of its components has not been adequately studied. There are no previous studies on the prognostic value of DTS from standard bicycle ergometer. Purpose: The aim of this study was to assess the prognostic usefulness of DTS among patients undergoing standard bicycle ergometer testing in two different populations.

Methods: A total of 3936 patients (2371 men) in the Finnish Cardiovascular Study (FINCAVAS) and 2683 men in the Kuopio Ischemic Heart Disease study (KIHD) underwent a standard bicycle ergometer test. DTS was formed with ST-segment deviation and angina pectoris data as appropriate and by converting metabolic equivalents of task (METs) to standard treadmill exercise time. Results: In FINCAVAS, during a median 6.3-year (interquartile range, IQR, 4.5–8.2) follow-up period, 180 patients (4.6%) suffered the primary endpoint, cardiovascular (CV) mortality. In KIHD, 562 patients (21.0%) died from CV causes during the median follow-up of 24.1 (IQR 18.0–26.2) years. Using Cox regression, DTS was predictive of CV death in both study populations as a continuous variable after adjustment with age, sex, body mass index, current smoking, history of coronary heart disease, diabetes and usage of β-blockers (FINCAVAS; HR 1.03, 95% CI 1.01–1.06, p=0.004 and KIHD; HR 1.04, 95% CI 1.03–1.06, p<0.001). As a three-category-variable, DTS was still predictive of CV death (FINCAVAS; adjusted HR 3.15 for lowest and highest tertile, 95% CI 1.83–5.42, p<0.000 and KIHD; adjusted HR 1.71, 95% CI 1.34–2.18, p<0.000). However, after adjusting for the individual components of DTS (METs, ST-segment deviation and exercise-induced angina), DTS was not associated with CV mortality in either study populations (FINCAVAS; adjusted HR 1.15, 95% CI 0.60–2.19, p=0.672 and KIHD; adjusted HR 0.90, 95% CI 0.68–1.20, p=0.466). Exercise capacity as METs was the only DTS component significantly predicting CV mortality in both study populations (p<0.001).

Conclusions: The Duke Treadmill Score seemed to be predictive of CV death for patients who underwent...
bicycle exercise test in two different populations. However, when adjusted with its components, the predictive power of DTS disappeared, as METs proved to be a superior predictor. Future treadmill-based research should also elucidate the role of DTS independent of its components, particularly exercise capacity.

Effect of Implant Coating on Wireless Powering for Intracranial Pressure Monitoring System
A fully wireless implantable system can be used for long-term monitoring of intracranial pressure. In this type of system, an implant is placed under the skull and monitored pressure is transmitted wirelessly outside the skull. Moreover, the implant is powered through an inductive coupling. To avoid any infection and damage to the implant, the implant should be coated with biocompatible material. In this paper, we investigate the impact of coating on the maximum wireless link power efficiency through simulations in anatomical and layered tissue head models and present test results.

Abstract: Vibration stimulator for imaging mechanotransduction based cell responses
Presenting a specially designed vibration stimulator system for live cell imaging
Abstract: Vibration stimulator for microscopying of fast cell responses

Presenting a tool for mechanotransduction research for studying fast epithelial cell responses to the vibration stimulation

General information
State: Published
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Computational Biophysics and Imaging Group
Authors: Halonen, H., Ihalainen, T., Hyttinen, J.
Number of pages: 1
Publication date: 2 Jul 2017
Peer-reviewed: Unknown
Event: Paper presented at The 23rd Congress of the European Society of Biomechanics, Seville, Spain.
Keywords: mechanotransduction, vibration, mechanical stimulation, epithelial cell
Links:

