A New Scale Measuring Psychologic Impact of Genetic Susceptibility Testing for Alzheimer Disease

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Abstract: This paper describes the development and psychometric properties of a new scale for assessing the psychologic impact of genetic susceptibility testing for Alzheimer disease (AD). The new instrument, The REVEAL Impact of Genetic Testing for Alzheimer's disease (IGT-AD) was designed to examine the unique nature of genetic information and the disease course of AD. The scale was tested as a part of a multicenter clinical trial designed to evaluate the impact of AD risk assessment and data were collected from 276 participants in the study. Using an iterative process of principal component analysis and Cronbach α, the final 16-item IGT-AD was found to have a 2-factor structure with excellent internal reliability. Construct validity was established by patterns of correlation with other standardized self-reported measures. This scale should be useful in the identification of patients who maybe susceptible to the negative effects of receiving genetic information, monitoring of patients who have received genetic information, and as a tool for researchers who wish to study the effects of genetic susceptibility testing for AD.

Key Words: Alzheimer disease genetics, genetic testing, Alzheimer disease risk assessment

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Alzheimer disease (AD) is the most common cause of all the dementing disorders.[1] With the oldest population groups rapidly growing in the United States, the number of AD patients is expected to triple in the United States between 2000 and 2050, from 4.5 million to 13.2 million people with AD.[2] The increase in the number of AD patients is a matter of great concern not only from an individual's perspective, but also from an economic and pubic health point of view.[3]

Mutations in 3 genes, amyloid precursor protein, presenilin 1, and presenilin 2, have been linked to rare early-onset forms of AD, with symptoms that usually begin in the fourth or fifth decades. Polymorphisms in a number of other genes, in particular apolipoprotein E (APOE) and neuronal sortilin-related receptor (SORL1), are associated with the more common late-onset form of AD.[4,5] APOE and SORL1 are susceptibility genes that are neither necessary nor sufficient to cause AD. This limitation, coupled with a general lack of treatment options for AD, has prompted several consensus statements to caution against the introduction of clinical susceptibility testing of genes in asymptomatic individuals.[6–9] At the same time, the lack of scientific data also prompted these statements to encourage research on the benefits and limitations of disclosing genetic susceptibility information. With the growing number of individuals with AD and the even greater number of older Americans at risk for AD, it is likely that genetic susceptibility testing will become an important clinical, ethical, and research issue in the near future.

The REVEAL study (Risk Evaluation and Education for Alzheimer's Disease) is a series of randomized clinical trials designed to evaluate the impact of risk assessment, including APOE genotype disclosure, for AD. The study protocol was developed by a multidisciplinary team of experts in the fields of AD, neurology, genetics, genetic counseling, psychology, and bioethics, many of whom had previously been involved in the consensus statements against *APOE* genetic susceptibility testing. A primary aim of the REVEAL study was to determine whether AD genetic risk assessment can be provided safely and effectively to adult children and siblings of AD patients. Thus far, study results based on established outcome measures such as the Center for Epidemiologic Studies-Depression Scale (CES-D), Beck Anxiety Inventory (BAI), and Impact of Event Scale (IES) have revealed that, in general, AD genetic risk assessment can be disclosed safely.[10–12]

In a separate but related study that collected qualitative data from select REVEAL participants approximately 18 months after their risk assessment disclosure, there was some anecdotal evidence to suggest that some participants did experience a certain amount of emotional distress.[13] A few participants described their genetic results as "depressing," "frightening," and "disappointing." This pattern of results has previously been shown in cancer research, and underscores the possibility that certain psychologic responses to genetic testing may not be fully captured by commonly used scales.[14] Because the CES-D and BAI are general measures of depression and anxiety, and because the IES was created as a measure of subject distress for any event, these instruments may not be appropriate for detecting psychologic distress in a genetic testing situation.[15–17] And even though the IES has more recently been applied to assessing the psychologic impact of

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predictive genetic testing (eg, Huntington disease, and hereditary breast and ovarian cancer), AD may be sufficiently different from other health conditions to warrant a disease-specific approach to measuring the psychologic impact of genetic testing.[18,19]

A couple of scales have been developed to assess the impact of genetic testing. One is, the Multidimensional Impact of Cancer Risk Assessment (MICRA) questionnaire.[14] It was published in 2002 as a questionnaire used to assess the impact of cancer genetic testing with BRCA 1/2 testing as a model. It is a scale that takes into account special features of genetic testing such as the impact of the results on family members and relatives. Another available instrument is the PAGIS, or the Psychological Adaptation to Genetic Information Scale, published in 2005.[20] The PAGIS is based on the conceptual framework of Skirton's grounded theory of the client's perspective of genetic counseling and on the Roy Adaptation Model.[20] The goal of the scale was to isolate the impact of genetic testing regardless of the likelihood of the gene causing the disease. The PAGIS was not developed with a specific disease in mind and it seems that to date, there are no published reports using the PAGIS.

