

iDAScore


Science publications and selected abstracts | Vitrolife 2023



Table of content

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Publications

 Click on a section title to jump to that section.

Development of iDAScore	4
Validation studies	5
iDAScore and Chromosomal constitution	6
iDAScore explainability	6

Selected abstracts

Validation studies	8
iDAScore and Chromosomal constitution	10
iDAScore explainability	11



Development of iDAScore

Development and validation of deep learning based embryo selection across multiple days of transfer

Jacob Theilgaard Lassen, Mikkel Fly Kragh, Jens Rimestad, Martin Nygård Johansen, Jørgen Berntsen.

Summary: This publication details the development, training and performance of iDAScore® update (version 2) including cleavage stage transfers.

Sci. Rep. 2023; 13, 4235. <https://www.nature.com/articles/s41598-023-31136-3>

Robust and generalizable embryo selection based on artificial intelligence and time-lapse image sequences

Jørgen Berntsen, Jens Rimestad, Jacob Theilgaard Lassen, Dang Tran, Mikkel Fly Kragh.

Summary: Details the development, training and validation of iDAScore (version 1).

PLoS One. 2022; 17(2): e0262661. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8809568/>

Validation studies

Improved pregnancy prediction performance in an updated deep-learning embryo selection model: a retrospective independent validation study

Satoshi Ueno Ph.D., Jørgen Berntsen M.Sc. b, Tadashi Okimura B.Sc. a, Keiichi Kato M.D. Ph.D.

Summary: Validation and comparison of performance of iDAScore (version 1 and 2) and Gardner grading. iDAScore (version 2) demonstrates better performance and a linear correlation with clinical outcomes.

Reprod. Biomed. Online Available online 28 July 2023. [https://www.rbmojournal.com/article/S1472-6483\(23\)00408-X/fulltext](https://www.rbmojournal.com/article/S1472-6483(23)00408-X/fulltext)

Pregnancy prediction performance of an annotation-free embryo scoring system on the basis of deep learning after single vitrified-warmed blastocyst transfer: a single-center large cohort retrospective study

Satoshi Ueno, Ph.D.Jørgen Berntsen, M.Sc.Motoki Ito, M.Sc.Tadashi Okimura, B.Sc.Akiko Yabuuchi, Ph.D.Keiichi Kato, M.D., Ph.D.

Summary: Validation of iDAScore (version 1) for prediction of Fetal Heart Beat. iDAScore performed as good as or better than traditional morphology grading but did not require annotations.

Fert. Ster. 2021; 116(4) P1172-1180 [https://www.fertstert.org/article/S0015-0282\(21\)00495-7/fulltext](https://www.fertstert.org/article/S0015-0282(21)00495-7/fulltext)

Correlation between an annotation-free embryo scoring system based on deep learning and live birth/neonatal outcomes after single vitrified-warmed blastocyst transfer: a single-centre, large-cohort retrospective study

Satoshi Ueno, Jørgen Berntsen, Motoki Ito, Tadashi Okimura, Keiichi Kato.

Summary: Study looking at age stratified iDAScore groupings and clinical and neonatal outcomes. Validation study of iDAScore (version 1). Includes CPR, LB rate

J Assist Reprod Genet. 2022; 39(9): 2089-2099 <https://link.springer.com/article/10.1007/s10815-022-02562-5>

External validation of a model for prioritizing day-3 embryos for transfer based upon deep learning and time-lapse imaging

J Zhu, L Wu, J Liu, Y Liang, J Zou, X Hao.

Summary: Validation of iDAScore (version 2) for FHB in Day 3 transfers. iDAScore significantly correlated with FHB and within morphological classes, iDAScore could further refine viability ranking within morphology classes.

Reprod. Biomed. Online 2023; 47 (3) (not open access) [https://www.rbmojournal.com/article/S1472-6483\(23\)00339-5/fulltext](https://www.rbmojournal.com/article/S1472-6483(23)00339-5/fulltext)

Interest of iDAScore (intelligent Data Analysis Score) for embryo selection in routine IVF laboratory practice: Results of a preliminary study [Article in French]

S Sarandi, Y Boumerdassi, L O'Neill, V Puy, C Sifer.

Summary: iDAScore (version1) is concordant with embryologist heararchal grading and correlates with clinical outcome. iDAScore provides a reliable heararchal ranking of embryos automatically.

