by funding from Örebro University and Örebro University Hospital Research Foundation.

Conclusions: PEARL fulfils the need for a collaborative network for pain in early life researchers in the Nordic countries.

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Searching for protein biomarkers in pain medicine – Mindless dredging or rational fishing?

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Aims: Biomarker research seems to be somewhat controversial in pain medicine. Because pain is a subjective experience, renowned pain researcher Eija Kalso wrote in a 2004 *Pain* editorial that biomarkers for pain is an impossibility. However, in the same editorial, she also seemed to imply that what she called "biomarkers of (neuronal) activity in the nociceptive pathway" would be possible. Recently, I proposed the neologism "noci-marker" as a better term than "pain biomarker" for denoting attempts to find objective, measurable correlates to the neurobiological processes involved in different pain conditions. The purpose of the present conceptual work is to propose criteria for sensible hypothesis-generating research in the field of "noci-marker" research.

Method: Conceptual theoretical work, with examples from the literature.

Results: Criteria for sensible biomarker research in pathological pain conditions, together with examples from the literature, will be presented for discussion, including consideration of (work in progress):

- "Mirroring" rationale – which body fluid is studied? The example of saliva vs. cerebrospinal fluid.
- Time frame rationale – when is it sensible to look for what? The example of Cystatin C.
- Statistical considerations – univariate multiple testing vs. correlation structure of a whole data set. The example of multivariate data analysis by projection using SIMCA.
- The definition of patient cohorts – clinically and phenotypically.
- Relating findings to the literature and to systems biology. The example of Pain Networks.
- Reporting issues – how should the hypothesis-generating (explorative) nature of such studies be acknowledged?

Conclusions: Although it seems ethically dangerous and philosophically dubious to talk about "pain biomarkers", searching for biological correlates to pathological activity in the nociceptive pathways ("noci-markers") seems justified and conceptually possible.

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Effectiveness of smart tablets as a distraction during needle insertion amongst children with port catheter: Pre-research with pre-post test design

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Aims: Children who experience pain and anxiety while undergoing interventions or treatments during hospitalization at a young age can experience negative feelings which can influence how they experience health care in the future.

The purpose of the study was to evaluate the protocol of using a tablet computer as a source of distraction from pain and fear when children undergo needle insertion in a port catheter (port-a-cath®).

Methods: The study uses a quasi-experimental pretest-post test design with a sample of 14 children, 20 months to 16 years of age, 9 boys and 5 girls. Pain and fear were first evaluated without the distraction of a tablet computer. The second time pain and fear were evaluated while a tablet computer was used for distraction. The children evaluated their pain and fear with a 10 cm Numeric Rating Scale (NRS/VAS) and six faces scales in all cases except three. In those three cases the mothers evaluated the children's pain and fear with the NRS, the Faces scale, or the Legs, Activity, Cry, Consolability scale (FLACC).

Results: The Shapiro–Wilk test showed a significant distribution ($p < 0.05$) of pain and fear but most subjects did not feel any fear before the intervention. The mean score of pain was 2.90 (sd = 3.67) and the mean score for fear was 3.67 (sd = 3.76). No significant difference was found between pain and the fear prior to the intervention ($p = 0.09$). Children who felt fear prior to the intervention (n = 5) experienced significantly lower pain when a tablet computer was used ($p < 0.05$). No difference was found between pain and fear by age or gender. No difference in pain was found by the type of distraction ($p = 0.20$). All subjects where highly experienced with needle insertions and some of them had developed their own approach to deal with the intervention.

Conclusions: More extensive research is needed in this area.

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Postoperative oxycodone in breast cancer surgery: What factors associate with analgesic plasma concentrations?

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Aims: Parenteral oxycodone is increasingly used worldwide to manage perioperative pain. Oxycodone doses required for adequate analgesia vary significantly between individuals. Our

study investigated whether an analgesic plasma concentration could be determined for oxycodone and which factors affect it.

