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#0208

## USABILITY STUDY ON GLASS IONOMER CEMENTS / GLASS HYBRIDS.

### OBJECTIVES

This study aims to evaluate and rank the usability of market leading Glass Ionomer Cements (GIC) / Glass Hybrids (GH) in their respective capsule systems. The usability factors covered in this study are listed below:

Usability Factor	The desired performance of each usability factor to deliver the best user experience is defined to be as follows:	Usability Factor	The desired performance of each usability factor to deliver the best user experience is defined to be as follows:
<b>Activation Force (AF)</b>	The activation of a GIC / GH capsule broadly describes the process of depressing the capsule plunger to introduce the powder and liquid components before thorough mixing on a triturator. As low as possible without causing premature activation ("Preactivation")	<b>Paste Stickiness (PS)</b>	Does not stick to instruments
<b>Extrusion Force (EF)</b>	The extrusion force of a GIC / GH capsule broadly describes the maximum force required to fully extrude the mixed contents of the capsule. As low as possible without causing premature paste extrusion ("Spurting")	<b>Nozzle Design (ND)</b>	<b>Nozzle Length</b> - Measured vertically from nozzle base to tip. As long as possible for maximum reach
<b>Paste Viscosity (PV)</b>	Depends on user preference and restoration type		



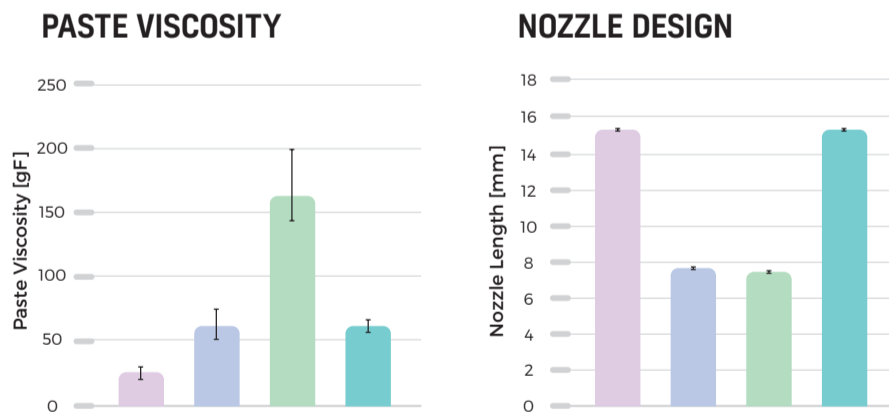
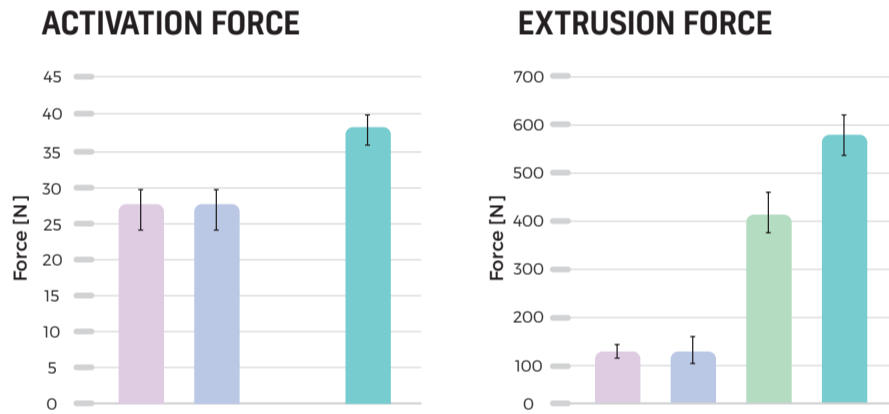
### CONCLUSION

Within this study, the results indicates that HV has the highest overall usability score [14], with SC being a close runner-up [13]. This was achieved through a combination of a user-friendly capsule design and smart product design.

### RESULTS AND DISCUSSION

	Riva SC (SC)	Riva SC HV (HV)	Ketac™ Universal Aplicap™ (KU)	Equia Forte® HT (HT)
<b>Activation Force (N) n=20</b>	27±3 <sup>a</sup>	27±3 <sup>a</sup>	N/A <sup>1</sup>	38±2
<b>Extrusion Force (N) n=20</b>	143±14 <sup>b</sup>	139±32 <sup>b</sup>	413±47	577±47
<b>Paste Viscosity (gF) n=5</b>	24±4	67±12 <sup>c</sup>	170±29	66±4 <sup>c</sup>
<b>Nozzle Length (mm) n=3</b>	15.1±0.1 <sup>d</sup>	7.7±0.1	7.1±0.0	15.2±0.1 <sup>d</sup>
<b>Paste Stickiness</b>				

<sup>1</sup> Ketac™ Universal Aplicap™ is activated using an additional activator and cannot be tested through the indicated test method. Mean with the same letters are not statistically different (p<0.005) Data analysed using unpaired t-test.

