

IS FORENSIC PAINT ANALYSIS AFFECTED BY ENVIRONMENTALLY FRIENDLY PRODUCTS?

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Introduction

- In forensic science, paint can be key evidence to identifying the scene of the crime or to link a suspect back to the scene.
- Forensic paint analysis is performed by using attenuated total reflectance infrared spectroscopy (ATR-FTIR) to determine the paints chemical make-up to see if it is the same between a known source and an unknown chip.
- Provides a chemical fingerprint that is unique to the composition of the paint, allows identification of the binder
- With environmentally friendly paints becoming more common in homes, **this study was conducted to determine if these paint formulations pose a new forensic problem.**
- ECOS Paints™ include “a molecular sieve which is designed to both stop harmful volatile organic compounds (VOCs) from being released into the air and to trap them as they float through a room” (*Air Pure Learn*).
- The adsorption of these VOCs from products by these paint could potentially alter the observed infrared spectra
- This study was conducted to determine if these VOCs, which would be adsorbed, changes the observed chemical makeup of these paints overtime.
- **If the spectra change, then this could have implications in forensic analysis which forensic chemists should be aware of.**

Discussion

- Visual examination of the IR spectra, show paints A-D having distinct chemical fingerprints from one another.
- One wavenumber present in all samples (1727 cm^{-1}), was used to determine changes in intensity over time. Fig 2-5 shows that by Week 4 the intensity is decreasing, then increasing again up to Week 8. This change is significant over time after Anova with p-value < 0.05 for all 4 paints. A second peak (1235 cm^{-1}) had the same results.
- Implications are that forensic chemists need to be aware that these paints are changing over time
- VOCs could be reaching an equilibrium between the air and the paints.
- **Future work:** replicating analysis including different substrate as well as retesting these samples now that 4 months have passed to see if any long term changes.

References

Air Pure Learn. ECOS Paints. (n.d.). <https://ecospaints.net/air-purifying-learn>
Association, A. L. (n.d.). *Volatile organic compounds*. American Lung Association. <https://www.lung.org/clean-air/at-home/indoor-air-pollutants/volatile-organic-compounds#:~:text=Volatile%20organic%20compounds%2C%20or%20VOCs,they%20are%20in%20the%20air.>

Experimental Design

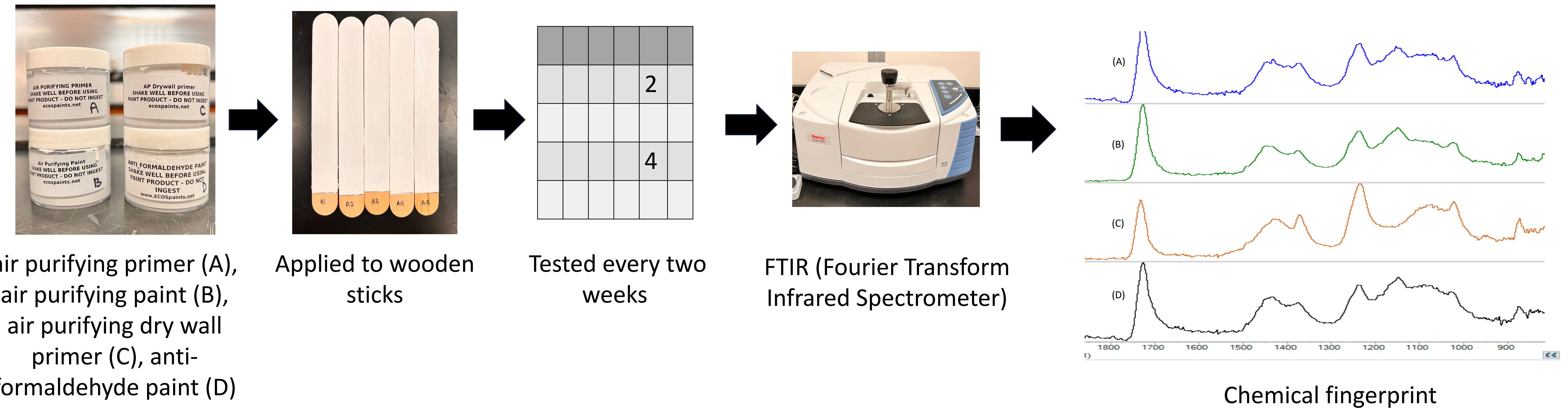


Fig 1. Experimental Design

Results

Fig 2. Paint A comparison overtime, significant difference over time and $P < 0.05$

