Demographic and Psychosocial Factors Predicting College Students' Attitudes About and Interest In Genetic Risk Testing

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BACKGROUND

Genetic risk or susceptibility testing has become more common in medical genetics and genetic counseling, and through direct-to-consumer (DTC) companies. These tests aim to assess a healthy individual's risk to develop various conditions. Some studies assess the public's attitudes toward and uptake of genetic risk tests (e.g., McBride et al. 2009; McGuire et al. 2009), but their results do not directly inform genetics service providers' practice. Because so little is known about consumers' interest in and attitudes about genetic risk testing, additional investigations are needed.

STUDY AIMS

1. Investigate what factors are associated with consumer interest in genetic risk testing.
2. Gather information about how people would prefer genetic risk testing services to be delivered.
3. Explore the types of psychological and behavioral reactions people anticipate having following a high risk test result.

METHODS

Sample: Undergraduate (*n*=1,130) and graduate (*n*=165) bioscience majors at a major Midwestern university invited through a college listserv to participate in an anonymous online survey. A total of 247 students responded (~response rate=19%).

Survey: Created by investigators . Open- and closed-ended items explored interest in and attitudes about genetic risk testing. One closed-ended item assessed the outcome variable, whether participants would be interested in genetic risk testing for any condition (*Yes/No/Not Sure).* Two validated scales were used: *Multidimensional Health Locus of Control* (MHLC),and *Health Value scale*. The MHLC (18 items) assesses an individual's perceived control on three dimensions : internal control (e.g., " I am in control of my health"), powerful others (e.g., "Health professionals control my health"), and chance (e.g., "My good health is largely a matter of good fortune"). The Health Value scale asks respondents to rank 10 values, including health (1= *Most Important Value).*

Data Analysis: This mixed-methods study included both quantitative and qualitative data analysis methods. Logistic regression analysis identified significant predictors of *interest in genetic risk testing*. Predictor variables tested included: 4 demographic and 8 personal and family health characteristics, scores on the MHLC and relative health value (calculated from the Health Value scale), familiarity with genetic concepts and professionals (6 items), preferences for testing services (5 items), reaction to testing (2 items), and whether participants had any ethical concerns (1 item).

RESULTS

Participant Health Characteristics and Interest in Genetic Risk Testing (*n*=174)

Variable	*n*	%	*M*	*SD*	*Mdn*	Range
Personal Health History:						
Clinical Depression	38	21.8				
Mental Illness	21	12.1				
Nicotine Dependence	13	7.5				
Cardiovascular Disease	7	4.0				
Alcoholism	1	0.6				
Cancer	1	0.6				
Type I Diabetes	0	0.0				
Type II Diabetes	0	0.0				
Health Locus of Control:						
Internal			25.2	4.32	25.0	9-34
Chance			16.4	4.64	17..0	6-36
Powerful Others			14.7	4.32	14.0	6-26
Health Value Ranking			3.7	2.25	3.0	1-10
Relative Health Value			-2.25	3.45	2	-8-+6

Variable	*n*	%	*M*	*SD*	*Mdn*	Range
Predicted Health Risk:[a]						
Cancer			3.5	1.34	4	1-6
Cardiovascular Disease			3.3	1.36	3	1-6
Severe or Clinical Depression			3.2	1.53	3	1-6
Obesity			2.7	1.31	3	1-6
Type II Diabetes			2.7	1.34	2	1-6
Alcoholism			2.5	1.37	2	1-6
Mental Illness			2.5	1.43	2	1-6
Nicotine Dependence			1.9	1.21	2	1-6
Type II Diabetes			1.7	0.88	1	1-6
Interest in Testing:						
Yes	129	74.1				
No	45	25.9				

Note: [a]Participants were asked to indicate their perceived risk (Scale: 1=*No Risk*, 6=*Extremely High Risk*) of developing nine conditions based on their family history and personal health behaviors.

Regression

Participants who answered "yes" or "no" to the outcome variable and had ≤25% missing data (*n*=174) were included in regression analysis. A multiple imputation procedure was used to handle missing data, allowing for inclusion of more participants in the logistic regression.

Exploratory model fitting using logistic regression was performed with interest in genetic risk testing as the outcome variable to determine significant predictors. The final model had the lowest Akaike's Information Criterion (AIC) of all tested models (*AIC*=184.83; Nagelkerke's R^2=0.20, p<0.001), signifying it is the best fitting model for describing the predictors of interest in genetic risk testing.

