



Bioethics

ISSN: 2989-5448 (Online)

Publisher: Tomorrow's Research Publications (TRP)

An International Peer-Reviewed Open Access Journal

Review Article

The Ethics of Predictive Genetic Screening in Preimplantation Embryos

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ABSTRACT

Preimplantation genetic testing has expanded from screening for single, well-characterized mutations to polygenic risk scoring, which estimates an embryo's probabilistic risk of complex disease and, more controversially, its predicted standing on non-disease traits.

This review surveys the ethical case for conventional monogenic testing and examines how that case weakens as screening moves toward polygenic disease-risk prediction and further still toward trait selection, where predictive power is modest and reference data are skewed toward limited ancestries.

It draws on recent professional guidance, including a 2026 ASRM Ethics Committee opinion counseling against clinical use of polygenic embryo screening, alongside qualitative work on how clinicians and patients actually experience the technology.

It also revisits the long-standing expressivist objection to genetic testing and its recent reformulation around relational equality, arguing that this critique applies with particular force to polygenic trait selection.

We conclude that the field needs a graduated ethical and regulatory framework that treats monogenic testing, polygenic disease-risk testing, and non-disease trait selection as distinct categories, rather than governing all three under one undifferentiated policy.

Keywords: preimplantation genetic testing; polygenic risk scoring; reproductive autonomy; disability rights; reproductive ethics

Citation: Fischer C, Whitmore E and de Boer E (2026) The Ethics of Predictive Genetic Screening in Preimplantation Embryos. *Bioethics*. 1(1):01-05.

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Article History: Received 01 January 2026 | Accepted 27 March 2026 | Published 18 June 2026

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INTRODUCTION

For most of its clinical history, preimplantation genetic testing has been a narrow tool aimed at a narrow

problem: couples carrying a known single-gene mutation, or a chromosomal rearrangement, who wanted to avoid transmitting a specific, well-characterized disease to a child. That framing is

no longer adequate to describe what the technology can now do. Advances in genome-wide association studies have made it possible to compute a polygenic risk score for an embryo biopsy -- a probabilistic estimate of lifetime risk for conditions from coronary artery disease to schizophrenia, and, more controversially, for continuous, non-disease traits such as predicted height or educational attainment. Preimplantation genetic testing for polygenic disorders, usually abbreviated PGT-P, has moved from a theoretical possibility to a commercially available service offered directly to fertility patients, well ahead of the scientific and ethical consensus needed to evaluate it responsibly [1].

This gap between availability and readiness is precisely what has occupied the recent bioethics literature. The American Society for Reproductive Medicine's Ethics Committee, revisiting the question in 2026, concluded that PGT-P should not yet be offered in clinical practice, a judgment that followed an earlier practice committee report reaching much the same conclusion on scientific and ethical grounds [2,3]. That a major professional body felt it necessary to say so at all reflects the reality that some clinics were already marketing the service. This review surveys the case for and against predictive genetic screening of embryos, the specific problems introduced when the target is not a single gene but a statistical aggregate of thousands of small genetic effects, and the older, still unresolved disability-rights critique that predates PGT-P but that recent scholarship argues applies to it with new force.

FROM MONOGENIC DIAGNOSIS TO
POLYGENIC PREDICTION

The ethical case for standard preimplantation genetic testing rests on a fairly stable foundation: a couple at known risk of transmitting a serious, highly penetrant genetic disease can use the information to avoid implanting an affected embryo, exercising a form of reproductive autonomy that most bioethicists accept does not reduce to eugenics simply because it involves selecting among embryos. A comprehensive mapping of the ethical, legal, and social implications of PGT catalogued a wide range of recurring concerns even for this established use -- discarded-embryo status, the moral weight of testing for adult-onset or incompletely penetrant conditions, and unequal access -- well before polygenic scores entered the picture [4]. Patients who have actually gone through PGT report a genuinely mixed experience of the technology: relief at avoiding a known disease sits alongside discomfort with the embryo-selection process itself, and few describe the decision in the straightforwardly technical terms that clinical counseling sometimes assumes [5].

Polygenic risk scores break this foundation in several distinct ways. First, unlike a monogenic test, a polygenic score does not tell a couple whether an embryo will develop a condition; it shifts a probability, often by a modest amount, against a baseline

population risk that is itself uncertain and derived overwhelmingly from adult data in populations of European ancestry, limiting its reliability for embryos of other backgrounds. Second, because polygenic architecture underlies not just disease risk but ordinary human variation in traits like height, cognitive test performance, and personality, the same statistical machinery used to flag disease risk can, without much technical modification, be pointed at traits that have nothing to do with health. Recent scholarship treating the two uses -- disease-risk reduction and trait selection -- as continuous with each other, rather than categorically separate, has become one of the sharper reframings in the debate. A 2026 analysis argued for a middle path between outright prohibition and unregulated clinical use, proposing a cautious, tightly bounded rollout limited to well-validated disease associations rather than a blanket ban or a blanket green light [6].