Still, the scales described above are not disease specific to AD. Thus, the purpose of the present study was to develop a brief, self-report measure of the psychologic impact of genetic susceptibility tests for AD to be used in both clinical (eg, genetic counseling) settings and also in research on genetic risk disclosure.

MATERIALS AND METHODS

Overview of REVEAL II

Because this paper will focus on the development of a new scale using data from the second REVEAL trial (REVEAL II), a brief description of the REVEAL II protocol will be given here. Additional descriptions of the clinical trial rationale, design, and results have been published elsewhere.[21]

The primary aim of REVEAL II was to determine whether genetic risk assessment with APOE disclosure could be safely carried out using a condensed, clinically feasible protocol. Study participants were either randomized into the control arm, which featured a comprehensive extended protocol with multiple preparatory visits with genetic counselors, or the intervention arm, which used a shorter condensed protocol using an education brochure and supplementary brief genetic counseling sessions. Participants in both arms of the study were given risk assessments based on their APOE genotype, age, sex, race, and family history. The impact of learning this information was tracked for 1 year with follow-up visits at 6 weeks, 6 months, and 12 months after the disclosure.

Development of the protocol was overseen and approved by a study External Advisory Board, and also institutional review boards at each study site.

Participants

All participants were adult children of a person with clinically diagnosed and/or autopsy-confirmed AD. Of the 437 participants who enrolled in the study, most were self-referred. For example, 239 or 55% of the participants volunteered because they heard about the study from a friend, an advertisement brochure, a presentation given by a member of the REVEAL study, or another research study at any one of the 4 study sites. An additional 161 or 37% of the participants heard about the study through the Internet, community newsletters, health fairs, other neurologists, or the Alzheimer's Association.

Potential participants were initially screened for clinically significant levels of depression and anxiety at baseline; participants scoring above clinical thresholds on the measures of depression and anxiety (see below) were excluded from the study (n = 6) and thus never completed the newly developed instrument at follow-up. All participants who were screened out because of elevated depression and anxiety were provided with appropriate referral information for mental health consultation. After this screening, there were 280 participants in the study who received their genetic risk assessment. Of those, 277 responded to the 6-week follow-up questionnaire, and 256 answered the questions necessary for the analysis. The respondents were of a mean age of 58.0 (SD = 10.5) with an average of 16.1 (SD = 2.5) years of education. In all, 71.1% of the respondents were female, 81.25% were white, and 42.2% received a ε4+ genotype disclosure. There were no statistical differences with regard to demographic characteristics between the respondents and nonrespondents. Of those participants who completed the follow-up, 2 were found to have elevated scores on the measures of depression and anxiety and were provided with referral information for mental health consultation.

Preliminary Item Pool

The preliminary item pool for the new instrument consisted of items from a modification of the original MICRA developed by Cella and colleagues.[14] The MICRA was developed based on their belief that there were "meaningful–but as of yet unmeasured–personal and family problems and concerns related to the information transmitted during the (cancer) genetic testing experience" (p. 565). In other words, they were taking note of the anecdotal evidence on the effects of cancer genetic testing that were not measured by currently available psychiatric measurements. The same concern was true in measuring the impact of AD susceptibility genetic testing. A more sensitive test could capture the situational effects of AD genetic testing as opposed to the more generalized effects captured by other outcome measures such as BAI or CES-D. As MICRA was one of the only validated scales designed specifically to assess the psychologic impact of genetic susceptibility testing for an adult-onset disease, it provided a good basis from which to develop an AD-specific scale. Furthermore, the MICRA is unique in that it is also measuring the positive effects stemming from genetic testing, that is, in addition to items that reflect the degree of anxiety, uncertainty, or regret experienced by the discloser, which is common among many scales, the MICRA has 4 items that measure degrees of relief, happiness, and satisfaction experienced by the discloser.