Method for Evaluation of Surgical Wound Healing: A Case Study

We arranged a case study in order to examine whether tetrapolar bioimpedance measurement could be applied for evaluating the healing of a surgical wound. We measured the donor site surgical wound of a patient who had undergone a breast reconstruction surgery. The measurements were conducted three times in a nine days period, starting from the first postoperative day. As a reference, the impedance of an unaffected site was also measured. The electrodes were placed at equal distances, four centimetres apart in a parallel formation. The results show that, at low frequencies, the impedance of the wound increases with time. At higher frequencies, the situation is opposite; the impedance of the wound is initially higher than the reference and decreases with time. Both ends seem to approach the reference impedance as the healing proceeds. Our results are in accordance with the normal course of surgical wound healing and more specifically appear to be related to the diminishing swelling around the wound site. We conclude that the obtained results are interesting in a level that calls for further investigation.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Physiological Measurement Systems and Methods Group, BioMediTech, Turku Univ Hosp, University of Turku, Åbo Akademi, Tampere University Hospital
Authors: Kekonen, A., Bergelin, M., Eriksson, J., Kaartinen, I., Viik, J.
Number of pages: 4
Pages: 446-449
Publication date: 13 Jun 2017

Host publication information
Title of host publication: EMBEC & NBC 2017 : Joint Conference of the European Medical and Biological Engineering Conference (EMBEC) and the Nordic-Baltic Conference on Biomedical Engineering and Medical Physics (NBC), Tampere, Finland, June 2017
Place of publication: Singapore
Publisher: Springer
Editors: Eskola, H., Väisänen, O., Viik, J., Hyttinen, J.
ISBN (Print): 978-981-10-5121-0
ISBN (Electronic): 978-981-10-5122-7

Publication series
Name: IFBME Proceedings
Volume: 65
ISSN (Print): 1680-0737
ISSN (Electronic): 1433-9277
ASJC Scopus subject areas: Medicine(all), Health Professions(all), Surgery, Dermatology
Keywords: Bioimpedance, Tetrapolar, Surgical, Wound, Monitoring, Healing, Assessment, Method
DOIs: 10.1007/978-981-10-5122-7_112

Bibliographical note
jufoid=58152
Research output: Scientific - peer-review › Conference contribution
Examining service experiences: comparing methods to capture children’s experiences

Purpose – Recent discussion on the service-dominant logic (SDL) and interest of studying service experiences in different contexts have increased. However, this has brought up a new methodological challenge for contemporary research. Research methods used, need to capture experiences in the contexts of value co-creation while taking dimensions affecting to experience co-creation into account. This challenges researchers to adapt their methodology to be suitable for the context of studied phenomenon. This paper will provide a set of methodological snapshots applicable for SDL and service research in a context of healthcare services for children and their families.

Design/Methodology/approach – Study draws on selected literature from the fields of service research and healthcare services and tests new methods of capturing experiences in a special experience context of children’s healthcare. We analyze and report a set empirical studies applying of qualitative and quantitative approaches for investigating experience in a special research field of children’s healthcare experience. These methodological approaches include probing, structured and unstructured interviews and surveys. We review and compare the key characteristics of the methods and their respective benefits for service experience research.

Findings – Key findings shows that some research methods are more appropriate capturing children’s experience data. Study also suggest that some methods are more appropriate for capturing data of co-creation in children’s social contexts.

Research implications – The paper builds contribution by increasing understanding on how different research methods capture dimensions of service experience co-creation and help researchers interested in studying children’s experiences to select an appropriate methodology for conducting their research.

Originality/value – Service experience research lacks paper that pieces together different methodology approaches capturing complex phenomenon of children’s experiences.

Key words methodology, children’s experiences, service experience, healthcare

Paper type – Research paper

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Industrial and Information Management, Research group: Center for Innovation and Technology Research, Research group: Center for Innovation and Technology Research, Aalto University, School of Science, Department of Computer Science
Authors: Litovuo, L., Aarikka-Stenroos, L., Kaipio, J., Karisalmi, N.
Number of pages: 20
Publication date: 9 Jun 2017

Host publication information
Title of host publication: The 5th Naples Forum on Service 2017 proceedings : Sorrento, Naples, Italy 6-9 June 2017
Publisher: SIMAS di Salerno for Naples Forum on Service
Editors: Gummesson, E., Mele, C., Polese, F.
ISBN (Electronic): 978-88-92667-57-0
Keywords: methodology, children's experiences, service experience, healthcare, experience
Links:

Research output: Scientific - peer-review › Conference contribution

Foundational eHealth Curricula for the health care workforce

The European Union supported project EU*US eHealth work aims at developing the eHealth skills and competencies of the people working in health care. A part of this work is to develop curricula describing what the personnel should learn about the various aspects of eHealth.