Table 1. Comparison of conventional monogenic PGT, polygenic disease-risk screening (PGT-P), and polygenic non-disease trait selection.

Screening type	Predictive certainty	Generalizability across ancestries	Strength of reproductive-autonomy argument
Monogenic PGT (known mutation)	High for the specific mutation tested	High -- based on direct sequence detection	Strong -- avoids a defined, often serious disease
Polygenic risk scoring for disease (PGT-P)	Modest -- shifts probability against an uncertain baseline	Low -- reference data skew toward European ancestries	Contested -- risk reduction is real but often small
Polygenic scoring for non-disease traits	Very low for any individual embryo	Low, and further confounded by trait heritability estimates	Weak -- shifts from avoiding disease to ranking predicted futures

Figure 1. Schematic, illustrative comparison of clinical readiness and ethical acceptability across three preimplantation screening uses, as currently characterized in the literature (not derived from a single empirical study).

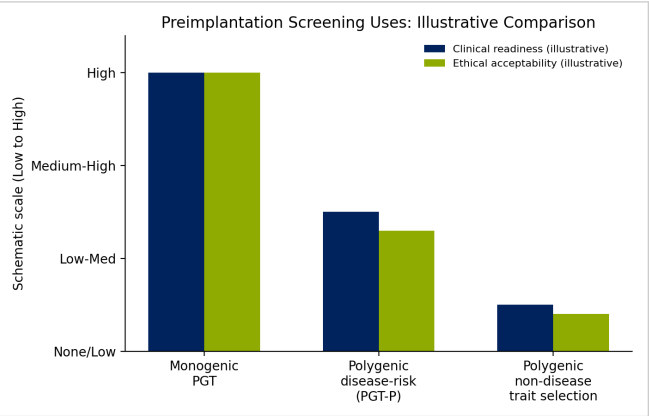


Table 1 summarizes how conventional monogenic PGT, PGT-P for disease risk, and PGT-P for

non-disease traits differ along the dimensions that drive most of the ethical disagreement: predictive certainty, generalizability across ancestries, and the strength of the reproductive-autonomy argument that can be made in support of each. Figure 1 presents the same three uses on an illustrative low-to-high scale of clinical readiness and ethical acceptability as currently assessed in the literature, showing the widening gap between the two as one moves from monogenic diagnosis toward trait selection.

CLINICIANS, PATIENTS, AND THE PROBLEM OF "GOING TOO FAR"

Much of the polygenic embryo screening debate has so far been conducted at the level of principle -- what autonomy permits, what commercial fertility medicine ought to be allowed to sell -- with comparatively little attention to how the people actually delivering and receiving the technology understand it. A qualitative study of healthcare professionals working in reproductive medicine found considerable ambivalence: many providers accepted the underlying logic of screening for well-established, highly penetrant disease risk, but described a distinct discomfort with polygenic scoring specifically, precisely because its predictive power for any single embryo is so much weaker than patients are typically led to believe, and because they could see no principled stopping point once trait-based scoring for non-disease characteristics became technically available [7]. That professional unease is echoed in survey and interview work synthesized in a recent scoping review of the ethical and social implications of polygenic embryo screening, which found that concerns cluster around four recurring themes: overstated predictive claims in direct-to-consumer marketing, the psychological burden placed on prospective parents asked to rank embryos by probabilistic scores, the reintroduction of genetic determinism into clinical counseling, and the absence of any professional consensus on what, if anything, should be disclosed to patients about a score's limited reliability [8].

A parallel legal-commentary literature has focused less on the clinical encounter and more on the near-total absence of regulation specific to polygenic screening. A widely read 2024 analysis argued that existing reproductive-technology law was written for an era of monogenic testing and single, well-defined genetic questions, and simply does not anticipate a service that ranks embryos by an aggregate statistical score across dozens of traits simultaneously, several of them cognitive or behavioral rather than medical [9]. Because PGT-P is currently sold directly to consenting adults through private fertility clinics rather than administered through a national screening program, it has so far evaded most of the regulatory mechanisms -- professional licensing review, insurance-coverage gatekeeping, government health-technology assessment -- that have historically slowed the clinical

adoption of unproven genetic technologies.