Five significant predictors: rating self as high-risk for obesity (*OR*=1.60) or cardiovascular disease (*OR*=1.35), have an intention to act on one's increased risk (*OR*=2.08), and rank doctors (*OR*=0.58) and websites (*OR*=0.64) higher in regards to comfort with their services for ordering and interpreting genetic risk testing.

Variable	R^2	*p*	AIC	*B*	*SE*	*P*	*OR [95%CI]*
Final Model	.20	<.001	184.83				
Intercept				1.50	1.32	.25	
Self Rated Risk: Obesity				0.47	0.17	.007	1.60 [1.14, 2.25]
Self Rated Risk: Cardiovascular Disease				0.37	0.15	.05	1.35 [1.01, 1.82]
Would Act on Increased Risk				0.73	0.40	.07	2.08 [0.95, 4.55]
Importance Rank: Doctors				-0.54	0.26	.04	0.58 [0.34, 0.97]
Importance Rank: Websites				-0.45	0.23	.04	0.64 [0.41, 0.99]

Note: R reported is Nagelkerke's R^2; Model *p* calculated as χ^2 test of difference between residual variance and null deviance.

Psychosocial and Behavioral Reactions

The most prevalent feelings anticipated after the receipt of a concerning high-risk test result were anxiety and worry (*n*=136/246), fear (*n*=77), and indifference (*n*=50).

Over half (57.7%; *n*=142/246) reportedly planned to take action to reduce their concern about their increased risk. Most commonly described actions included:

- **Prevention/Risk Reduction Strategies & Maintain a Healthy Lifestyle** (*n*=110): "Do everything in my power to prevent it."
- **Seek More Information** (*n*=32): *"Reducing concern would be obtained through educating myself on the topic."*

Genetic Risk Testing Service Provision

Level of comfort with different individuals and services for assistance with ordering and interpreting a genetic test was highest for genetic counselors, then doctors, and lowest for genetic testing websites. Major domains for explanations of comfort rankings include:

- **Expertness** (*n*=85): *"I know that, overall, physicians, genetic counselors, and nurses are more educated than I in the field of inherited diseases and their prevention."*
- **Trustworthiness** (*n*=29): *"A genetic testing website would make me suspicious of their advice since they have an agenda."*
- **Quality of Care** (*n*=20): *"Nurses have a more approachable nature than doctors."*

Regression Sample Demographics (*n=174)*

Variable	*n*	%	*M*	*SD*	*Mdn*	Range
Gender:						
Female	124	71.3				
Male	49	28.2				
Other	1	0.6				
Age (in years)			23.3	4.43	21.0	18-46
Ethnicity:						
Caucasian/White	150	86.2				
Asian/Pacific Islander	11	6.3				
Multiracial	7	4.0				
Chicano/Latino	2	1.1				
African American/African/Black	1	0.6				
American Native	0	0.0				
Other	2	1.1				
Year in School:						
Freshman	2	1.1				
Sophomore	36	20.7				
Junior	42	24.1				
Senior	74	42.5				
Graduate Student	16	9.2				
Other	4	2.3				
Health Rating						
Excellent (5)	41	23.6				
Good (4)	104	59.8				
Fair (3)	25	14.5				
Poor (2)	3	1.7				
Very Poor (1)	0	0.0				

DISCUSSION

The present study found that a large proportion of individuals are interested in genetic risk testing (~63% of the total sample), and feel most comfortable consult with genetic counselors or doctors during the testing process. The types of factors that appear related to greater interest in genetic risk testing include: perceived high-risk of obesity and heart disease, intention to act on high-risk test results, and comfort with doctors and websites as service providers in the genetic testing process.

Study Limitations:

- Homogeneous sample of undergraduate students.
- Hypothetical responses.
- Reversed rating scale in two questions as compared to the remainder of the survey.

Practice and Research Implications:

- Health care providers should be prepared to deal with genetic risk testing.
- Qualitative studies (e.g., in-depth interviews) would help to clarify why factors identified in this study are significant predictors.
- Future studies should investigate what people actually do or plan to do with genetic test results.

REFERENCES

McBride, C. M., Hensley, S., Reid, R. J., Larson, E. B., Baxevanis, A. D., & Brody, L. C. (2009). Characteristics of users of online personalized genomic risk assessments: Implications for physician-patient interactions. *Genetics in Medicine, 11(8),* 582-587.

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