The original MICRA questionnaire contains 3 sections, but only 1 of the sections (section 1) is for all respondents. Section 1 contains 3 subscales, a positive subscale (4 items), a distress subscale (6 items), and an uncertainty subscale (9 items), and 2 additional items that did not fit into any of the subscales but that were retained for the total scale (21 items). Section 2 (2 items) pertained only to those respondents who have children, and section 3 (2 items) is for those respondents who have had or currently have cancer. The questionnaire asked the respondents to

indicate whether they have experienced each statement on a 4-point scale (0, 1, 3, 5) in the past week. A response of 0 indicated never experiencing the statement whereas a 5 indicated often experiencing the statement. A higher score on any of the subscales or the total scale indicated greater psychologic distress. The positive subscale is reverse scored to reflect this.

Our modification of the MICRA differed from the original questionnaire in 2 ways. First, sections 2 and 3 were eliminated. Section 2 was eliminated to have a uniform scale applicable to all respondents. Section 3 was eliminated because it is not relevant to asymptomatic individuals. Second, because the original questionnaire applied to genetic testing of cancer, the language for REVEAL's modified scale was adapted to reflect characteristics of AD. For example, item 9 of section 1 states, "Worrying about my risk of getting cancer [or getting cancer again if you have ever been diagnosed with cancer]," was modified to read "Worrying about my risk of getting AD." In addition to replacing "cancer" with "AD," the clause in the parenthesis was stricken. Unlike cancer, where there are treatment options such as chemotherapy, and surgery, AD currently does not have any disease modifying therapies, and people affected by the disease do not recover. A total of 6 items, items 9 to 14 of section 1 from the original scale were modified in this manner.

In this form, the modified MICRA was administered at each of the 3 follow-up visits. The items were accompanied by the following instructions: "The questions below are about some specific responses you may have had after receiving your genetic test results. Please answer every question….. Indicate whether you have experienced each statement never, rarely, sometimes or often in the past week, by circling the corresponding number."

Statistical Analysis

The first goal of the statistical analyses was to reduce the initial item pool to its most parsimonious form, and to create the most psychometrically sound instrument. To accomplish this, we used factor analysis (FA) and calculated Cronbach α (CA) in an alternating and iterative process to help us arrive at the final structure of the new scale. After each analysis, whether it was FA or CA, we looked for items that did not fit a set of criteria that we derived a priori, and eliminated them from the item pool. This process was continued until all of the items fit our inclusion criteria (see below), resulting in the final structure of our measure.

The FA, achieved by way of principal component analysis with Varimax rotation, was used as a test of the internal construct validity of the scale. Principal component analysis determines the number of components, or subscales, contained in the item pool, based on intercorrelations among the items. Essentially, the analysis tries to explain the variance in the data by a set of latent factors by which items can be grouped. To determine the number of factors from the analysis, we examined the Scree plot and the eigenvalues. The eigenvalue is equivalent to the amount of variance in the item pool explained by each factor, and the Scree plot is simply the visual plot of the eigenvalues by the number of factors. Our a priori criteria for determining the number of components to retain included a combination of eigenvalues greater than 1, and breaks in the curve of the Scree plot.[22]

To determine which items would constitute each factor, we looked at factor loading values. Before initiating our analysis, we set the inclusion criteria for each factor at 0.50, and the exclusion criteria at 0.20. Thus, for an item to be retained and included in a factor, it needed to have a factor loading value of greater than 0.50 for 1 factor, and factor loading values of less than 0.20 for all other factors. If an item had a factor loading value of greater than 0.20 for more than 1 factor, or if an item did not have a factor loading value of greater than 0.50, then the item was eliminated.

CA was used to measure the resulting factors' internal consistency, or the extent to which the items within each of the factors measured the same domain or construct. The measure is essentially an average correlation of the items within the test or subtest.[23] Additional analyses using CA evaluated the correlation of each item with the rest of the factor item pool. After an item in the pool is removed, the α was calculated for the remaining items. After the α was calculated, the removed item is placed back in the pool and the next item is removed for the next α calculation. This procedure is repeated for every item in the pool. If the α value increases after an item is removed, then the conclusion can be drawn that the removed item is not highly correlated with the rest of the items. Similarly, if the α value decreases after an item is removed, then it can be concluded that the removed item is highly correlated with the rest of the pool. Using this method, we were able to eliminate items that were not highly correlated with the rest of the factor item pool (ie, those items whose removal increased the α's value).

