Appendix H

Understanding and Using the XBA PSW-A v1.0 Software Program Tab by Tab

While reading the information in this appendix, having the PSW-A program open will be helpful.

General Comments

1. Upon opening the program, users may see a variety of security warnings. As long as the program is opened from the CD, there is no possibility of any virus or security risk involved in opening or using the file. Messages from the operating system that warn against opening files that may contain viruses that could harm your system may therefore be ignored. After these types of messages, another one may appear when the program opens that states: “Some active content has been disabled.” IF this message appears, simply click on the “Options” button on the right side of the bar and select “Enable this content.” Selecting this option enables macros built into the program and ensures that the program functions properly. If you are not able to clear data after you click on the “Clear Data on ALL Tabs” button on the Identifying Information tab, you have not successfully enabled macros. In this case, check (again) for the security warning under the main menu bar (or reopen the program and wait for the warning to pop up) and follow instructions to enable content.
2. There are two ways to move from one tab to another tab in the XBA PSW-A v1.0 . You may click on any of the colored buttons in the program provided for direct navigation, or you may click on the actual tabs lined up along the bottom of the application window. If you choose to navigate via the latter option, use the arrows at the bottom left corner of the window to scroll through the tabs, as not all tabs are visible at once. Most users will find the navigation buttons (which are usually orange for going back and blue for going forward) more efficient for moving through the tabs in the program.

Tab 1: Identifying information

1. The identifying information tab is shown in Figure H.1.
2. You ***must*** select the individual’s ***grade*** (from the drop-down menu in Step 4) in order for the program to work properly. Click the cell and the menu will appear automatically or you may enter the grade manually. If an invalid entry is made an error message will pop up. Simply correct

the entry or select from the menu again. Entering any other information, such as the name of the individual’s school and examiner, is optional.

3. Regardless of how much information is entered on this tab, only the *name* and *grade* will be carried over to each tab of the program. Once the required (and other desired) information has been entered, click the blue “Go to *g*-Value Data Entry Tab” button to proceed.

