

Quantifying the effect of visual feedback on hand washing quality

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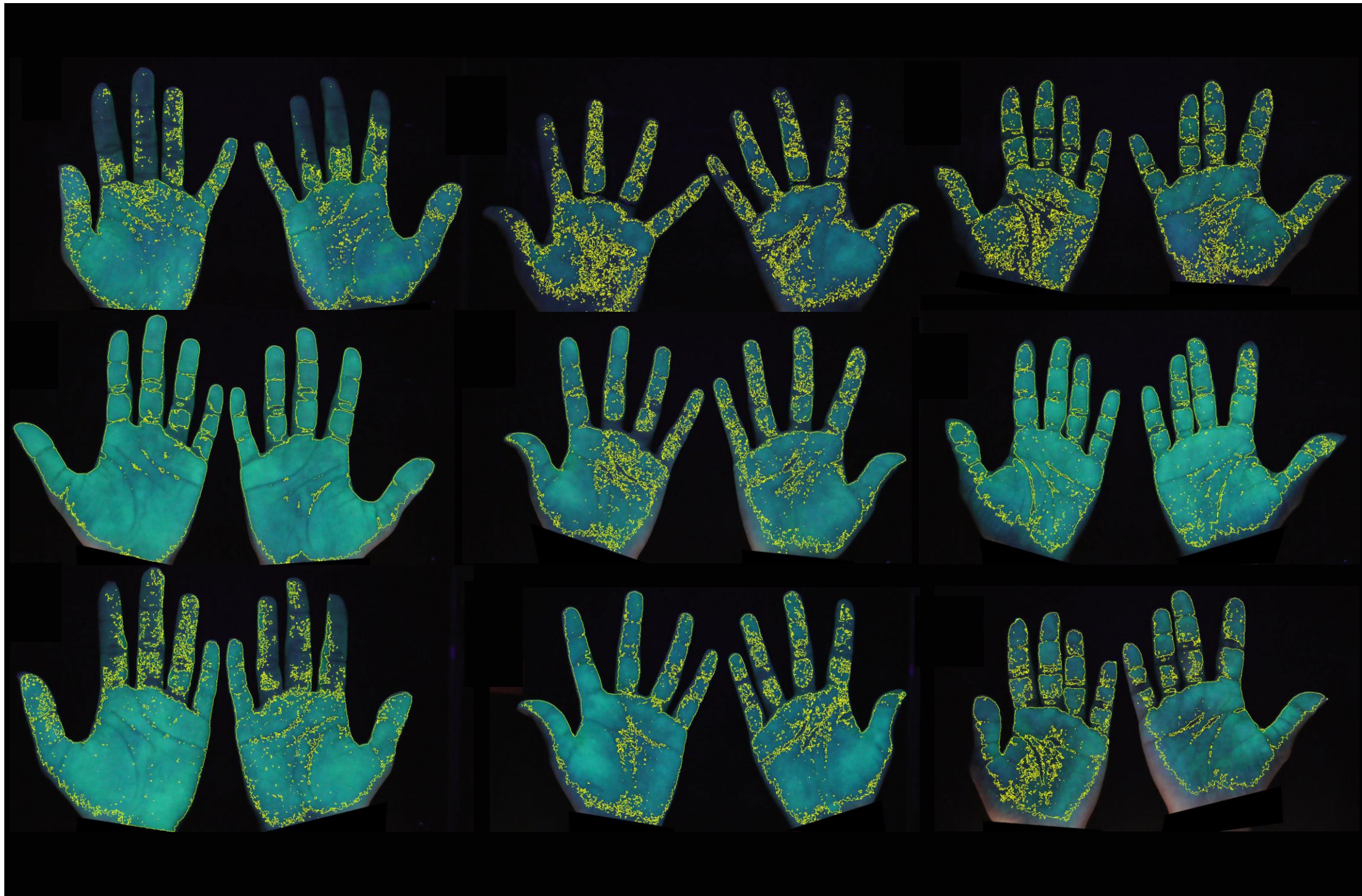
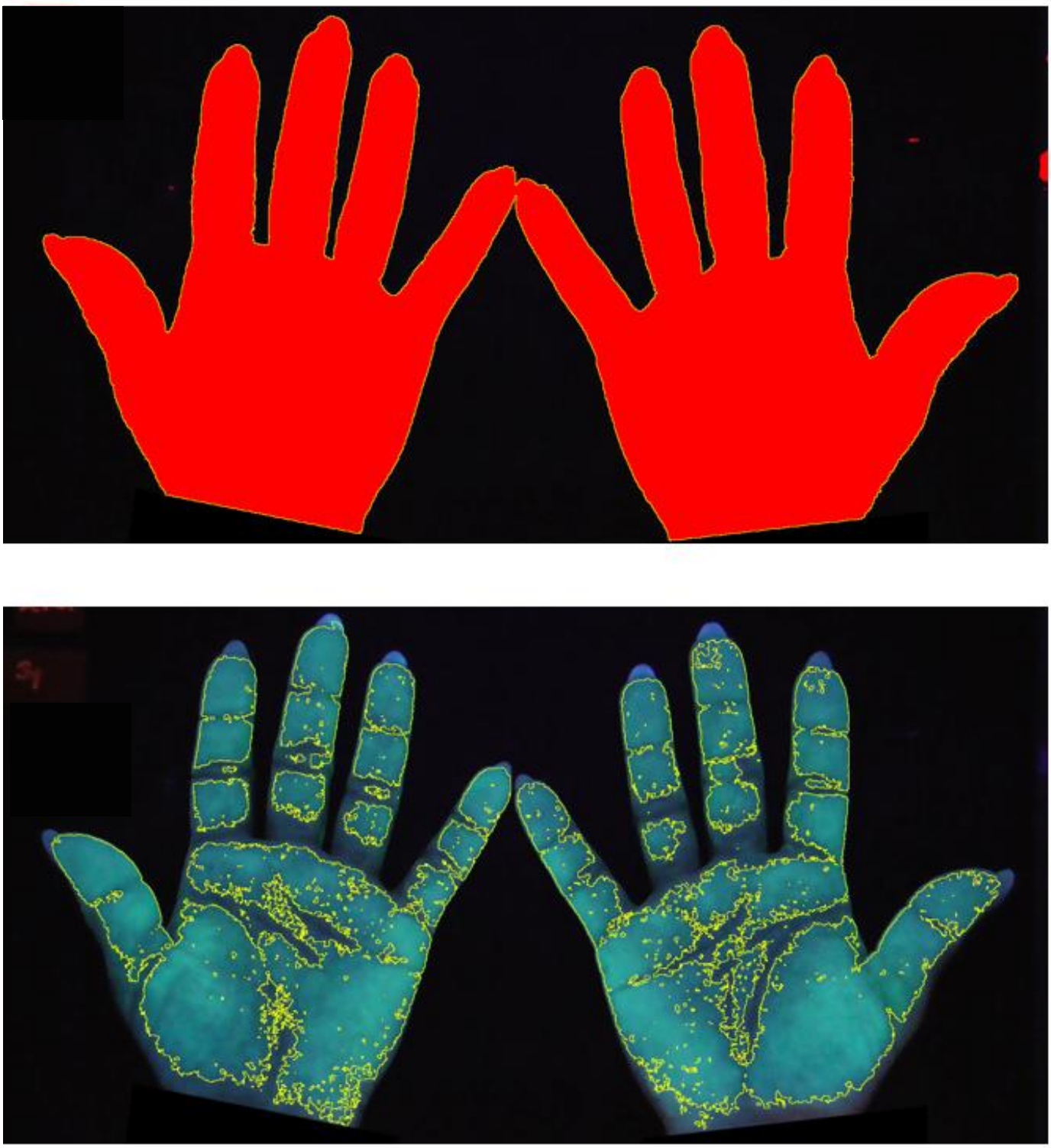
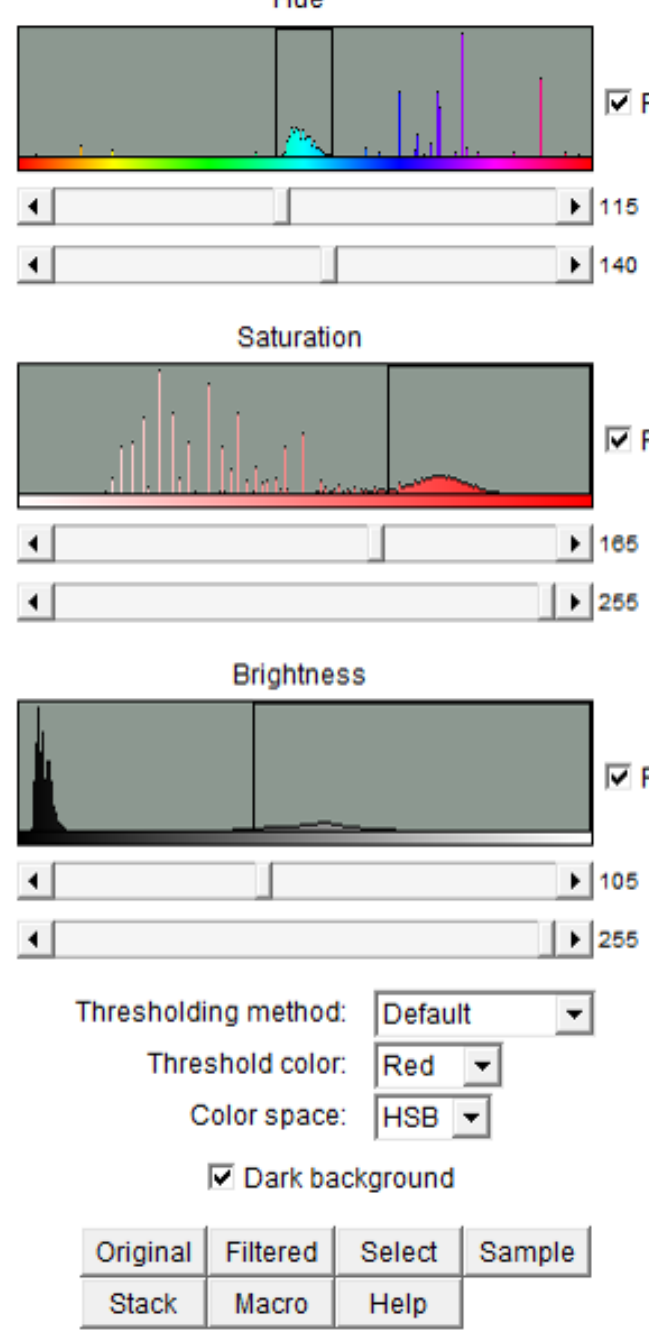
Hand washing is a critical and low-cost safety measure in multiple instances. A correlation between improved hand hygiene and decreasing rates of infectious diseases has been shown multiple times. Hand washing is a learned behavior but often a neglected or ineffectively performed practice. The evenly performed distribution of the soap across the entire hands is one key to achieve optimal results. Therefore, the aim of this study was to investigate if colored soap improves hand washing performance via its visual feedback. In a pre-post intervention study, we have quantified the wetting of the palm using UV light active soap. Participants could use uncolored UV light active soap on a daily basis for eight days, before switching to soap with identical composition, except the added yellow color, for another eight days. Afterwards, the colorless soap was used for eight more days. The yellow color washes off with