Gynecol Obstet Fertil Senol. 2023 Jul-Aug;51(7-8):372-377. <https://www.sciencedirect.com/science/article/abs/pii/S2468718923001289?via%3Dihub>

iDAScore and Chromosomal constitution

Towards Automation in IVF: Pre-Clinical Validation of a Deep Learning-Based Embryo Grading System during PGT-A Cycles

Danilo Cimadomo, Viviana Chiappetta, Federica Innocenti, Gaia Saturno, Marilena Taggi, Anabella Marconetto, Valentina Casciani, Laura Albricci, Roberta Maggiulli, Giovanni Coticchio, Aisling Ahlström, Jørgen Berntsen, Mark Larman, Andrea Borini, Alberto Vaiarelli, Filippo Maria Ubaldi, Laura Rienzi.

Summary: iDAScore version 1 correlated significantly with day of full blastocyst formation, as well as morphology by Gardner grading as well as their internal clinical grading system. iDAScore also correlated with chromosomal status with an AUC 0.60, as well as live birth of euploid transfers (AUC 0.66). In mixed cohorts, a euploid embryo was ranked as the top score in 63% of cases versus 47% for embryologist top choice.

J Clin Med. 2023 Mar; 12(5) p. 1806. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10002983/>

Does embryo categorization by existing artificial intelligence, morphokinetic or morphological embryo selection models correlate with blastocyst euploidy rates?

Kato K, Ueno S, Berntsen J, Kragh MF, Okimura T, Kuroda T.

Summary: Study showing correlation between KIDScore, iDAScore and euploidy rates. All methods showed significant correlation with euploidy rates.

Reprod. Biomed. Online 2023 Feb;46(2) p274-281. [https://www.rbmojournal.com/article/S1472-6483\(22\)00702-7/fulltext](https://www.rbmojournal.com/article/S1472-6483(22)00702-7/fulltext)