General information
State: Published
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Sleep and Sensory Signal Analysis Group-SSSSAG, Research group: Personal Health Informatics-PHI
Authors: Värri, A., Tolonen, J.
Number of pages: 6
Pages: 1-6
Publication date: 23 May 2017
Peer-reviewed: Unknown
Keywords: health informatics competency, health informatics skills, health informatics workforce, health informatics education, health informatics technology
EU*US eHealth Works to Improve Global Workforce Development

For the past several decades, healthcare organizations and providers in the United States, the European Union and other countries around the globe, have advanced the digital transformation of healthcare to help increase quality, safety and efficiency. Health information technology/eHealth enables healthcare workers and providers the opportunity to maximize their care delivery, ultimately resulting in better outcomes for patients, consumers and society.

The core of any healthcare system is its workforce. Therefore, healthcare systems require a robust supply of highly skilled professionals who are proficient in eHealth/health IT to use, operate and maintain the digital services, which are an increasingly essential part of their infrastructure. Some of these professionals are front-facing care providers such as doctors, nurses, pharmacists and other caregivers and need “eSkills” to achieve and sustain success in their work. Others are on the extended healthcare team, such as clinical informaticists, health information staff, biomedical engineers and researchers, employ eHealth on a daily basis where the use of ICT (information and communications technology) is critical. Furthermore, some healthcare staff that may not be traditionally thought of as using ICT in their work, such as pastoral care workers (clergy), environmental workers, or nutritional staff, who are also more frequently relying on digital services and technology to manage their daily tasks.

To take on these expanded duties, all workers within the healthcare environment must be trained in eHealth, preferably before they even receive their first job. Therefore, the development and advancement of a healthcare workforce equipped with eHealth skills is vital to the present and future state of healthcare. This eHealth enabled workforce will assure that systems keep working functionally, that clinical workflows are incorporated into technology, and that healthcare is delivered in a manner that is safe, secure and quality-infused.

This paper will discuss the ways in which the EU*US eHealth Project, in cooperation with its Consortium members and a large stakeholder community, will work to measure, inform, educate and advance development of a skilled eHealth workforce throughout the European Union, United States and globally, with the goal of creating a legacy of digitally empowered health care professionals now and in the future.

General information
State: Published
Ministry of Education publication type: D2 Article in professional manuals or guides or professional information systems or text book material
Authors: Blake, R., Shaw, T., Blake, A., Hübner, U., Kaye, R., Schug, S., Thye, J., Värrri, A.
Number of pages: 12
Pages: 1-12
Publication date: 7 Mar 2017

Host publication information
Title of host publication: HIMSS White Papers
Publisher: Healthcare Information and Management Systems Society
Keywords: health informatics competency, health informatics skills, health informatics workforce, health informatics education, health information technology
ASJC Scopus subject areas: Computer Science (miscellaneous), Health Professions(all)
Electronic versions:
EU-us-ehealth-workforce-development
Links:
Research output: Professional › Chapter

Association of exercise loading history with fall-induced hip fracture risk.
Influence of exercise history on fall-induced hip fracture risk.