normal hand washing routine, while the UV component remains prolonged. Every day pictures of the ventral side of the hands were taken immediately after participants washed hands and the UV fluorescence was evaluated regarding the distribution of the UV dye. The percentage of fluorescent areas of the palm increased significantly from using colorless soap (n = 44) from a median of 69 % to 76 % using colored soap (n = 46) and dropped back to 72 % without the color feedback. Results suggest that the method using UV light active color in soap is suitable for evaluation of hand washing in respect of calculation the wetting surface with soap. Due to rather high variation between the individuals, it is important to include a sufficient number of participants. Furthermore, data indicate that the quality in hand washing increased with using a colored soap as direct visual feedback.

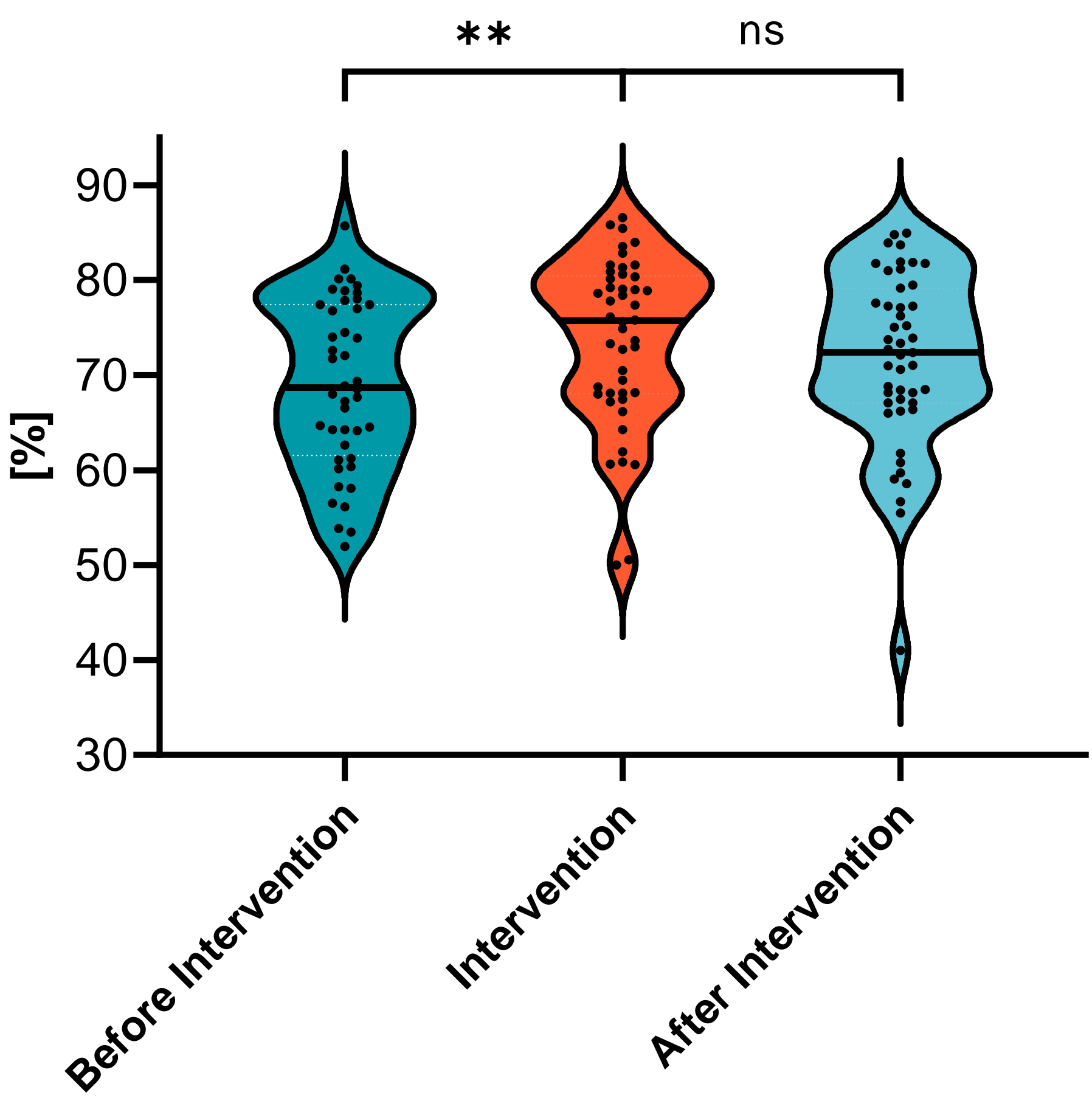


The yellow stained soap (VisiSoap®, Heyfair, Jena, Germany) shows where soap is distributed and afterwards washed off. Thus, correct hand washing should be intuitively learned. To verify this hypothesis, the soap was supplemented with a fluorescent dye (Solvent Green 7) and UV fluorescence on hands after washing documented and evaluated.

Using the pictures, the complete surface of the hand palms was determined by measurement of the area reflecting the full color spectrum detected by the camera (marked in red). The surface stained by the soap with fluorescent dye (outlined in yellow) was measured by selecting the color of the dye exited by UV light (turquoise in color histogram). The ratio of both values represent the percentage of fluorescent area.



In total, 44 pictures after usage of unstained soap, 46 pictures after usage of colored soap and, last, again 45 pictures after application of unstained soap were evaluated.



Fluorescence on hands after usage of unstained soap, colored soap and again after unstained soap. Highest fluorescence ratio was measured after the application of colored soap.

Despite rather high variation between the individuals, the usage of colored soap increased the fluorescent area of the palms significantly indicating an improved wetting of the hands. This suggests the method can be suitable for such analysis when enough participants were included.