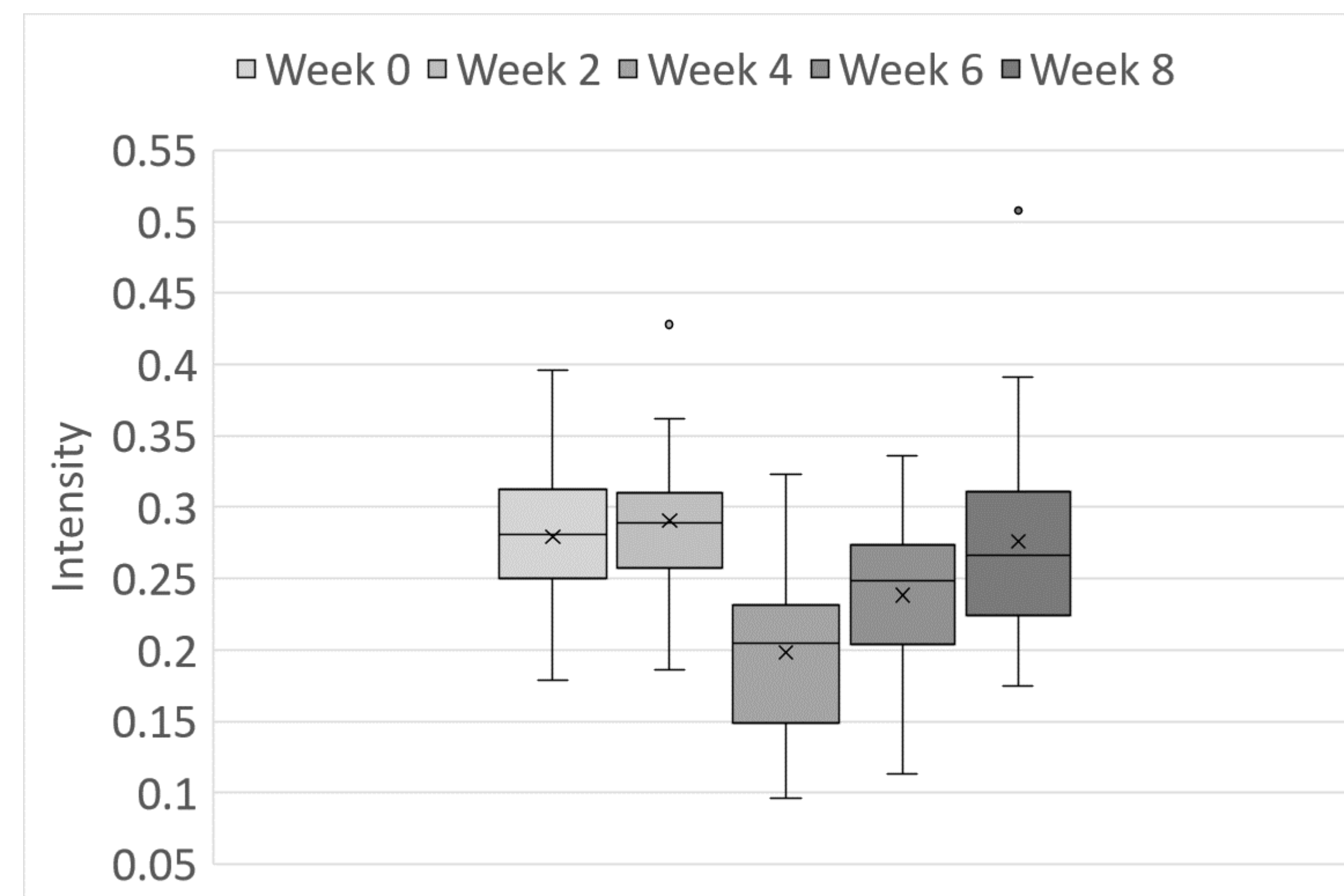


Fig 4. Paint C comparison overtime, significant difference over time and $P < 0.05$

