

*Results of BioRID-II Dummy Jacket Calibration Test*

*JARI/JASIC*

Purpose

To conduct the newly proposed calibration test of the jacket, and to identify the characteristics of the jacket alone. Furthermore to verify the jacket tests methods.

Description

Conduct a calibration test on the jacket alone, using three BioRID-II jackets and verify the reproducibility of the jacket.

Dummies used

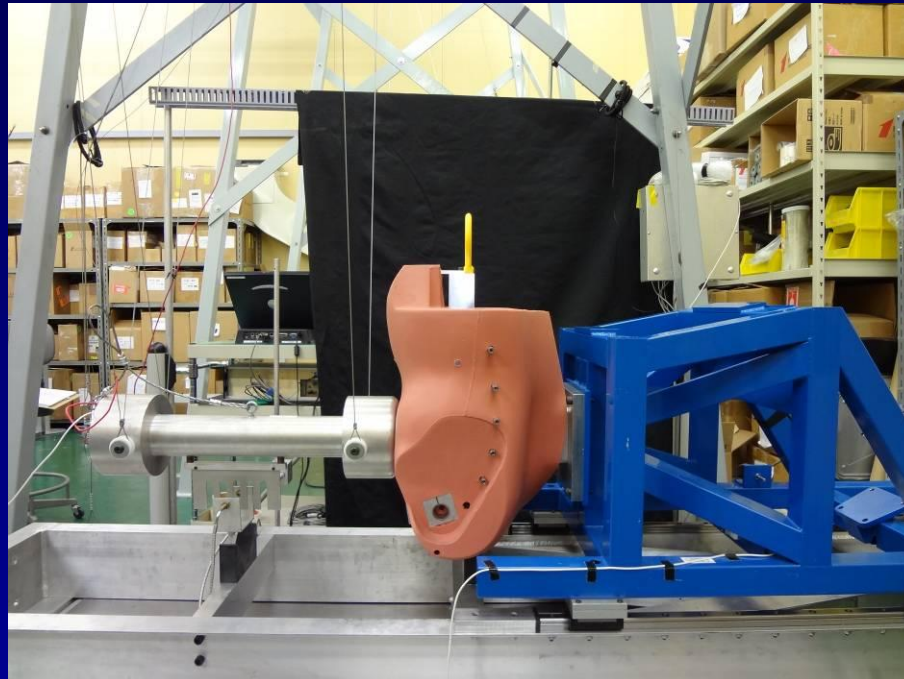
BioRID-II dummy (Ver. G):

095G dummy, 102G dummy, (JARI dummy used in this year's tests)

115G dummy (Humanetics dummy used in this year's tests),

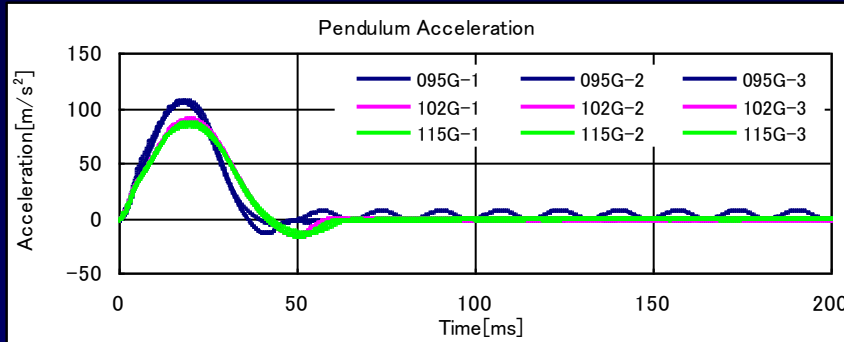
Test Method

Calibration test on the jacket alone (light probe, 13.97 kg)

