

# Centrifugation-free, simple, microfluidic sperm sorting devices are superior to density gradient centrifugation in selecting competent spermatozoa for intra-uterine insemination

Y. Iwamoto, S. Mizuta, A. Takemura, S. Kitahara, K. Doi, Y. Ohara, H. Matsubayashi, T. Ishikawa  
Reproduction Clinic Osaka, Reproductive Medicine, Osaka, Japan



## Background

The processing and selection of healthy sperm are crucial for achieving a successful pregnancy and securing healthy offspring. Although density gradient centrifugation (DGC) is the most widely used method of sperm separation, the most effective technique remains uncertain. Studies suggest that compared to DGC, non-centrifugal devices may decrease the generation of reactive oxygen species and DNA damage during sperm preparation while also improving embryonic development. In recent years, several non-centrifugal devices such as SwimCount™ Harvester and ZyMöt® have been developed for selecting high-quality sperm. However, their effect on intra-uterine insemination (IUI) outcomes remains unknown.

## Objective

To determine the clinical advantages of the Microfluidic sperm sorting devices (MFSS) over DGC as a sperm preparation method for IUI.

## Materials & Methods

A prospective study was conducted throughout 2024 (January to December) consisting of 132 infertile couples.

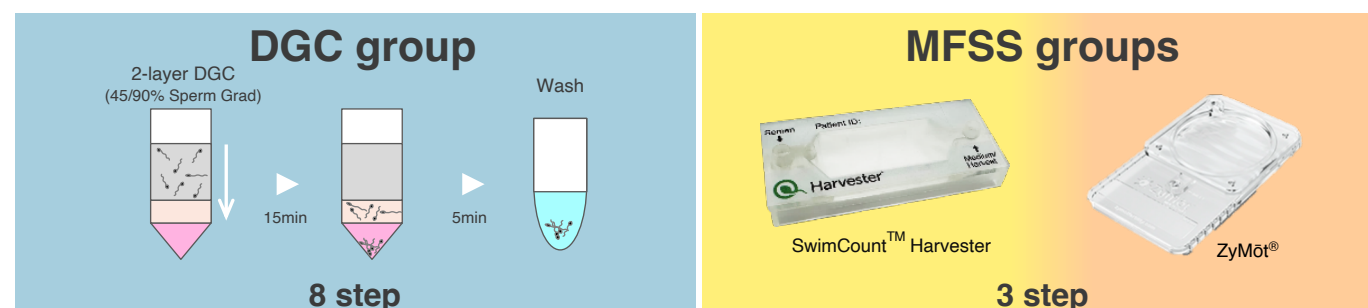
(Evenly distributed into DGC, SwimCount™, and ZyMöt® groups, with 44 cases each)

- Female age: < 35 years
- Semen volume:  $\geq 1.4$  mL
- A motile sperm count:  $\geq 10$  million/3 mL
- First or second IUI
- Never undergone ART

### We evaluated

- Sperm DNA fragmentation rate (SDFR)
- Motile sperm recovery rate
- Total motile sperm count
- Sperm motility
- Clinical pregnancy rate

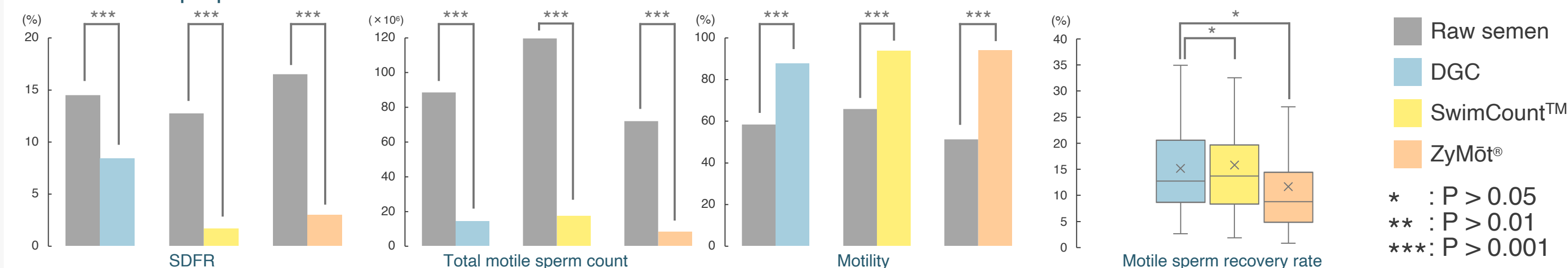
\*These data were confirmed using the Student t-test, the Mann-whitneyU test, the Kruskal-Wallis test, the Steel-Dwass test, or the Fisher's exact test. Confounding factor was adjusted by propensity score matching.



