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Optimisation strategies of different VAT photopolymerization printers

URB2i

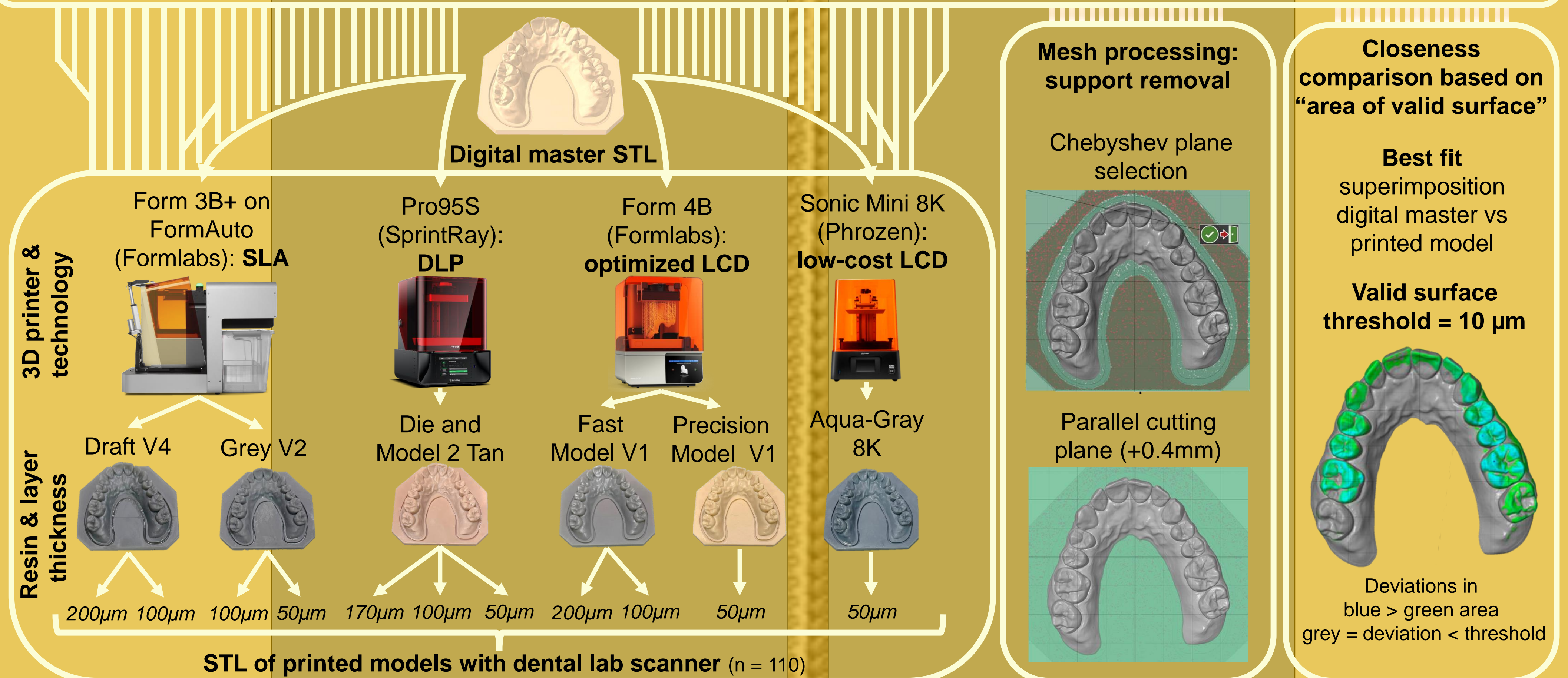


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Objective 1: Create a protocol to compare the **closeness** of 3D printed models, with different VAT printers & post-processed while considering various resin types and layer thicknesses.

Objective 2: Assess the **efficiency** of printing and post-processing 10 models, printed two by two on the platform.