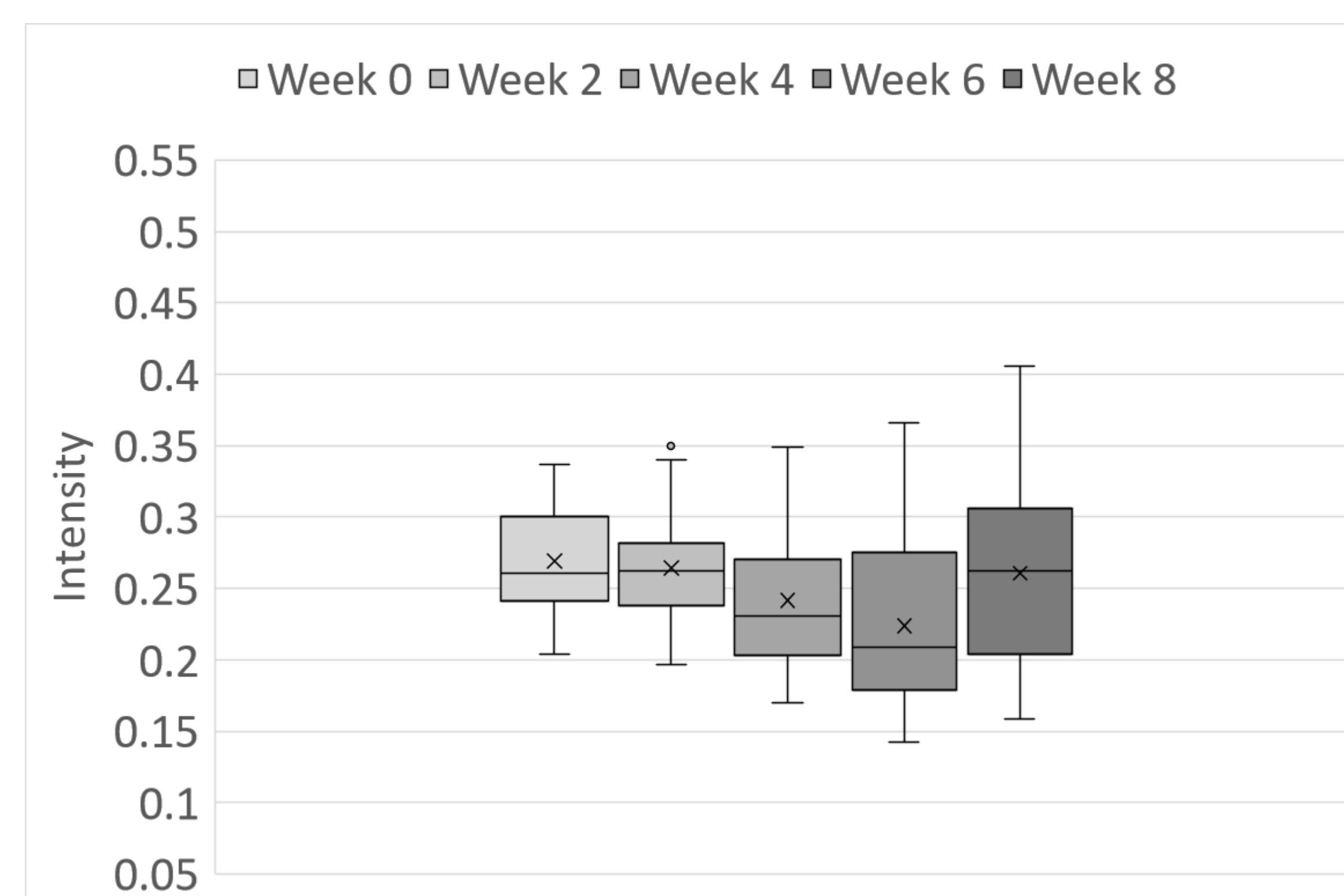


Fig 3. Paint B comparison overtime, significant difference over time and $P < 0.05$