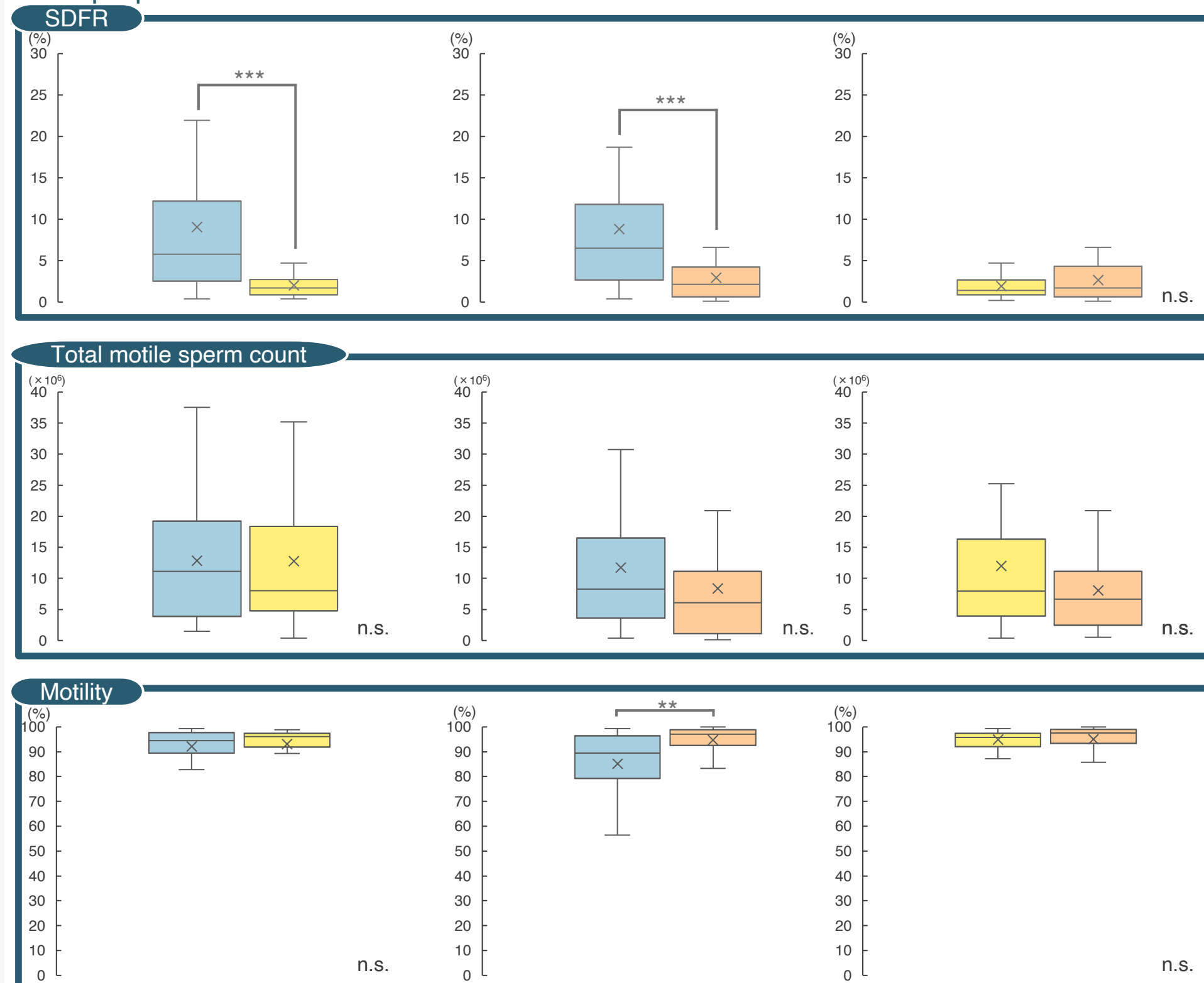
	DGC	SwimCount™	ZyMöt®
Female age	30.3 ± 2.7	31.0 ± 2.4	31.4 ± 2.0
Male age	31.8 ± 4.0	32.7 ± 4.6	32.9 ± 3.8
Semen vol.	3.2 ± 1.3	3.1 ± 1.0	3.1 ± 1.3

## Results

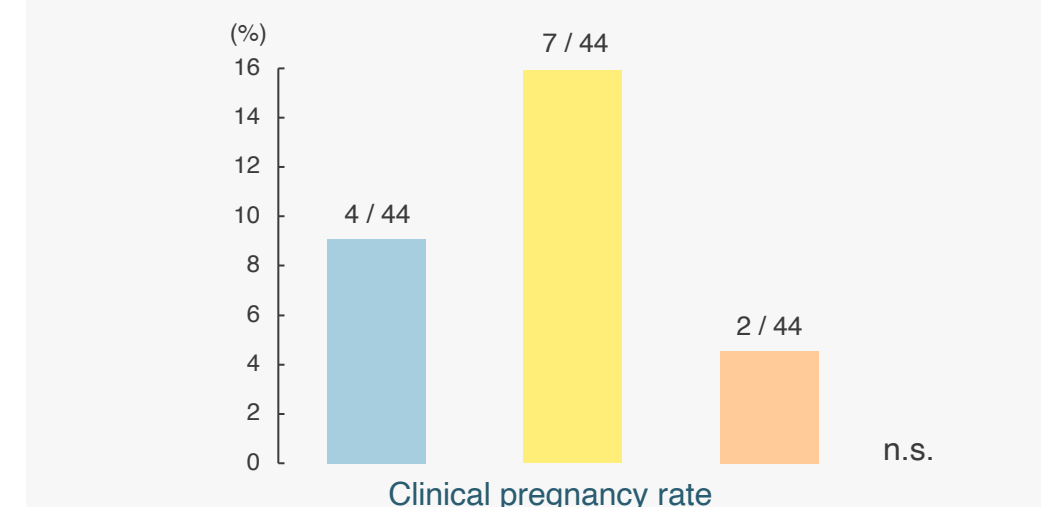
### Before & after preparation



### After preparation



### Clinical outcome



After propensity score matching, the SDFR in the MFSS groups was significantly lower compared to the DGC group ( $p < 0.001$ ). The motile sperm recovery rate was significantly higher in both the DGC and SwimCount™ group relative to the ZyMöt® group ( $p < 0.05$ ). No significant differences were observed in total motile sperm count across all groups. However, sperm motility was notably greater in the ZyMöt® group than in the DGC group ( $p < 0.01$ ). Clinical pregnancy rates did not differ significantly among the groups.

## Conclusion

The MFSS offers clinical outcomes comparable to those of DGC in IUI, while simplifying the procedure and reducing sperm DNA damage. Considering its widespread application in ART, the MFSS may be a practical alternative for sperm preparation in IUI.