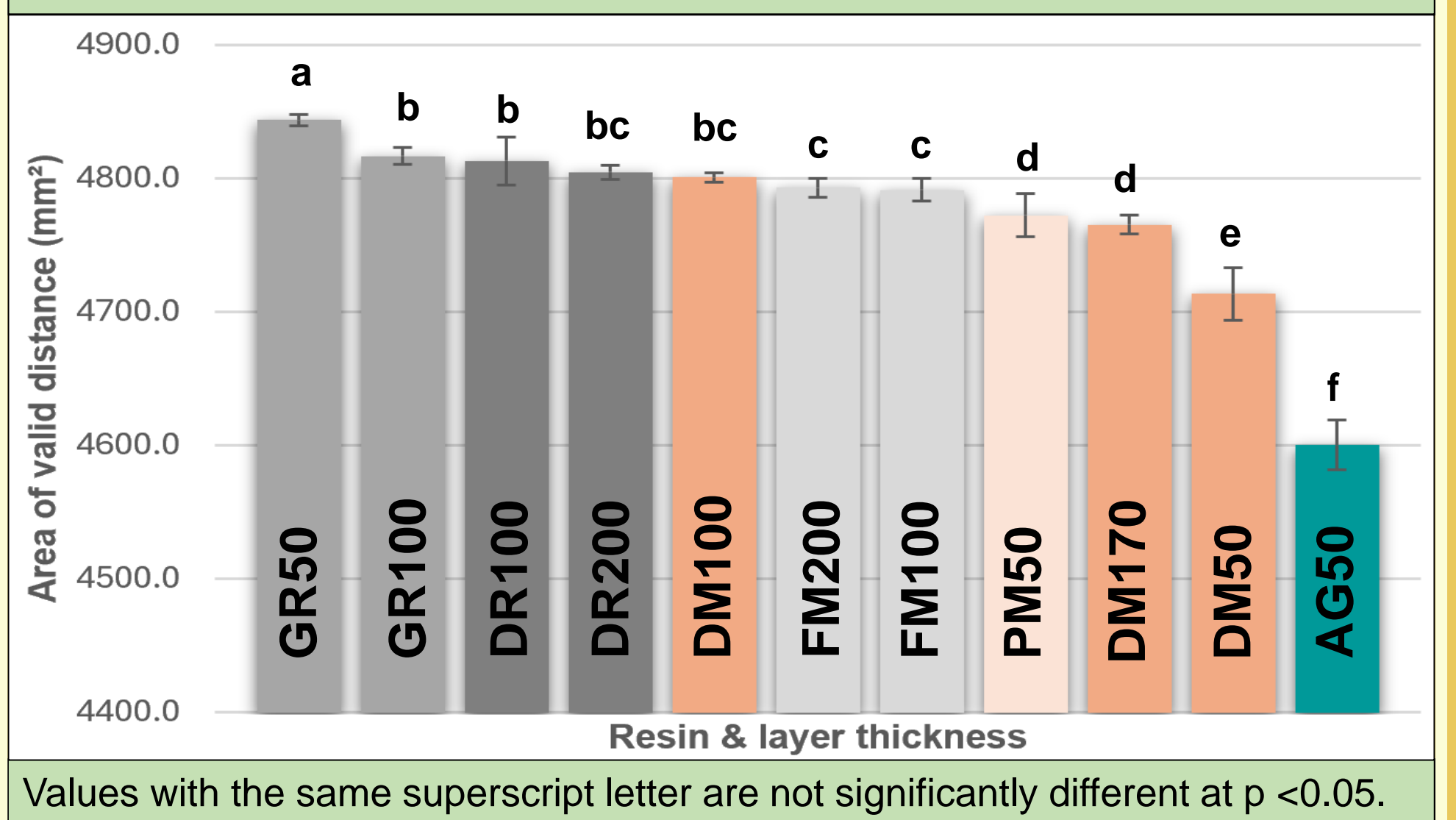


Results

Printing efficiency: total printing and production (printing + post-processing) time of 10 models for each resin & layer thickness

Resin & layer thickness	Total printing time	Total production time
Draft 200µm (DR200)	3h40	4h08
Draft 100µm (DR100)	7h45	8h13
Grey 100 (GR100)	12h35	13h35
Grey 50 (GR50)	22h00	23h00
Fast Model 200µm (FM200)	1h05	2h45
Fast Model 100µm (FM100)	3h05	4h45
Precision Model 50µm (PM50)	9h00	9h50
Die and Model 170µm (DM170)	2h35	3h35
Die and Model 100µm (DM100)	3h10	4h10
Die and Model 50µm (DM50)	5h25	6h25
Aqua-Gray 50µm (AG50)	8h40min	12h30

Closeness: "area of valid distance" between the various resin types and layer thicknesses



Capacity (2 models vs 10 models in a go (DR + GR group)) and **parameters** (wash time & cure time) of post-processing units respective to the manufacturer parameters and the established protocol **influence the total production time** of 10 printed models. e.g. post-processing time is 28 min for all 10 models within DR group versus 3h50 for AG50 group

Discussion

Closeness can be affected by the parameters related to the **hardware** of the VAT printer and the post-processing units:

- **Platform speed + VAT temperature** need to be adapted to the **resin's rheology** for optimising **resin flow** → avoid separation of the layers (e.g. DM50)



- **Pixel smoothing** in the new-gen "optimised LCD" could reduce the closeness with the original STL model
- Inappropriate curing time & temperature may lead to **part warpage** (i.e. distortion)

Conclusion

New-gen "**optimised LCD**" matches **DLP** and surpasses "**low-cost LCD**" in printing closeness depending on the resin type and layer thickness

Automated SLA printer (i.e. FormAuto) and **large** post-processing (wash & cure) units are promising to optimise both closeness and efficiency

SLA VAT printer present a better closeness overall

Reducing layer thickness does not necessarily increase the closeness