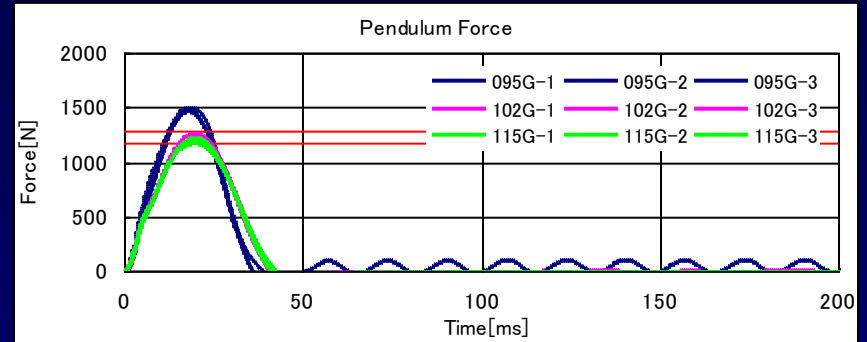


Measurement items: Impactor acceleration, sled acceleration

## (Impactor acceleration)

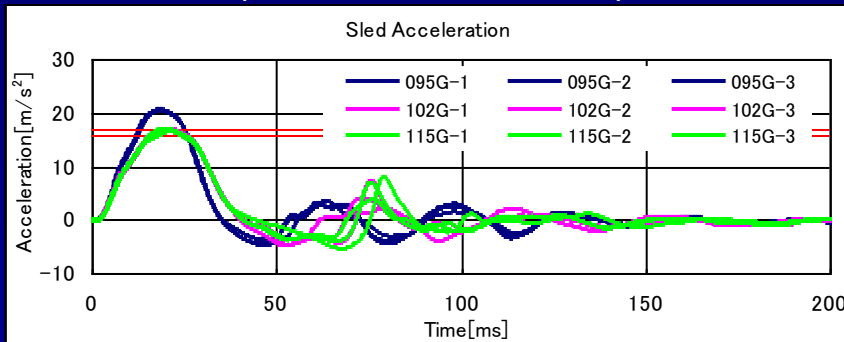


## (Impactor force)

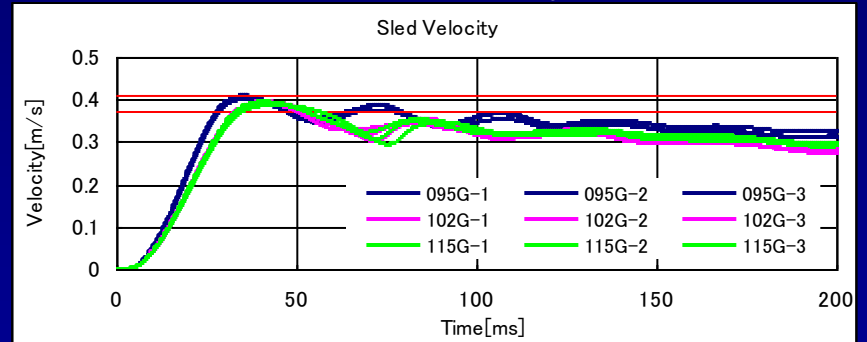


\* It was confirmed that the waveform at acceleration of 095G included electric noise (in one case only).