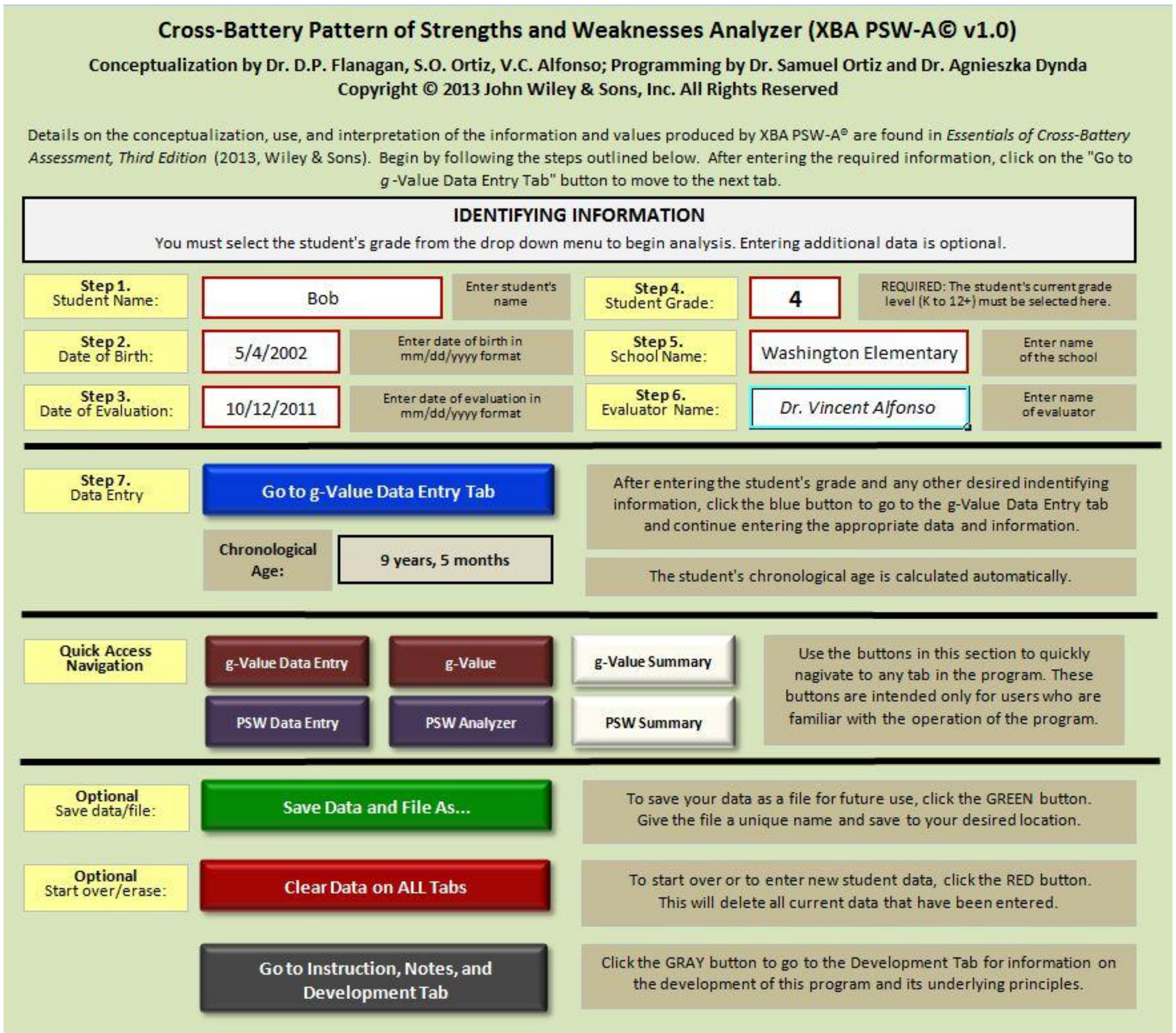


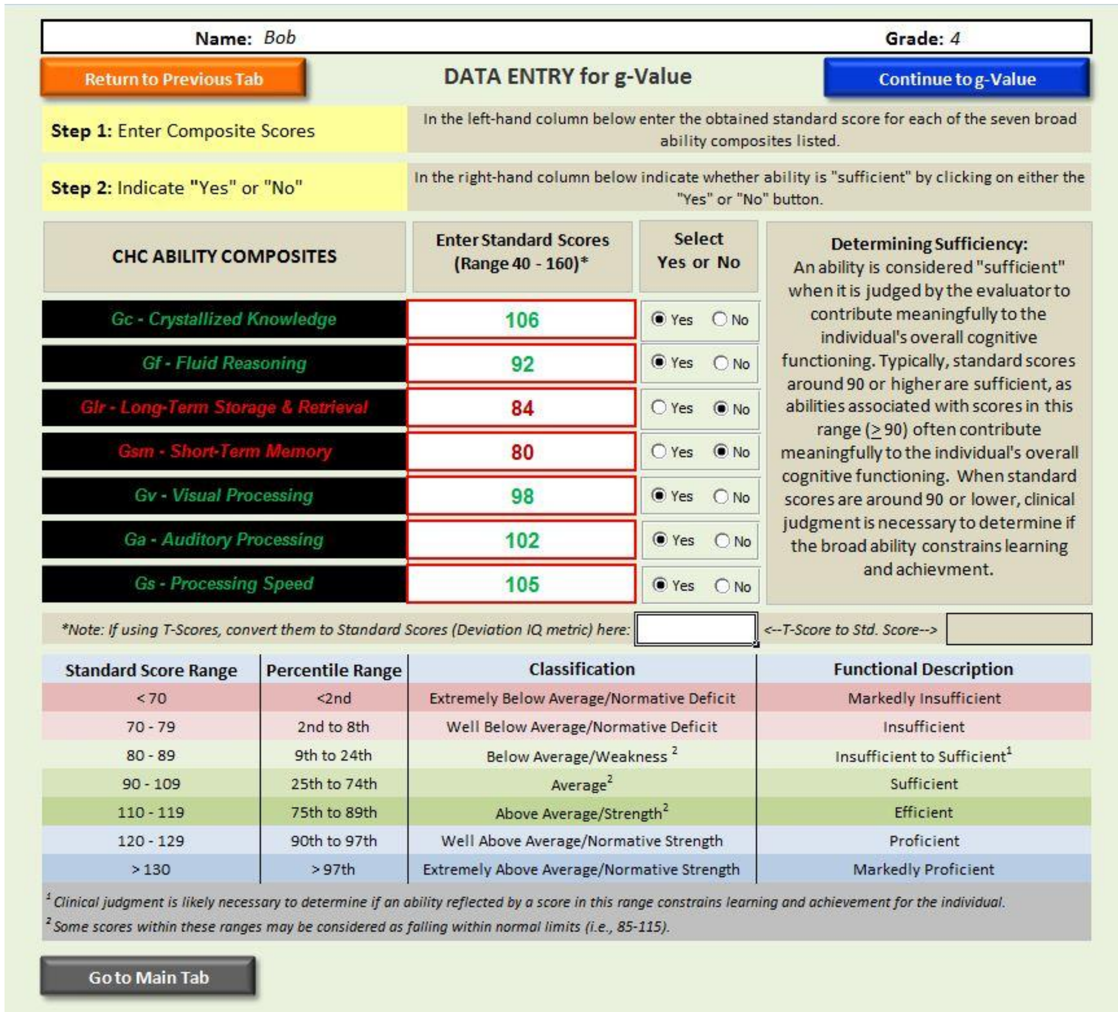
Figure H.1 Identifying Information Tab of the PSW-A v1.0

