Table S1. Summary of Results Regarding the Question of Mechanical Properties in Comparison. [N] = Not applicable, [O2] = Oxygen, [N2] = Nitrogen, [VH] = Vickers hardness, [HM] = Hardness measurement, [EIT] = Indentation modulus, [ηIT] = Elastic modulus, [RIT] = Relaxation index, [TPU] = Thermoplastic polyurethane, [DMEM] = Dulbecco's Modified Eagle Medium.

AUTHOR (YEAR)	STUDY-DESIGN	MATERIALS + MANUFACTURING PROCESSES	INTERVENTION	POST	OUTCOME
Atta (2024)	In vitro	3D Print (TC-85) + Thermoforming (Zendura A, Zendura FLX, CA Pro)	DSC, DMA, Form recovery tests, three-point bending, Vickers hardness (VH)	N/A	DPAs exhibited shape memory properties. They provide improved control over aligner design & thickness, minimizing material waste.
Camenisch (2024)	In vitro	3D Print (TC-85)	Half of the samples were fabricated in a horizontal orientation and the other half in a vertical orientation. The following properties were examined: yield strength (YS), tensile strength (BS), plastic strain (ε), hardness (HM), indentation modulus (EIT), elastic modulus (ηIT), and relaxation index (RIT).	N	The printing orientation has no effect on the mechanical properties of DPAs.
Can (2022)	In vivo	3D Print (TC-85)	Sixteen directly printed aligners (DPAs) were tested, with ten serving as a control group. The remaining six aligners were worn for one week. HM, EIT, ηIT, and RIT were measured.	O2	The mechanical properties of the DPAs were not affected after one week of wear.
Grant (2023)	In vitro	3D Print (TC-85)	Using three multi-axis sensors, the moments and forces generated by the 0.50 mm thick aligners were measured, with the labial and lingual areas modified to 1 mm thickness at selective points. This was done at intraoral temperatures.	N/A	Targeted increases in the thickness DPAs alter the magnitude of the generated forces and moments, which optimizes tooth movement and minimizes side effects.
Hertan (2022)	In vitro	3D Print (TC-85) + Thermoforming (PETG)	Force measurement of both aligner samples. The aligners were temperature-controlled before and during the test.	N	At intraoral temperatures, DPAs exhibited significantly less force than TFAs. DPAs demonstrated a much more consistent force profile.
Jindal (2019)	In vitro	3D Print (Dental LT Resin) + Thermoforming (PETG)	Five observers measured the tooth height for both types of aligners to assess geometric deviations. Both aligner samples were subjected to a compression load of 1000 N to evaluate their load and deformation behavior.	N/A	The DPAs demonstrated greater geometric accuracy and could withstand maximum loads of nearly 662 N. In contrast, the TFAs deformed plastically and irreversibly under high loads, while DPAs exhibited elastic deformation with restoring forces.
Lee (2022)	In vitro	3D Print (TC-85) + Thermoforming (PETG)	Comparison of the PETG samples with the TC-85 sample was conducted using dynamic mechanical analysis at 37°C and 80°C. The shape memory property was assessed using a U-bend test.	N/A	TC-85 can exert a constant light force application, possesses shape memory properties, and exhibits geometric stability at high temperatures.
Martina (2019)	In vitro	Thermoforming (PETG,Smart Track und TPU)	The samples were placed in airtight tubes with DMEM at 37°C for two weeks. The cell viability of human gingival fibroblasts (HGFs) was assessed using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assays.	-	ach material exhibited slight cytotoxicity after 14 days, with Biolon showing the highest cytotoxicity, which was increased by the thermoforming process.

Pratsinis (2022)	In vitro	3D Print (TC-85)	Ten sets of aligners were immersed in sterile deionized water for 14 days, and the cytotoxicity and estrogenicity of the released factors were evaluated on human gingival fibroblasts (HGF) as well as estrogen-sensitive MCF-7 and estrogen-resistant MDA-MB-231 breast cancer cell lines.	N/A	No cytotoxic effects.
Quinzi (2023)	In-vitro	Thermoforming (PETG & TPU)	After 7 days, all aligners were filtered following immersion in artificial saliva and mechanical friction, and then analyzed using RMS and SEM	-	Microplastic particles were released due to the mechanical friction of the aligners.
Sayahpour (2024)	In vivo	3D Print (TC-85) + Thermoforming (PETG und TPU)	Thirty patients wore aligners for seven days. There was a control group with unused aligners. The following properties were assessed: HM, EIT, ηIT, and RIT.	O2 + N	The PETG group exhibited the best mechanical properties. DPAs had a higher RIT and EIT, which could impact clinical efficiency.
Shirey (2023)	In vitro	3D Print (Material X + OD Clear TF) + Thermoforming (EX30 und LD30)	Moist samples were exposed to a phosphate buffer solution at 37°C for 7 days, while dry samples were stored at 25°C. Tensile and relaxation tests were conducted using an RSA3 dynamic mechanical analyzer and an Intron universal testing system to determine the modulus of elasticity, tensile strength, and relaxation properties.	N/A	Moist samples had a greater effect on the mechanical properties of directly printed aligners (DPAs) compared to thermoformed aligners (TFAs).
Simunovic (2023)	In vitro	3D Print (TC-85)	Investigation of post-processing methods. The conversion rate of liquid resin and post-processed materials was analyzed using FTIR, comparing the environments (nitrogen vs. air) and rinsing protocols.	O2 + N	Adverse effects of oxygen on the polymerization process.
Taher (2023)	In vitro	3D Print (Dental LT Harz) + Thermoforming(TPU)	Addition of chitosan nanoparticles (antibacterial) to the clear aligner resin of DPAs, mixed at concentrations of 2%, 3%, and 5%. Fourier-transform infrared spectroscopy was used to determine the conversion degree.	N/A	Significant reduction of bacterial colonies with the addition of 3% and 5% chitosan nanoparticles in DPAs.
Tarek (2023)	In-vitro	Thermoforming (TPU)	Investigation of artificial aging through thermocycling and mechanical loading on force/torque transmission.	-	Decrease in force/torque generation in aligners subjected to thermocycling and mechanical loading. Mechanical loading has a greater impact on aligners than thermocycling alone.
Zinelis (2022)	In vitro	3D Print (TC-85)	Five 3D printers were used to determine HM, EIT, and ηIT.	N/A	The mechanical properties depend on the specific 3D printer used.