## (Sled acceleration)

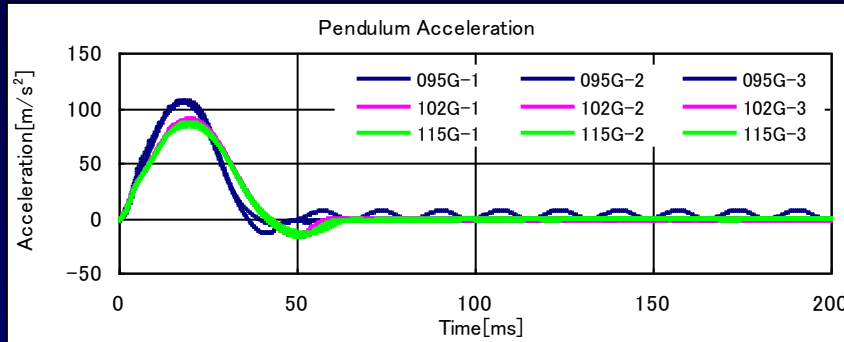


## (Sled velocity)

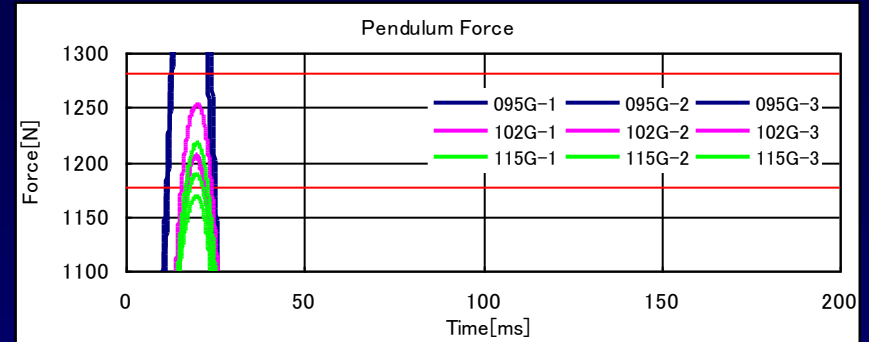


For all the items, only 095G dummy showed different phase shift of waveform. Further, 095G dummy showed a peak value of impactor force about 10 % higher and a peak value of sled velocity about 20 % higher than those of the other dummies.

(Impactor acceleration)

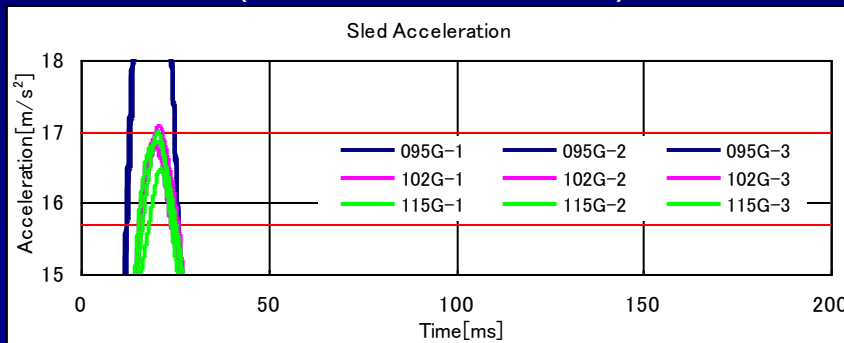


(Impactor force)

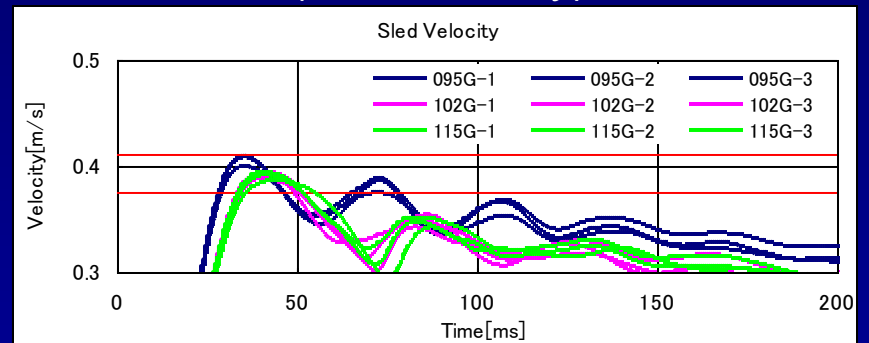


\* It was confirmed that the waveform at acceleration of 095G included electric noise (in one case only).

(Sled acceleration)



(Sled velocity)



For sled velocity, all the tests satisfied the corridor. For impactor force and sled acceleration, however, some tests went out of the corridor.

(Repeatability, reproducibility, and hardness)