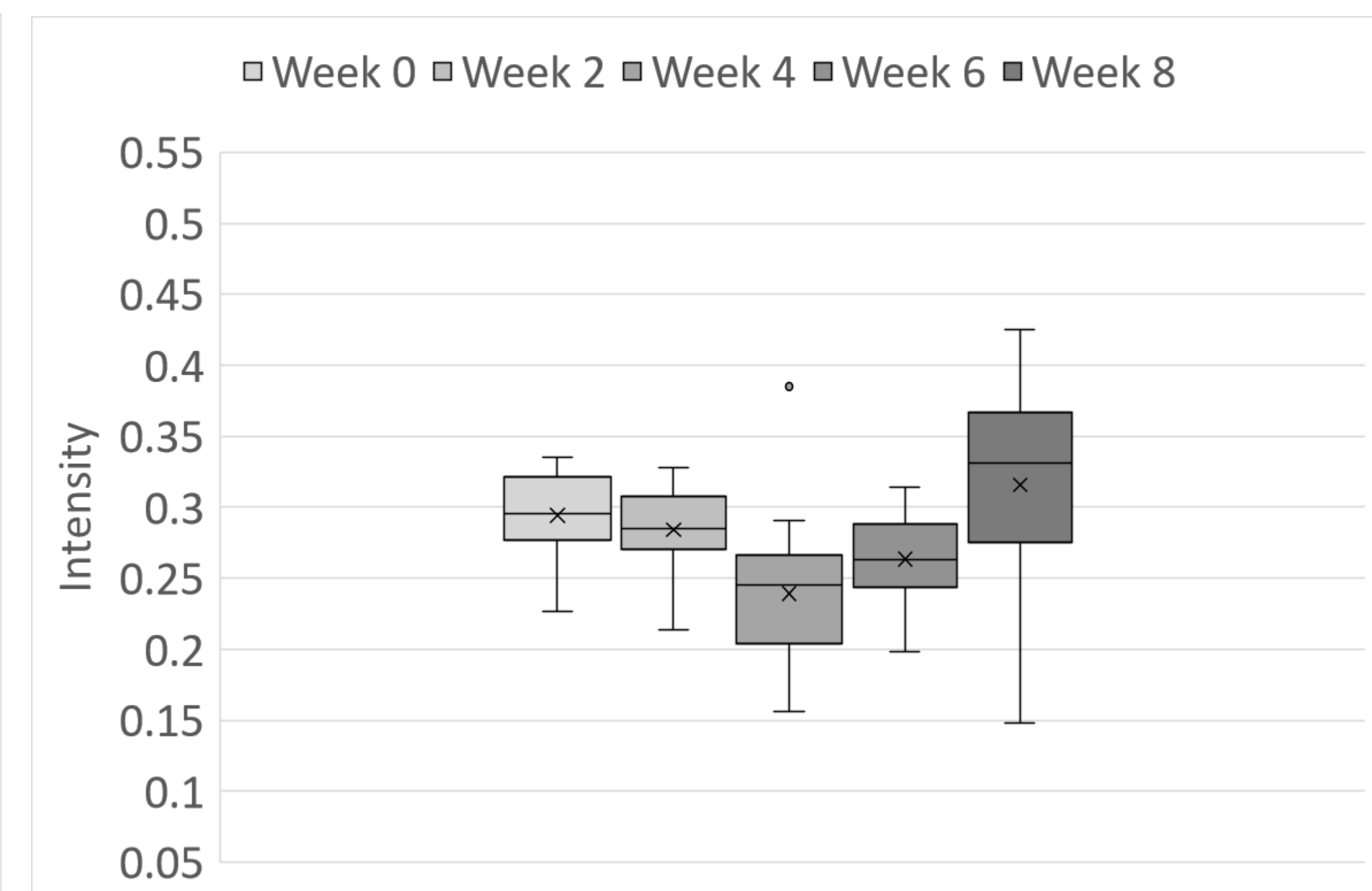


Fig 5. Paint D comparison overtime, significant difference over time and $P < 0.05$