Tab 2A: *g*-Value Data Entry

1. An example of data that have been entered into the *g*-Value data entry tab is found in Figure H.2.
2. The *g*-Value provides a quantitative indicator regarding the likelihood that an individual’s overall cognitive ability is average or better, despite one or more cognitive weaknesses or deficits. Because the global test

score yielded by popular intelligence tests, such as the Full Scale IQ (FSIQ) on the Wechsler Scales, is often attenuated by specific cognitive deficits (e.g., a processing speed deficit), the *g*-Value was created to answer this question: Is the individual's overall cognitive ability at least average when the cognitive deficit(s) is not included in the estimate? Because individuals with SLD have specific cognitive weaknesses or deficits in combination with a number of intact cognitive abilities or cognitive strengths, total test scores, like the FSIQ, often provide a misleading estimate of the individual's intellectual capacity, a problem recognized as far back as the 1920s (e.g., Orton, 1925; see Chapter 4). The computed *g*-Value reflects the likelihood that the individual has at least average overall cognitive ability when the potential attenuating effects of the specific area(s) of weakness are removed.

The *g*-Value is based on information about an individual's performance across seven broad CHC cognitive ability domains in addition to the number and type of abilities that are judged by the evaluator to be "sufficient." For example, an individual with three sufficient abilities would have a lower *g*-Value than an individual with six sufficient abilities. Also, an individual whose *Gf*, *Gc*, *Glr*, and *Gsm* were judged to be sufficient would have a higher *g*-Value than an individual with sufficient *Gsm*, *Gv*, *Ga*, and *Gs*, even though each had the same *number* of sufficient abilities (i.e., 4). The reason for the different *g*-Values in the latter example is because abilities such as *Gf* and *Gc* have higher *g-weights* than abilities like *Ga* and *Gs*, meaning that they contribute more to overall *g* (or general intelligence). Furthermore, in earlier grades (i.e., grades K–2), *Gc*, *Gsm*, *Glr*, and *Gs* (or corresponding specific narrow abilities in these domains) are considered the most important for academic success, whereas *Gc*, *Gsm*, *Glr*, and *Gf* (or specific narrow abilities in these domains) appear to be the most important abilities in the later grades (i.e., grade 3+). These judgments were made by the current authors based on their review of the literature on CHC ability–achievement relations and on their understanding of general curricular demands by grade (e.g., Flanagan, Alfonso, & Mascolo, 2011; Flanagan, Ortiz, Alfonso, & Mascolo, 2006; McGrew & Wendling, 2010). As such, when the broad CHC abilities that are most predictive of academic success at a particular grade are at least average, they contribute more to the *g*-Value than other (at least average) abilities (e.g., *Ga*, *Gs*). Abilities that are not estimated to be in the average range or higher do not contribute to the g-Value. Readers who are interested in learning more about the g-Value and how it was derived may read about it on the Development tab of the XBA PSW-A v1.0.



Name: *Bob* **Grade:** *4*

Return to Previous Tab | DATA ENTRY for g-Value | Continue to g-Value

Step 1: Enter Composite Scores	In the left-hand column below enter the obtained standard score for each of the seven broad ability composites listed.
Step 2: Indicate "Yes" or "No"	In the right-hand column below indicate whether ability is "sufficient" by clicking on either the "Yes" or "No" button.