Jacket	Impact Acc. (m/s <sup>2</sup> )	Impact Force (N)	SLED Acc. (m/s <sup>2</sup> )	SLED Vel. (m/s)	Hardness	
					Before	After
095G-1	106.2	1483.8	20.2	0.4	6	6
095G-2	106.2	1483.9	20.5	0.4	6	6
095G-3	104.7	1462.9	20.5	0.4	6	6
C.V.(%)	0.8	0.8	0.9	1.3		
Ave.	105.7	1476.9	20.4	0.4		
S.D.	0.9	12.1	0.2	0.0		
102G-1	89.7	1252.6	17.1	0.4	3	3
102G-2	86.2	1204.7	16.8	0.4	3	3
102G-3	86.3	1205.7	16.8	0.4	3	3
C.V.(%)	2.2	2.2	1.0	0.8		
Ave.	87.4	1221.0	16.9	0.4		
S.D.	2.0	27.4	0.2	0.0		
115G-1	83.7	1168.7	16.5	0.4	3	3
115G-2	87.1	1216.8	16.9	0.4	3	3
115G-3	85.1	1188.2	17.0	0.4	3	3
C.V.(%)	2.0	2.0	1.6	1.0		
Ave.	85.3	1191.2	16.8	0.4		
S.D.	1.7	24.2	0.3	0.0		
Reproducibility						
C.V.(%)	6.1	6.1	5.8	1.1		
Ave.	92.8	1296.4	18.0	0.4		
S.D.	9.8	137.3	1.8	0.0		

The dummies showed good repeatability and reproducibility, which were less than 10% for all the items.

In the measurement of the jacket hardness, only 095G indicated a hardness of 6, while 102G and 115G showed a hardness of 3. None of the tests indicated any change of hardness during the test.

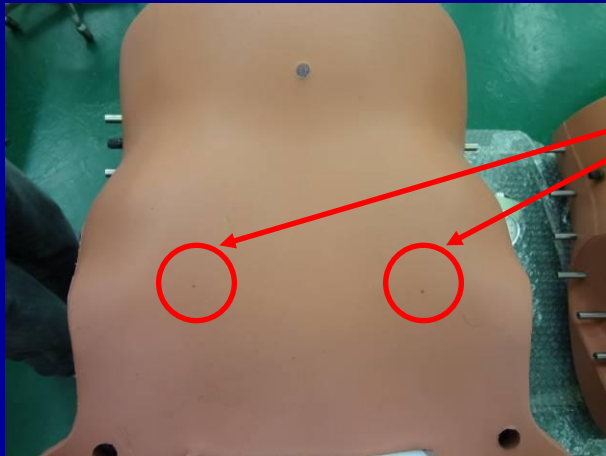
The tests were conducted at an interval of 30 to 60 minutes.

Hardness: The resistant relative displacement to be observed when the surface of the test subject is pricked with a blunt-point needle. Applicable standards include JIS K 6253 and ISO 7619. E.g. The hardness of human skin is around 10.

What caused the phase shift of waveforms of 095G dummy?

The calibration test of dummies with a headrest using the light probe showed phase shifts of waveforms in the force and acceleration of 095G dummy. The present test of the jacket alone also showed phase shifts in the waveforms. The hardness of the jacket was 6 for 095G dummy and 3 for 102G and 115G dummies. This made the starting slope of waveforms of 095G dummy steeper and the peak higher than the other dummies.

The above shows that difference in jacket hardness influences the waveform phases and peaks. Only, in actual tests, effects will be substantially negligible, because the impact energy there is higher than that of the present test. Yet, to unify the impact characteristics of dummies, we need to standardize jacket characteristics. No difference in hardness was observed between the front and back sides of the jacket.



Where hardness was checked  
(Hit with a probe)

Summary

(Test on Jacket Alone)

- For impactor acceleration and pendulum force, only 095G dummy showed different waveform phases. For sled acceleration and sled velocity, too, only 095G dummy showed different waveform phases.
- For sled velocity, all the tests satisfied the corridor. For impactor force and sled acceleration, however, some tests went out of the corridor.
- The dummies showed good repeatability and reproducibility, which were less than 10% C.V.
- In the measurement of the jacket hardness, only 095G indicated a hardness of 6, while 102G and 115G showed a hardness of 3. This shows that the difference in hardness of the jacket changes the waveform phases and peaks in force and acceleration.
- Only, in actual tests, effects will be substantially negligible, because the impact energy there is higher than that of the present test. Yet, to standardize the impact characteristics of dummies, we need to unify jacket characteristics.

In conclusion, it was found that, in tests on jackets alone, too, difference in hardness of the jacket influences the output of the dummy. Standardization of the hardness characteristic of jackets is necessary.



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