THE EXPRESSIVIST OBJECTION, REVISITED

Long before polygenic scoring existed, disability scholars and bioethicists raised what has become known as the expressivist objection to prenatal and preimplantation genetic testing: that systematically testing for and avoiding the birth of children with a given genetic condition sends a message, whether or not any individual parent intends it, that lives with that condition are not worth living, or worth living only conditionally [10]. The objection has always been contested -- critics point out that an individual reproductive choice does not necessarily generalize into a social judgment about people currently living with the condition, and that treating it as though it does risks constraining reproductive autonomy on the basis of an inference the choosing parent may not have drawn at all [11]. But the objection has proven durable precisely because it tracks something empirical: work with people who actually live with the conditions targeted by prenatal and preimplantation testing has repeatedly found that many experience routine genetic screening as an implicit statement about the perceived value of lives like theirs, even when no single test result is aimed at them personally [12].

A recent reformulation of the objection reframes it away from expression and toward relational equality: the concern is not primarily about the message a testing regime sends, but about the material effect of a society organizing its reproductive technology and public health infrastructure around the elimination of certain kinds of people, which erodes the equal standing of those who are born with the traits being screened against, independent of anyone's communicative intent [13]. This reframing has direct purchase on polygenic embryo screening, arguably more than it did on earlier monogenic testing. A polygenic score for a behavioral or cognitive trait is, definitionally, a statement about where a predicted future person would fall on a population distribution that necessarily includes people who already occupy the lower end of that distribution; ranking and discarding embryos by that score is a more explicit act of comparative valuation than testing for a single, discrete disease mutation ever was. Recent work situating this critique within genetic counseling education argues that training programs have been slow to reckon with the field's eugenic history and slower still to build anti-ableist commitments into how counselors are taught to present polygenic results to patients [14].

WHERE SCREENING TECHNOLOGIES CONVERGE

It is worth noting that preimplantation polygenic screening did not develop in isolation; it sits alongside an expanding menu of prenatal and preconception

genomic technologies raising structurally similar questions about predictive certainty and the threshold of severity that should trigger a screening offer at all. Analysis of how the ethical criteria used to justify preimplantation testing might be extended, or should be resisted, in the context of expanding non-invasive prenatal screening has argued that both technologies suffer from the same underlying problem: severity is doing enormous ethical work in professional guidelines, yet it remains defined inconsistently and applied unevenly across conditions and jurisdictions [15]. Broader reviews of prenatal genomic testing generally have reached similar conclusions about the difficulty of translating rapidly advancing genomic capability into stable, defensible clinical policy [16].

CONCLUSION

Predictive genetic screening of embryos has outpaced the ethical and regulatory frameworks meant to govern it, and polygenic scoring has done so more dramatically than any single development in the field's history. The case for permitting well-validated, disease-specific monogenic PGT remains comparatively strong, resting on decades of clinical experience and a reproductive-autonomy argument that most bioethicists find persuasive within reasonable limits. That case weakens considerably as testing moves toward polygenic disease risk, where predictive power is genuinely modest and unevenly distributed across ancestries, and weakens further still when the target shifts from disease to non-medical traits, where the expressivist and relational-equality critiques bite hardest. Professional bodies have so far responded with caution rather than prohibition, which seems defensible as an interim position, but caution is not the same as a settled ethical framework. What the literature surveyed here suggests is needed is not a single verdict on preimplantation screening as such, but a graduated framework that treats monogenic disease testing, polygenic disease-risk testing, and non-disease trait selection as ethically distinct categories requiring different levels of scrutiny, disclosure, and regulatory oversight, rather than one undifferentiated technology governed by one undifferentiated policy.

DECLARATIONS

Acknowledgements

The authors thank colleagues at their respective institutions for helpful conversations that sharpened the scope and structure of this review.

Funding

This review received no external funding.

Conflict of Interest

The authors declare no conflicts of interest relevant to this work.

Author Contributions

Claire Fischer conceived the review and drafted the initial manuscript. Elena Whitmore performed the literature synthesis on polygenic risk scoring and clinical practice, and critically revised the manuscript. Erik de Boer contributed the sections on the expressivist objection and disability-rights scholarship, and provided final approval of the submitted version. All authors read and approved the final manuscript.

Ethics Statement

As a literature review synthesizing previously published, publicly available research and policy analysis, this article did not involve new data collection from human participants and did not require institutional ethics committee approval.

Data Availability

No new data were generated or analyzed for this review. All sources discussed are cited in the reference list and are publicly available through their respective publishers.

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