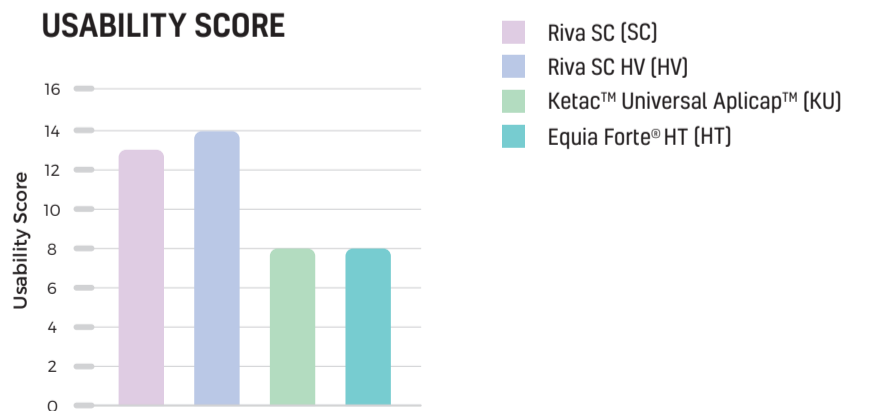


### EVALUATION OF RESULTS

Usability Factor	Desired performance	1	2	3	4	
<b>Activation Force</b>	As low as possible without causing premature activation ("Preactivation")	<b>SCORE</b>	KU	HT	HV/SC	HV/SC
<b>Extrusion Force</b>	As low as possible without causing premature paste extrusion ("Spurting")		HT	KU	SC	HV
<b>Paste Viscosity</b>	Depends on user preference and restoration type		NA			
<b>Paste Stickiness</b>	Does not stick to instruments		HT	SC	HV/KU	HV/KU
<b>Nozzle Design</b>	Nozzle Length	KU	HV	SC/HT	SC/HT	

- Results indicate that:**
- HV and SC performed best on Activation Force.
  - HV performed best on Extrusion Force.
  - HV and KU performed best on Paste Stickiness.
  - SC and HT performed best on Nozzle Design.
- Additional comments:**
- Activation Force**
    - KU was ranked lowest as it requires an additional tool for activation unlike the other evaluated products.
  - Paste Viscosity**
    - Performance for paste viscosity has not been ranked as it is dependent on user preference and restoration requirements.
    - It is therefore ideal to have a range of options available.
  - Paste Stickiness**
    - SC ranked higher than HT as paste strand is noticeably thinner, indicative of a less sticky paste.

Overall comparison	Usability Ranking (Ascending left to right)	HT	KU	SC	HV
	Overall Usability Score (Highest score given if tied)	8	8	13	14



### EXPERIMENTAL METHODS

Riva Self Cure/ SDI Limited (SC), Riva Self Cure HV/ SDI Limited (HV), Ketac™ Universal Aplicap™/ 3M (KU) and Equia Forte® HT/ GC Corp (HT) were evaluated in their respective capsule delivery systems.

Activation Force of a capsule (Plunger) was determined via the maximum value measured by a compression test (INSTRON #5942). Force values were recorded every 1.25 N over a travel distance of 4.5 mm at a travel speed of 150 mm/min.

Extrusion Force of a capsule was determined via the maximum value measured by a compression test (INSTRON #5566). Force values were recorded every 10 N between the travel distance of 10 - 13.5 mm at a travel speed of 45 mm/min.

Paste Viscosity of an extruded cement was determined via the maximum value measured by a compression test (Brookfield CT3 Texture Analyser). Force values were recorded every 0.1 mm over a travel distance of 4.0 mm with a probe (LA39) speed of 2.00 mm/s.

Paste Stickiness of an extruded cement was evaluated via photos taken during a compression test (Brookfield CT3 Texture Analyser). Probe (TA8) was used at a travel speed of 2.00 mm/s.

Nozzle design was evaluated based on the nozzle length measured vertically from the nozzle base to tip.