After 2 iterations of FA and CA, we were left with only items that fit the inclusion criteria described above, leaving the final structure that we have named the REVEAL Impact of Genetic Testing in Alzheimer's Disease (IGT-AD) scale. Next, we used Spearman correlations to compare this final form of the IGT-AD with other more established psychometric scales (see below) as a measure of construct validity.

Other Measures

The IES is a 15-item self-report measure that assesses 2 common responses related to a specific stressful life event: intrusion and avoidance.[17,24] It is a reliable scale that can be anchored to any specific life event and permits the assessment of participants over time, comparison of the degree of distress among subgroups, and comparison of the impact of various events.[25] The IES has been specifically anchored to test-related distress in previous genetic testing studies.[15,26] For the purpose of this study, the total IES (range, 0 to 75) was used.

The CES-D[16,27–29] was originally developed as a measure of depressive symptoms in community-dwelling adults and has been widely used as a screening instrument in studies of non-clinical populations. The 20 items are rated on a 4-point scale according to the frequency with which symptoms were experienced during the preceding week and are summed to compute a total score (range, 0 to 60). The CES-D shows good internal consistency for the general population[28] and correlates strongly with the Beck Depression Inventory.[29]

The BAI[30] is a 21-item screening test designed to distinguish common symptoms of anxiety from those of depression and to be sensitive to treatment change. It has been extensively validated and has shown excellent

test-retest reliability and internal validity.[31] The BAI is scored on the basis of self-reported severity of a given symptom over the past week for 0 (not at all) to 3 (severely), yielding a total score from 0 to 63.

RESULTS

Two iterations of FA and CA were performed to eliminate items that did not fit the inclusion criteria. The first iteration reduced the number of items from 21 to 17, and the second iteration eliminated 1 more item reducing the total number of items to 16 (Table 1).

Of the 4 items that were eliminated from the original item pool during the first iteration, 3 items (4, 12, 15) were excluded because they did not satisfy the inclusion criteria of the FA, and 1 item (13) was excluded because it did not satisfy the inclusion criteria of the CA. During the second iteration, item 20 was eliminated after FA because it did not have a factor loading value of greater than 0.50 for either of the 2 factors.

On the basis of the eigenvalue criteria of greater than one, 6 factors could potentially be identified in the scale. However, examination of the Scree plot, which identified the possibility of 2 or 3 factors, and the factor loading coefficients, revealed that 2 factors were optimal. Factor 1, which we named the distress subscale owing to the context of the items, explained 32.9% of the total variance, and factor 2, which we named the positive subscale, explained 16.7% of the total variance. Thus, the 2 components together explain 49.6% of the total variance (Table 2), which is typically considered acceptable for this type of scale development. Although the original MICRA contained 3 components, our analyses suggest that 2 of the original components (the distress subscale and the uncertainty subscale) are not measuring significantly different dimensions of psychologic impact as it pertains to AD genetic testing.

The CA analysis eliminated any items that led to a significantly lower α value when deleted. The raw α was used for comparison when evaluating internal reliability of each component separately, but the standardized α was used when evaluating both components together as the 2 components have dissimilar variances. The distress subscale, which contains 12 items, has an α value of 0.86, and the positive subscale, which contains 4 items, has an α value of 0.82. The total scale also has an α value of 0.82.

Table 3 presents the final REVEAL IGT-AD scale items. The individual items of each subscale are summed to form a score for each subscale. The items of the positive subscale are reversed before summation (ie, a "5" becomes a "0," a "3" becomes a "1," and vice versa). The score of the total scale is the sum of the 2 subscale scores. Descriptive statistics of IGT-AD and other scales are presented in Table 4.

To establish the scale's external validity, the IGT-AD was compared with other more established scales, using Spearman rank order correlations (Table 5). IGT-AD total and the distress subscale are positively correlated with IES, BAI, and CES-D indicating convergent validity. Furthermore, the positive subscale is negatively correlated with IES, and BAI, and it is essentially uncorrelated with CES-D, indicating divergent validity.

DISCUSSION

The IGT-AD is the first and only scale developed to assess the psychologic impact of AD genetic susceptibility testing. Results of this study indicate that it is a valid, reliable scale that may be more appropriate for measuring the impact of genetic susceptibility testing in AD than generalized mood scales or other event specific scales not sensitive to issues unique to genetic testing. This scale addresses the unique nature of genetic information as it relates to AD and isolates the impact of this genetic information. The IGT-AD has a number of unique features. For example, its item content is specific to issues pertaining to AD genetic testing. Second, the inclusion of a distress subscale and positive subscale allows for the measurement of both constructs in the same overall scale. For example, in the context of APOE genetic testing, a respondent can be distressed about being homozygous for the ε4 allele, but at the same time be relieved that his or her risk of getting AD is not as high as he or she thought. Having a positive and a negative component allows the IGT-AD to parse out 2 distinct potential reactions.