Hip fracture is a major public health problem. Thin superolateral cortex of the femoral neck experiences unusually high stress in a sideway fall, contributing to hip fracture risk. The aim of this study is to examine how exercise based loading history, known to affect the femoral neck cortical structure, influences fall-induced fracture risk. For this purpose, finite element models were created from the proximal femur MRI of 91 young athletic and 20 control females. Fall-induced superolateral cortical safety factors (SF) were estimated in the distal volume of femoral neck. Significantly higher (p < 0.05) SFs were observed from femoral necks with high impact (H-I), odd impact (O-I), and repetitive impact (R-I) exercise history, indicating lower fracture risk. The results indicate that it is advisable to include some impact exercise in a fracture preventive exercise program.
Transcription Initiation Controls Skewness of the Distribution of Intervals Between RNA Productions

Most regulation in transcription controls when and with which intensity genes are expressed. However, recent evidence suggests that control is also exerted on the noiseness of this process. Here, we use an empirically validated stochastic multi-step model of transcription to explore how its steps kinetics affect the skewness of the distribution of intervals between consecutive RNA productions in individual cells. From the simulations, we show that skewness is independent of the mean transcription rate, but differs widely with the fraction of time the RNA polymerase spends in the steps following open complex formation. Next, from qPCR and live, time-lapse, single-RNA microscopy measurements of multiple promoters, we validate our model predictions. Using the validated model, we then show that skewness affects, e.g., the fraction of time protein numbers are below a threshold. We conclude that skewness in transcription kinetics can be tuned by the rate-limiting steps in initiation and, thus, may be an evolvable decision-making parameter of genetic circuits.

Biomaterials for Electronics

Challenges of climate change, ecological scarcity and depletion of natural resources form a global push towards a bioeconomy, which means shifting from fossil to renewable raw materials. Wood biomass will likely get a significant role in
the Finnish bioeconomy. Finnish economy has conventionally focused on bulk products, while the challenge in the future is to bring high added value to the fibre based components and products. Cellulose based nanomaterials are low-cost, strong, porous, lightweight, solution processable, biocompatible, biodegradable and piezoelectric biomaterials, which have obvious applications for example in biomedical and electronic applications.

Piezoelectric sensors are widely applicable for various healthcare and well-being applications. We have recently studied flexible piezoelectric sensors made from commercial PVDF films and printable PVDF-TrFE ink, as well as biodegradable films from wood-based cellulose nanofibrils (CNF) and bacterial cellulose (BC).

The high porosity of CNF makes it also a promising material for supercapacitors, also known as electrochemical double-layer capacitors (EDLC). We have recently demonstrated the fabrication of supercapacitor electrodes from a mixture of CNF and dandelion using high temperature pyrolysis.

References:

Porous polymer tubes for urethral tissue engineering

Hypospadias is a condition where the opening of the urethra is abnormally situated. It is one of the most common congenital anomalies affecting one in 200 to 300 male children. The most severe cases require urethral reconstruction and every other of these operations leads to complications. In this study porous polymer tubes are designed for repairing large urethral defects. The tubes are made from polylactide (PLA) and polybutylene succinate (PBS) as well as two blends (PLA/PBS 75/25 blend and a 50/50 blend). The structure is made porous with supercritical carbon dioxide. The main aim is to create a suitable porous structure to enable the formation of an impermeable epithelium and allowing the surrounding tissue to partially grow inside the tubes anchoring it to its place. The morphology of the tubes was observed with optical microscope and the porosity was characterized with microcomputed tomography. The results are promising and suggest that these novel replacements are promising alternatives for urethral tissue engineering.

The impact of acquisition dose on quantitative breast density estimation with digital mammography: results from ACRIN PA 4006
Organisations: University of Pennsylvania
Authors: Chen, L., Ray, S., Keller, B., Pertuz, S., McDonald, E., Conant, E., Kontos, D.
Publication date: Sep 2016
Peer-reviewed: Yes