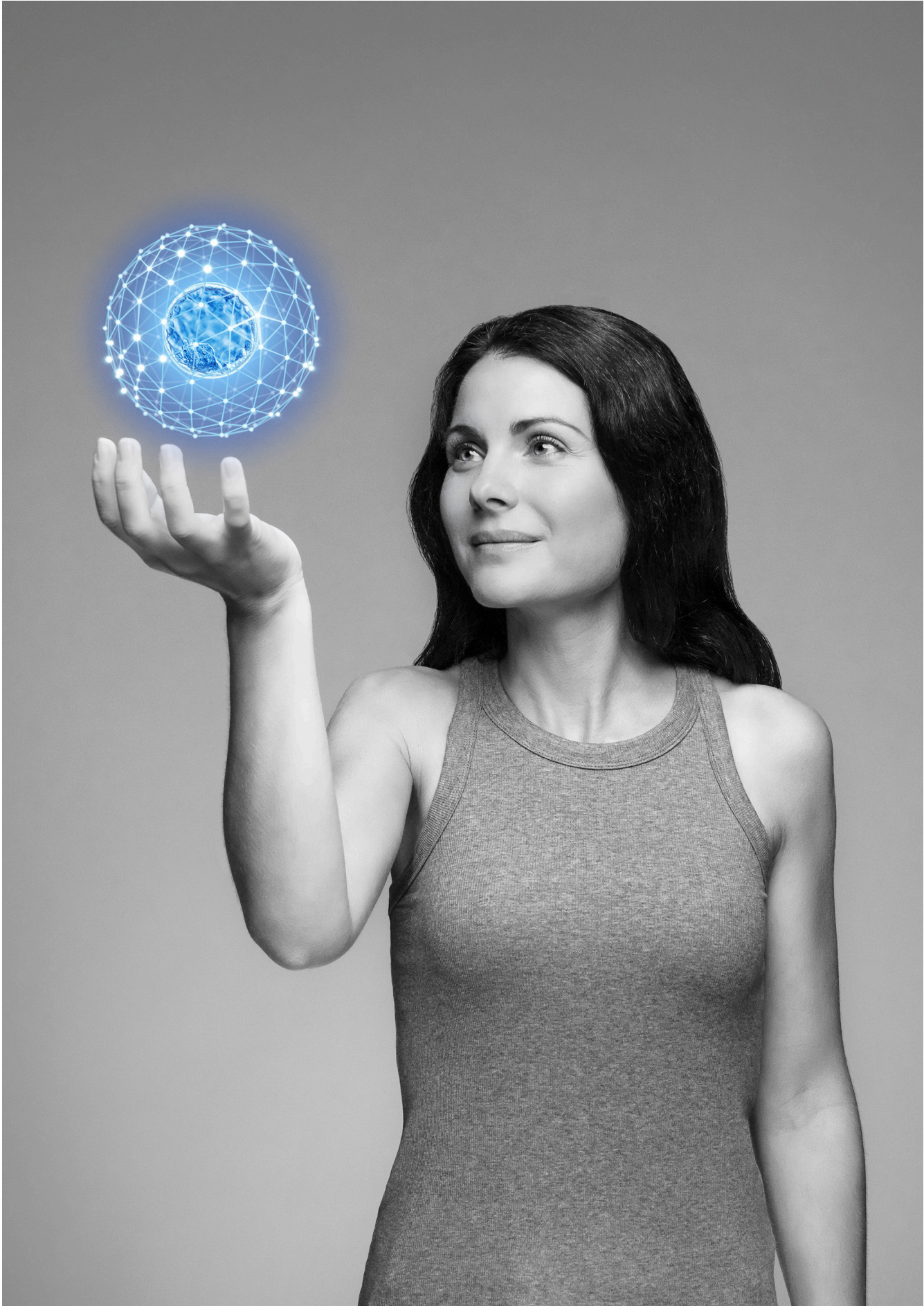
iDAScore explainability

Association between a deep learning-based scoring system with morphokinetics and morphological alterations in human embryos

K Ezoe, K Shimazaki, T Miki, Tsubasa, T Yuko, T Ayumi Amagai.

Summary: iDAScore correlates with routinely used embryo evaluation methods including cell fragmentation, pace of development, morphology.

Reprod. Biomed. Online 2022 45(6) p1124-1132 Published online: August 12, 2022
[https://www.rbmojournal.com/article/S1472-6483\(22\)00635-6/fulltext](https://www.rbmojournal.com/article/S1472-6483(22)00635-6/fulltext) (not open access)



Validation studies

Performance of iDAScore prediction models on clinical, obstetric and neonatal outcomes of single vitrified-thawed blastocyst transfer

Huang et al. Hum. Reprod., Volume 38, Issue Supplement_1 i99.

Summary: Independent external validation of iDAScore (version 1) for pregnancy rate, miscarriage rate and neonatal outcome in blastocyst transfers.

https://academic.oup.com/humrep/article/38/Supplement_1/dead093.194/7202560

Evaluation of an updated artificial intelligence embryo viability model on implantation and miscarriage

Gabrielsen et al. 2023 Hum. Reprod., Volume 38, Issue Supplement_1, i246.

Summary: Validation and comparison of iDAScore (version 1 and version 2). Predictive performance of version 2 is better than version 1 for prediction of implantation and miscarriage but did not reach statistical significance.

https://academic.oup.com/humrep/article/38/Supplement_1/dead093.486/7203375

Evolution of artificial intelligence-based embryo selection models: a massive external validation on 70,456 embryos

Rodriguez et al. 2023 Hum. Reprod., Volume 38, Issue Supplement_1.

Summary: Validation and comparison of KIDScore D5, iDAScore (version 1) and iDAScore (version2). iDAScore version 2 has the best performance in autologous cycles.

<https://doi.org/10.1093/humrep/dead093.558>

External validation of a model for prioritizing day3 embryos for transfer based on deep learning and time-lapse images

J.Zhu et al. 2023 Hum. Reprod., Volume 38, Issue Supplement_1 i241.

Summary: Validation of iDAScore (version 2) for classifying likelihood of fetal heart beat of fresh day 3 transferred embryos. iDAScore performed better than standard morphology.

https://academic.oup.com/humrep/article/38/Supplement_1/dead093.475/7202818

An artificial intelligence method based on time-lapse images and deep learning may predict if a day 2/3 embryo will form a utilizable blastocyst

Ahlstrom et al. 2023 Hum. Reprod., Volume 38, Supplement_1 i252.

Summary: iDAScore (version 2) predicts utilizable blastocyst formation from time-lapse images of early embryo development on day 2 and day 3. Specific score thresholds can be established to ensure high specificity on day 2 (89%) and on day 3 (88%) of prediction of utilizable blastocyst.

https://academic.oup.com/humrep/article/38/Supplement_1/dead093.498/7203470

Validation studies

Ensuring no clinical risk: a cohort analysis on the agreement between the embryo selected by the embryologist and the embryo selected by artificial intelligence

Bori et al. 2023 Hum. Reprod., Volume 38, Issue Supplement_1.

Summary: Safety validation study to determine if iDAScore (version 2) ranking is reliable and concordant with embryologists. When the top score matched, the pregnancy rate was significantly higher. This match occurred 63.5% of the time.

<https://doi.org/10.1093/humrep/dead093.559>

Embryo assessment at the click of a button is now possible: evaluation of a deep-learning algorithm integrated directly with the time-lapse platform

Bori et al. 2022 Hum. Repr., Volume 37, Supplement_1 i289.