Limitations

One limitation of the IGT-AD is that it was not initially developed with direct input from expert clinicians (eg, neurologists, psychiatrists, and psychologists), genetic counselors, geneticists, or likely respondents to the questionnaire. The scale was adapted from the MICRA,[14] which was developed specifically for cancer genetic testing, using participants interested in breast cancer genetic information. Thus, owing to differences in the age of onset, affected population, risk estimates, and treatment options between AD and breast cancer, the IGT-AD may lack some sensitivity to AD genetic susceptibility testing. In addition, because 6 potential participants were screened out before the study, owing to elevated CES-D and BAI scores, and because the CES-D and BAI were both found to be correlated with the IGT at follow-up, it is possible that our sample may have had an artificially suppressed range of scores on the IGT-AD. Despite these limitations, the

TABLE 1. Items Deleted From the Preliminary Item Pool

Item	Questions
4	Feeling guilty about my test result
12	Having difficulty making decisions about Alzheimer disease screening or prevention
13	Understanding clearly my choices for Alzheimer disease prevention or early detection
15	Thinking about my test results has affected my work or family life.
20	Worrying about the genetic counseling and testing process has brought about conflict within my family

Item 4 is from the modified MICRA distress subscale, items 12, 15, and 20 are from the modified MICRA uncertainty Subscale, and item 13 did not belong to a particular subscale.

MICRA indicates Multidimensional Impact of Cancer Risk Assessment.

TABLE 2. Varimax Rotated Component Pattern of the Final 16 REVEAL IGT-AD Items

Item	Component 1	Component 2
1	**0.80**	−0.12
2	**0.77**	−0.03
3	**0.77**	−0.04
4	−0.05	**0.82**
5	−0.18	**0.78**
6	**0.70**	0.00
7	**0.56**	0.02
8	**0.68**	0.05
9	**0.66**	0.07
10	**0.63**	0.10
11	**0.60**	0.16
12	**0.51**	0.13
13	**0.55**	−0.11
14	0.18	**0.76**
15	0.10	**0.83**
16	**0.59**	−0.17

The values denote the factor loading values or the correlation of each item with each component.

Bold formatting indicates loading on the respective component based on the inclusion criteria of greater than 0.50, and exclusion criteria of 0.20.

IGT-AD indicates Impact of Genetic Testing for Alzheimer's Disease; REVEAL, Risk Evaluation and Education for Alzheimer's Disease.

preliminary statistical analyses presented here suggest that the new scale has excellent internal reliability and construct validity, and that it is in fact measuring additional element(s) not captured by the other established scales. Further assessment of the validity of the new IGT-AD with additional convergent and divergent measures would be helpful.

TABLE 3. REVEAL IGT-AD Total Scale and Its Components

REVEAL IGT-AD	
Items	**Questions**
Distress Subscale	
1.	Feeling upset about my test result
2.	Feeling sad about my test result
3.	Feeling anxious or nervous about my test result
6.	Feeling a loss of control
7.	Having problems enjoying life because of my test result
8.	Worrying about my risk of getting Alzheimer disease
9.	Being uncertain about what my test result means about my risk of developing Alzheimer disease
10.	Being uncertain about what my test result means for my child(ren)'s and/or family's Alzheimer disease risk
11.	Feeling frustrated that there are no definite Alzheimer disease prevention guidelines for me
12.	Feeling concerned about how my test results will affect my insurance status
13.	Having difficulty talking about my test results with family members
16.	Feeling regret about getting my test results
Positive Subscale	
4.	Feeling relieved about my test result
5.	Feeling happy about my test result
14.	Feeling that my family has been supportive during genetic counseling and testing process
15.	Feeling satisfied with family communication about my genetic test result

IGT-AD indicates Impact of Genetic Testing for Alzheimer's Disease; REVEAL, Risk Evaluation and Education for Alzheimer's Disease.