Publication information
Journal: Radiology
Volume: 280
Issue number: 3
ISSN (Print): 0033-8419
Ratings:
Scopus rating (2016): SJR 3.488 SNIP 2.797 CiteScore 5.67
Scopus rating (2015): SJR 3.512 SNIP 2.765 CiteScore 5.5
Scopus rating (2014): SJR 3.795 SNIP 3.046 CiteScore 5.5
Scopus rating (2013): SJR 3.21 SNIP 2.953 CiteScore 5.4
Scopus rating (2012): SJR 3.279 SNIP 2.855 CiteScore 5.27
Scopus rating (2011): SJR 3.129 SNIP 2.696 CiteScore 4.93
Scopus rating (2010): SJR 3.226 SNIP 2.667
Scopus rating (2009): SJR 3.121 SNIP 2.76
Scopus rating (2008): SJR 3.051 SNIP 2.664
Scopus rating (2007): SJR 3.392 SNIP 2.729
Scopus rating (2006): SJR 3.078 SNIP 2.537
Scopus rating (2005): SJR 2.712 SNIP 2.642
Scopus rating (2004): SJR 2.664 SNIP 2.595
Scopus rating (2003): SJR 2.522 SNIP 2.709
Scopus rating (2002): SJR 2.479 SNIP 2.56
Scopus rating (2001): SJR 2.507 SNIP 2.665
Scopus rating (2000): SJR 2.949 SNIP 2.586
Scopus rating (1999): SJR 2.83 SNIP 2.855
Original language: English
DOIs: 10.1148/radiol.2016151749
Research output: Scientific - peer-review › Article

Fully-automated quantitative estimation of volumetric breast density from digital breast tomosynthesis images

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Pertuz, S., McDonald, E., Weinstein, S., Conant, E., Kontos, D.
Pages: 65-74
Publication date: Apr 2016
Peer-reviewed: Yes

Publication information
Journal: Radiology
Volume: 279
Issue number: 1
ISSN (Print): 0033-8419
Ratings:
Scopus rating (2016): SJR 3.488 SNIP 2.797 CiteScore 5.67
Scopus rating (2015): SJR 3.512 SNIP 2.765 CiteScore 5.5
Scopus rating (2014): SJR 3.795 SNIP 3.046 CiteScore 5.5
Scopus rating (2013): SJR 3.21 SNIP 2.953 CiteScore 5.4
Scopus rating (2012): SJR 3.279 SNIP 2.855 CiteScore 5.27
Scopus rating (2011): SJR 3.129 SNIP 2.696 CiteScore 4.93
Scopus rating (2010): SJR 3.226 SNIP 2.667
Scopus rating (2009): SJR 3.121 SNIP 2.76
Health figures: an open source JavaScript library for health data visualization

Background
The way we look at data has a great impact on how we can understand it, particularly when the data is related to health and wellness. Due to the increased use of self-tracking devices and the ongoing shift towards preventive medicine, better understanding of our health data is an important part of improving the general welfare of the citizens. Electronic Health Records, self-tracking devices and mobile applications provide a rich variety of data but it often becomes difficult to understand. We implemented the hFigures library inspired on the hGraph visualization with additional improvements. The purpose of the library is to provide a visual representation of the evolution of health measurements in a complete and useful manner.

Results
We researched the usefulness and usability of the library by building an application for health data visualization in a health coaching program. We performed a user evaluation with Heuristic Evaluation, Controlled User Testing and Usability Questionnaires. In the Heuristics Evaluation the average response was 6.3 out of 7 points and the Cognitive Walkthrough done by usability experts indicated no design or mismatch errors. In the CSUQ usability test the system obtained an average score of 6.13 out of 7, and in the ASQ usability test the overall satisfaction score was 6.64 out of 7.

Conclusions
We developed hFigures, an open source library for visualizing a complete, accurate and normalized graphical representation of health data. The idea is based on the concept of the hGraph but it provides additional key features, including a comparison of multiple health measurements over time. We conducted a usability evaluation of the library as a key component of an application for health and wellness monitoring. The results indicate that the data visualization library was helpful in assisting users in understanding health data and its evolution over time.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Personal Health Informatics-PHI
Authors: Ledesma, A., Al-Musawi, M., Nieminen, H.
Publication date: 22 Mar 2016
Peer-reviewed: Yes

