mNIRS 2024. University of Essex September 10.

SUMMARY OF END OF MEETING ROUNDTABLE DISCUSSION

Chair - Professor Chris Cooper

[note this is an initially AI generated summary from a recording of the discussion; the draft was then checked and edited/amended by Chris Cooper]

1. **Advancements in mNIRS Technology:**
    - **Equipment Diversity:** It was noted that a wide range of both homemade and commercial mNIRS devices are in use, promoting a rich environment for innovation and diverse applications.
    - **Integration and Innovation:** There is a push towards integrating mNIRS with other measurement tools. There could include measures of blood flow such as diffuse correlation spectroscopy (DCS) and muscle activity (electromyography, EMG). Expense has limited the application of blood flow measures (although cheaper speckle contrast methods were described at the meeting). However, it was noted that the adoption of EMG in the mNIRS field is surprisingly low, despite its more ready availability.

2. **Need for Standardization:**
    - **Protocols and Calibration:** It was argued that stablishing standard protocols for data analysis and device calibration would help ensure reproducibility and accuracy across different settings. The means as to how to achieve this was discussed (position paper in a journal and/or via a scientific society).
    - **Device Specifications:** Manufacturers should clearly specify the operational conditions of their devices, such as limits on skin and fat thickness, to guide users effectively. However, it was noted that this again would need a standard “view” on what was an acceptable deviation from what was acceptable, and what protocol was used for making the measurement
    - **Use of Phantoms:** Although it was noted that developing standardized phantoms for device validation could facilitate consistent comparisons and benchmarking across different laboratories and devices, there was some discussion on whether this was necessary or indeed desirable compared to in vivo calibrations using standard protocol e.g. a “physiological calibration via arterial occlusion (0%) followed by reperfusion (100%).
    - **Dynamic Phantoms:** Introducing phantoms that can simulate muscle activity during exercise may provide better validation and comparison

of devices. However, there was no agreement as to what such a phantom would look like.

3. **Addressing the Fat Layer Challenge:**
    - **The problem:** Continued efforts are needed to improve measurement accuracy through the adipose (fat) layer which can devalue mNIRS measures creating variability between subjects and in some cases making measurements unfeasible
    - **Technical Solutions:** . Currently most NIRS spectrometers attempt to address this via multi-distance methods (multiple source detector separations). However, time (and frequency) domain mNIRS has the potential to address aspects of the fat layer problem by providing deeper measurements. These tools currently have limited accessibility partly due to cost, but also due to lack of user awareness of their potential benefits.

4. **Future Meeting Formats and Frequency:**
    - **Meeting Success:** There was general agreement that mNIRS 2024 played a valuable role as an “in person” scientific meeting. A physical meeting complemented other virtual events, allowing for more informal discussions and hands on demonstrations of the latest commercial devices.
    - **Meeting Duration and Frequency:** There is a preference for biennial meetings over annual ones. Two years would allow time for more substantial data collection of preliminary ideas originally presented at mNIRS 2024. It would also allow sponsors to target a single larger meeting than two smaller ones held annually. Two days was felt like a good length for a meeting, given the current size of the community (with the caveat that the mNIRS 2024 audience could be biased in favour of this duration as this was the length of the current meeting)
    - **Global Participation:** Alternating meeting locations globally can enhance accessibility and diversity, though logistical challenges exist. Currently it was felt that there was a suitable critical mass for a biennial meeting in Europe. Therefore, a follow up meeting outside the UK elsewhere in Europe in 2026 would be generally appreciated. Some possible venues were discussed. Meeting biennially would also allow for a meeting in the “fallow” year (2025 or 2027) in North America or Asia where there is already considerable mNIRS activity.
    - **Online or in person:** It was felt that hosting the meeting online as well as in person (blended) was not desirable as it would detract from the in person “feel”: of the meeting and limit discussion. However, having an online “day” either before or after mNIRS might be possible, as has happened with the international fNIRS conferences. Summaries of the meeting and recording of the talks (with permission) could be made

subsequent to the event. It was noted that online-only meetings (e.g. MOXY Summit) exist and already enhance diversity and inclusion.
    - **Incorporating Experts:** Bringing in experts from related fields can enrich the discussions and foster interdisciplinary collaboration. An easy way to do this is by inviting plenary speakers working in related areas who work geographically close to meetings.

5. **Community Building and Collaboration:**
    - **Inclusive Participation:** Encouraging practitioners, manufacturers, and academics to collaborate ensures a well-rounded advancement of the mNIRS field.
    - **Supporting New Members:** Providing resources and support for newcomers, especially those from developing countries, can broaden the community and foster diverse perspectives.

6. **Formation of a Scientific Society:**
    - **Rationale:** Forming a scientific society might be a time consuming and potentially unnecessary distraction at this nascent state of the mNIRS field. However, ultimately it could provide several advantages such as:
    - **Organizational Support:** Given as source of revenue (where from?), a scientific can manage financial aspects, organize meetings, provide travel awards, and support the community's growth.
    - **Educational and Networking Opportunities:** The society can facilitate educational sessions, best practice sharing, and networking, enhancing the field's overall development.
    - **Balancing Standardization and Innovation:** The society could aim to promote standardization. However, it was noted this should not come at the expense of hindering technological advancements and innovation.
    - **Biennial Conference Support:** The society can provide governance and finance to ensure the viability of the biennial mNIRS conference in the future (especially if it grew and became a global event). Indeed, it was noted that this was the primary reason for the incorporation of the Society for Functional Near Infrared Spectroscopy (SfNIRS).

7. **Feedback on Current Meeting:**
    - **Success Indicators:** The meeting was deemed a success by most participants, with valuable interactions between technology developers and users.
    - **Areas for Improvement:** Suggestions include refining meeting formats, increasing the frequency of specialized sessions, and enhancing the inclusion of external experts.