TABLE 4. REVEAL IGT-AD and Other Scale Descriptive Statistics

	Mean	SD (Range)	Median
IGT-AD Total	16.9	9.9 (0-63)	17.0
IGT-AD Distress	6.5	7.9 (0-47)	4.0
IGT-AD Positive	10.5	6.7 (0-20)	11.0
IES Total	5.2	8.5 (0-47)	1.0
BAI	3.4	4.7 (0-26)	2.0
CES-D	6.5	6.7 (0-44)	5.0

BAI indicates Beck Anxiety Inventory; CES-D, Center for Epidemiologic Studies-Depression Scale; IES, Impact of Event Scale; IGT-AD, Impact of Genetic Testing for Alzheimer's Disease.

Another limitation of the study is the generalizability of the scale to the population at large. So far, the psychometric properties of the scale have only been tested on a single research population. REVEAL II participants reflect, for the most part, a particular segment of the society (ie, female, white, educated, and belonging to a higher socioeconomic class), though it should be noted that African Americans were actively recruited as a part of the study protocol and make up a substantial percentage of the study participants, especially when compared with other clinical trials. Thus, both the validity and the reliability of the IGT-AD need to be evaluated further in other populations that are more heterogeneous in their ethnic, sex, and socioeconomic makeup. Finally, it should be noted that results of this group-based study may not be appropriate for interpretation at the individual level, that is, further clinically based studies would be warranted before using the IGT-AD for individual clinical interpretation.

CONCLUSIONS

The REVEAL IGT-AD is a valid and reliable scale that can be used to measure the impact of genetic testing for AD (see appendix for the complete REVEAL IGT-AD scale). As research on genetic testing for AD becomes more prominent, driven by the increased prevalence of AD, consumer knowledge of genetics, and scientific knowledge of the genetic components of AD, a scale like the IGT-AD can aid in understanding the impact of genetic testing of

TABLE 5. Construct Validity: Spearman Correlations With Other Scales

	IES Total	BAI	CES-D
IGT-AD Total	0.32*	0.10	0.24*
IGT-AD Distress	0.59*	0.31*	0.33*
IGT-AD Positive	−0.09	−0.12	0.02
IES Total	—	0.35*	0.30*
BAI	—	—	0.55*

*$P < 0.0001$.

All others are not significant.

BAI indicates Beck Anxiety Inventory; CES-D, Center for Epidemiologic Studies-Depression Scale; IES, Impact of Event Scale; IGT-AD, Impact of Genetic Testing for Alzheimer's Disease.

AD. Used as an outcome measure, factors which lead to less desirable outcomes owing to AD genetic testing (ie, sadness, anger, and/or guilt) can be identified. As genetic testing of AD becomes more common, these studies would help identify those patients who may be at risk for associated distress and who may benefit from additional intervention.

APPENDIX

The REVEAL Impact of Genetic Testing in Alzheimer's Disease (IGT-AD) Scale

The questions below are about specific responses you may have had after receiving your genetic test results. Please answer every question in this section. Indicate whether you have experienced each statement never, rarely, sometimes or often in the past week, by circling the corresponding number.

	In the Past Week, I Have Experienced…	Never	Rarely	Some-times	Often
1.	Feeling upset about my test result	0	1	3	5
2.	Feeling sad about my test result	0	1	3	5
3.	Feeling anxious or nervous about my test result	0	1	3	5
4.	Feeling relieved about my test result	0	1	3	5
5.	Feeling happy about my test result	0	1	3	5
6.	Feeling a loss of control	0	1	3	5
7.	Having problems enjoying life because of my test result	0	1	3	5
8.	Worrying about my risk of getting Alzheimer disease	0	1	3	5
9.	Being uncertain about what my test result means about my risk of developing Alzheimer disease	0	1	3	5
10.	Being uncertain about what my test result means for my child(ren)'s and/or family's Alzheimer disease risk	0	1	3	5
11.	Feeling frustrated that there are no definite Alzheimer disease prevention guidelines for me	0	1	3	5
12.	Feeling concerned about how my test results will affect my insurance status	0	1	3	5
13.	Having difficulty talking about my test results with family members	0	1	3	5
14.	Feeling that my family has been supportive during genetic counseling and testing process	0	1	3	5
15.	Feeling satisfied with family communication about my genetic test result	0	1	3	5
16.	Feeling regret about getting my test results	0	1	3	5

Distress subscale contains items 1 to 3, 6 to 13, and 16. Positive subscale contains items 4, 5, 14, and 15. Total scale and subscales are scored by summing the circled numbers. The positive subscale is reverse scored.

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