Publication information
Journal: BMC Medical Informatics and Decision Making
Volume: 16
Issue number: 1
Article number: 38
ISSN (Print): 1472-6947
Ratings:
Scopus rating (2016): SJR 1.021 SNIP 1.125 CiteScore 2.27
Scopus rating (2015): SJR 1.055 SNIP 1.391 CiteScore 2.63
Scopus rating (2014): SJR 0.89 SNIP 1.199 CiteScore 2.01
Scopus rating (2013): SJR 0.693 SNIP 1.236 CiteScore 2.02
Scopus rating (2012): SJR 0.783 SNIP 1.229 CiteScore 2.14
Scopus rating (2011): SJR 1.053 SNIP 1.634 CiteScore 2.57
Scopus rating (2010): SJR 1.084 SNIP 1.678
Comparison of injury severity between moped and motorcycle crashes: A Finnish two-year prospective hospital-based study

Background and Aims: The coverage of the official statistics is poor in motorcycle and moped accidents. The aim of this study was to analyze the severity of motorcycle and moped crashes, and to define the degree of under-reporting in official statistics. Material and Methods: All first attendances due to an acute motorcyclist or moped driver injury registered in the emergency department between June 2004 and May 2006 were analyzed. The severity of the injuries was classified using the Abbreviated Injury Scale score and the New Injury Severity Score. The hospital injury data were compared to the traffic accident statistics reported by the police and compiled and maintained by Statistics Finland. Results: A total of 49 motorcyclists and 61 moped drivers were involved in crashes, leading to a total of 94 and 109 injuries, respectively. There were slightly more vertebral and midfoot fractures among motorcyclists than among moped drivers (p = 0.038 and 0.016, respectively). No significant differences were found between the severity (maximum Abbreviated Injury Scale and median New Injury Severity Scores) of the motorcycle and moped crashes. There was no in-hospital mortality. The degree of agreement (overlap) between the hospital dataset and the official statistics was 32%. The rate of under-reporting was 68%. Conclusions: According to the maximum Abbreviated Injury Scale and New Injury Severity Scores, the injury severity was equal for motorcycle and moped crashes. The degree of agreement between the hospital dataset and the official statistics was 32%.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Information Management and Logistics, University of Helsinki, North Kymi Hospital
Authors: Airaksinen, N., Nurmi-Lüthje, I., Lüthje, P.
Number of pages: 7
Pages: 49-55
Publication date: 1 Mar 2016
Peer-reviewed: Yes

Publication information
Journal: Scandinavian Journal of Surgery
Volume: 105
Issue number: 1
ISSN (Print): 1457-4969
Ratings:
Scopus rating (2016): CiteScore 1.83 SJR 0.614 SNIP 1.226
Scopus rating (2015): SJR 0.579 SNIP 0.885 CiteScore 1.46
Scopus rating (2014): SJR 0.554 SNIP 1.131 CiteScore 1.59
Scopus rating (2013): SJR 0.561 SNIP 0.857 CiteScore 1.53
Scopus rating (2012): SJR 0.575 SNIP 0.807 CiteScore 1.53
Scopus rating (2011): SJR 0.502 SNIP 0.878 CiteScore 1.37
Scopus rating (2010): SJR 0.452 SNIP 0.826
Scopus rating (2009): SJR 0.464 SNIP 0.567
Scopus rating (2008): SJR 0.547 SNIP 0.244

Original language: English
Keywords: Data visualization, Health data, Health informatics, Javascript
Electronic versions:
http://urn.fi/URN:NBN:fi:ttty-201603243765
Research output: Scientific - peer-review › Article
Implementation and User Testing of a System for Visualizing Continuous Health Data and Events
Efficient ways are needed to visualize the health status of a person and how the lifestyle, daily choices and health care actions are affecting it. Current systems lack a comprehensive interface for interaction and exploration of large and complex data and events affecting the data. Based on state-of-the-art data visualization techniques, we implemented and user tested a system that visualizes health data holistically over time. The system focuses on the dynamic changes by using a timeline of events affecting the overall health status. We conducted an extensive user testing process involving surveys, heuristics and observations in order to evaluate our system. The results show that our system has a high level of User Satisfaction while providing an adequate understanding, interaction and navigation of the data.