Summary: Validation of iDAScore (version 1). Blastocyst grading according to iDAScore is directly associated with conventional morphology and implantation potential, at least in treatments without preimplantation genetic testing for aneuploidy (PGT-A).

https://academic.oup.com/humrep/article/37/Supplement_1/deac107.201/6620012

Shorter duration of compaction during human in-vitro preimplantation embryo development is associated with a higher clinical pregnancy rate

Wouters et al. 2022 Hum. Reprod., Volume 37, Issue Supplement_1.

Summary: Retrospective analysis of SET with known outcome demonstrated that there were significant differences of duration of compaction, KIDScore and iDAScore (version 1) with respect to clinical outcome. Analysis confirmed previous findings that KIDScore and iDAScore are good predictors of clinical pregnancy.

<https://doi.org/10.1093/humrep/deac107.243>

iDAScore and Chromosomal constitution

Does embryo categorisation by existing artificial intelligence, morphokinetic, or morphological embryo selection models correlate with blastocyst euploidy rates?

Kato et al. 2023 Hum. Reprod., Volume 38, Issue Supplement_1.

Summary: Study showed that iDAScore and KIDScore performed better than Gardner grading for predicting euploidy, although not accurate enough to replace genetic testing. Note that KIDScore and iDAScore were not trained to predict chromosomal constitution.

<https://doi.org/10.1093/humrep/dead093.294>

Correlations between the artificial intelligence scoring system (iDAScorev1.0) and live birth outcomes in preimplantation genetic testing for aneuploidy cycles

Lee et al. 2023 Hum. Reprod. Volume 38 Supplement_1, i315.

Summary: Elevated iDAScore (version 1) scores are positively correlated with the probabilities of pregnancy and live birth (LB) in SETs following PGT-A.

https://academic.oup.com/humrep/article/38/Supplement_1/dead093.622/7202815?

A model based on artificial intelligence for the non-invasive prediction of embryo aneuploidy

Polia et al. 2023 Hum. Reprod., Volume 38, Issue Supplement_1.

Summary: This study demonstrated that iDAScore was correlated with euploidy, and that a model including age, TE and iDAScore could predict euploidy with an AUC of 0.747. Note iDAScore was not trained to predict euploidy.

<https://doi.org/10.1093/humrep/dead093.293>

Initial experience of using iDAScore as a tool to predict euploid blastocysts

Tan et al. 2023 Hum. Reprod. Volume 38, Supplement_1, i281.

Summary: Grouping of iDAScore into 4 score ranges and compared euploidy rates of Day 5 and 6 blastocysts. Euploidy rates of Group A,B,C and D were 56.7%(17/30),60.0%(105/175),65.9%(178/270) and 74.8% (288/385) and were statistically significant.

https://academic.oup.com/humrep/article/38/Supplement_1/dead093.554/7203247

iDAScore explainability

Association of a deep learning-based scoring system with morphokinetics and morphological alterations in human embryos

Takahashi et al. 2023 Hum. Reprod., Volume 38, Issue Supplement_1.

Summary: The morphokinetic analysis revealed that during the transformation to blastocyst stage, morphokinetic and morphological events were strongly associated with iDAScore.

https://academic.oup.com/humrep/article/38/Supplement_1/dead093.295/7202916

Comparing the performance of an artificial intelligence model for predicting embryo implantation between clinics with patient cohorts of different maternal age distributions

Johansen et al. 2023 Hum. Reprod., Volume 38, Issue Supplement_1.

Summary: iDAScore version 2 study. Examining how AUC can vary between clinics with different age distributions.

<https://doi.org/10.1093/humrep/dead093.296>

Temporal development of scores from a time-lapse based artificial intelligence provides no additional benefit compared to the latest score

J Lassen et al 2023 Hum. Reprod., Volume 38, Issue Supplement_1.

Summary: Study showing that the latest iDAScore which has taken into consideration the latest full sequence of development is the best available score. i.e. knowing the score on D2 and D3 does not influence the latest score. Therefore it is not necessary to take early scores into consideration

<https://doi.org/10.1093/humrep/dead093.148>

Applying two artificial intelligence-based embryo selection models on 5,624 blastocysts: prediction of implantation potential with machine learning and deep learning systems

Bori et al., 2022 Fert. Ster. volume 118, issue 4, supplement, e263.

Summary: This external validation demonstrated that both KIDScore D5 and iDAScore were correlated to the morphological evaluation performed by embryologist, and implantation outcome.

<https://doi.org/10.1016/j.fertnstert.2022.08.740>

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