Methods: 1000 women undergoing breast cancer surgery were recruited to the study. Demographic data were collected and their cold and heat pain sensitivity and anxiety scores were measured preoperatively. After surgery, rest and motion pain intensities were measured. Intravenous oxycodone was administered until the patients reported satisfactory pain relief (NRS <4/10). At this point, plasma concentrations of oxycodone and its metabolites were determined. A second plasma sample for oxycodone determination was taken when the patient requested a new dose of oxycodone. Genomic DNA was extracted from whole blood samples and the patients were genotyped for *CYP2D6*, *CYP3A4* and *CYP3A5* variants.

Results: The two oxycodone concentrations showed a strong correlation ($r = 0.84$). The pain intensity measured during motion before oxycodone dosing correlated significantly with the plasma oxycodone concentration (geometric mean 35.3 ng/ml and CV% 66.4) required to achieve satisfactory analgesia ($r = 0.38$, $p = 1.5 \times 10^{-33}$). The most important factors associating with postoperative pain intensity were type of surgery (breast conserving or mastectomy with or without axillary clearance) and the age of the patient. Older patients reported lower pain scores and required smaller oxycodone concentrations for satisfactory analgesia. *CYP2D6*, *CYP3A5* or *CYP3A4* genotypes did not significantly affect the oxycodone concentrations, but *CYP2D6* genotype significantly affected the formation of the metabolites oxymorphone and noroxymorphone. *CYP3A4* and *CYP3A5* genotypes did not affect the metabolite formation.

Conclusions: Our results indicate that the more pain the patient experiences postoperatively the greater her minimum plasma oxycodone concentration must be to achieve satisfactory analgesia. Type of surgery and age significantly affect postoperative pain intensity.

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Sport participation and physical activity level in relation to musculoskeletal pain in a population-based sample of adolescents: The Young-HUNT Study

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Aims: Studies have shown conflicting results regarding associations between physical activity (PA) and musculoskeletal pain among adolescents, and few have evaluated the impact of sport participation. Therefore, the aims of this study were to examine the associations between sport participation and persistent weekly pain by body region in a population-based sample of adolescents.

Methods: In this cross-sectional study, data from the adolescent part of the Nord-Trøndelag Health Study (Young-HUNT3) were used. Participants were asked how often during the last 3 months they had experienced pain in the neck-and-shoulders (NSP), low back (LBP) or lower extremities (LEP). The impact of sport participation and PA level on pain was evaluated using logistic regression analyses, stratified by gender, and adjusted for age, socioeconomic status and psychological distress.

Results: In total, 3765 boys and 3831 girls were included, mean age 15.8 years (SD 1.7). NSP was most prevalent (17%). Adolescents who participated in endurance sports had lower odds of NSP and LBP compared to non-participants. Participation in technical sports was associated with increased odds of LBP, and participation in team sports with increased odds of LEP, vs. no participation in the respective sports. Participation in strength sports and risk sports, vs. no participation, was related to higher levels of pain in all regions. Compared to a low PA level, a moderate PA level reduced the odds of NSP and LBP, whereas a high PA level increased the odds of LEP.

Conclusion: This study identified sports potentially protective, as well as sports associated with higher odds of NSP, LBP and LEP in a large population-based sample, and has increased the understanding of participation in sports as potential determinants of musculoskeletal pain among adolescents. Our findings highlight that types of sport adolescents participate in should be considered by healthcare professionals when evaluating their musculoskeletal pain.

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"Tears are also included" – women's experience of treatment for painful endometriosis at a pain clinic

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Aims: To explore how women perceive and are affected by treatment for painful endometriosis.

Method: Qualitative methodology with emergent design was used. Sixteen semi-structured interviews (including 3 follow-ups) with 13 women (age 20–47) treated at a pain clinic, were analysed with Grounded Theory.

Results: A preliminary model describes how women experience treatment for painful endometriosis and its consequences in one core category and three categories. The core category; Surviving painful endometriosis, described the women's promoting strategies like Knowledge, Adaption and Planning, and inhibiting reactions as Anxiety and Resignation. The three interacting categories; Woman with painful endometriosis, included experiences of "The self" and "The body". "The environment/significant others" described the environments' support. Missed opportunities were described as a lack of participation in important life areas; "Social life", "Career" and "Descendants". "New possibilities" were experienced when pain disappeared or could be controlled. Dependent on health care included the experiences of "Treatments" from help-