Feature-based analysis of mouse prostatic intraepithelial neoplasia in histological tissue sections
Prostatic intraepithelial neoplasia (PIN) represents premalignant tissue involving epithelial growth confined in the lumen of prostatic acini. In the attempts to understand oncogenesis in the human prostate, early neoplastic changes can be modeled in the mouse with genetic manipulation of certain tumor suppressor genes or oncogenes. As with many early pathological changes, the PIN lesions in the mouse prostate are macroscopically small, but microscopically spanning areas often larger than single high magnification focus fields in microscopy. This poses a challenge to utilize full potential of the data acquired in histological specimens. We use whole prostates fixed in molecular fixative PAXgene™, embedded in paraffin, sectioned through and stained with H&E. To visualize and analyze the microscopic information spanning whole mouse PIN (mPIN) lesions, we utilize automated whole slide scanning and stacked sections through the tissue. The region of interests is masked, and the masked areas are processed using a cascade of automated image analysis steps. The
images are normalized in color space, after which exclusion of secretion areas and feature extraction is performed. Machine learning is utilized to build a model of early PIN lesions for determining the probability for histological changes based on the calculated features. We performed a feature-based analysis to mPIN lesions. First, a quantitative representation of over 100 features was built, including several features representing pathological changes in PIN, especially describing the spatial growth pattern of lesions in the prostate tissue. Furthermore, we built a classification model, which is able to align PIN lesions corresponding to grading by visual inspection to more advanced and mild lesions. The classifier allowed both determining the probability of early histological changes for unclassified tissue samples and interpretation of the model parameters. Here, we develop quantitative image analysis pipeline to describe morphological changes in histological images. Even subtle changes in mPIN lesion characteristics can be described with feature analysis and machine learning. Constructing and using multidimensional feature data to represent histological changes enables richer analysis and interpretation of early pathological lesions.

The influence of foodstuff grouping on doses in safety assessments

Levosimendan alone and in combination with valsartan prevents stroke in Dahl salt-sensitive rats
The effects of levosimendan on cerebrovascular lesions and mortality were investigated in models of primary and secondary stroke. We aimed to determine whether the effects of levosimendan are comparable to and/or cumulative with those of valsartan, and to investigate whether levosimendan-induced vasodilation has a role in its effects on stroke. In a primary stroke Dahl/Rapp rat model, mortality rates were 70% and 5% for vehicle and levosimendan, respectively. Both stroke incidence (85% vs. 10%, \( P < 0.001 \)) and stroke-associated behavioral deficits (7-point neuroscore: 4.59 vs. 5.96, \( P = 0.001 \)) were worse for vehicle compared to levosimendan. In a secondary stroke model in which levosimendan treatment was started after cerebrovascular incidences were already detected, mean survival times were 15 days with vehicle, 20 days with levosimendan (\( P = 0.025 \), vs. vehicle), 22 days with valsartan (\( P = 0.001 \), vs. vehicle), and 31 days with levosimendan plus valsartan (\( P < 0.001 \), vs. vehicle). The respective survivals were 0%, 16%, 20% and 59%, and the respective incidences of severe lesions were 50%, 67%, 50% and 11%. In this rat model, levosimendan increased blood volume of the cerebral vessels, with significant effects in the microvessels of the cortex (\( \Delta R = 3.5 \pm 0.15 \) vs. 2.7 \( \pm 0.17 \)ml for vehicle; \( P = 0.001 \)) and hemisphere (\( \Delta R = 3.2 \pm 0.23 \) vs. 2.6 \( \pm 0.14 \)ml for vehicle; \( P = 0.018 \)). Overall, levosimendan significantly reduced stroke-induced mortality and morbidity, both alone and with valsartan, with apparent cumulative effects, an activity in which the vasodilatory effects of levosimendan have a role.