CHC ABILITY COMPOSITES	Enter Standard Scores (Range 40 - 160)*	Select Yes or No
Gc - Crystallized Knowledge	106	(●) Yes ( ) No
Gf - Fluid Reasoning	92	(●) Yes ( ) No
Glr - Long-Term Storage & Retrieval	84	( ) Yes (●) No
Gsm - Short-Term Memory	80	( ) Yes (●) No
Gv - Visual Processing	98	(●) Yes ( ) No
Ga - Auditory Processing	102	(●) Yes ( ) No
Gs - Processing Speed	105	(●) Yes ( ) No

Determining Sufficiency: An ability is considered "sufficient" when it is judged by the evaluator to contribute meaningfully to the individual's overall cognitive functioning. Typically, standard scores around 90 or higher are sufficient, as abilities associated with scores in this range (≥ 90) often contribute meaningfully to the individual's overall cognitive functioning. When standard scores are around 90 or lower, clinical judgment is necessary to determine if the broad ability constrains learning and achievment.

**Note: If using T-Scores, convert them to Standard Scores (Deviation IQ metric) here:* <--T-Score to Std. Score-->

Standard Score Range	Percentile Range	Classification	Functional Description
< 70	<2nd	Extremely Below Average/Normative Deficit	Markedly Insufficient
70 - 79	2nd to 8th	Well Below Average/Normative Deficit	Insufficient
80 - 89	9th to 24th	Below Average/Weakness [2]	Insufficient to Sufficient[1]
90 - 109	25th to 74th	Average[2]	Sufficient
110 - 119	75th to 89th	Above Average/Strength[2]	Efficient
120 - 129	90th to 97th	Well Above Average/Normative Strength	Proficient
> 130	> 97th	Extremely Above Average/Normative Strength	Markedly Proficient

[1] *Clinical judgment is likely necessary to determine if an ability reflected by a score in this range constrains learning and achievement for the individual.*
[2] *Some scores within these ranges may be considered as falling within normal limits (i.e., 85-115).*

Go to Main Tab

Figure H.2 *g*-Value Data Entry Tab of the XBA PSW-A v1.0

3. To use the program, users must have data that reflect the individual’s ability in each of seven broad CHC cognitive domains (i.e., *Gc*, *Gf*, *Glr*, *Gsm*, *Gv*, *Ga*, *Gs*). These data may come from a single battery (e.g., WJ III NU COG; DAS-II), a set of co-normed tests (e.g., KABC-II and KTEA-II), or a cross-battery (e.g., SB5 and selected tests from the WJ III NU COG). Note that it may be difficult to obtain a “broad” estimate of certain abilities listed on the *g*-Value Data Entry tab, such as *Gsm*, *Ga*, and *Gs*. This is because there are very few narrow abilities that comprise certain broad abilities. For example, *Gs* is comprised of the narrow abilities of Perceptual Speed (P), Rate of Test Taking (R9) and Reading Speed (RS), Writing Speed (WS) and Number Facility (N). The latter three narrow abilities are more “academic” than “cognitive” in nature. Since most intelligence, cognitive, and neuropsychological

batteries include measures primarily of P, it is difficult to obtain a broad estimate of *Gs* in any comprehensive "cognitive" evaluation, unless measures of academic fluency/speed are included. Therefore, if there is evidence of average or higher ability (or alternatively, below-average or lower ability) on at least two measures of P, that estimate may be entered into the *Gs* cell on the *g*-Value Data Entry tab.

Likewise, *Gsm* is comprised of two narrow abilities, Memory Span (MS) and Working Memory Capacity (MW). Therefore, if there is evidence of average or higher ability on at least two measures of MS, for example, that estimate may be entered into the *Gsm* cell on the *g*-Value Data Entry tab. If MW is below average, the MW estimate may be used as evidence of a cognitive weakness or deficit and entered on the Data Entry tab. Similarly, *Ga* is comprised of eight narrow abilities; however, only two (PC and US) are measured on cognitive and achievement batteries. Moreover, the majority of *Ga* subtests measure PC. Therefore, if there is evidence of average or higher ability (or alternatively, below-average or lower ability) on at least two measures of PC, that estimate may be entered into the *Ga* cell on the *g*-Value Data Entry tab. In those instances where *Ga* is below average or lower, the *Ga* estimate may also be used as evidence of a cognitive weakness or deficit and entered on the Data Entry tab.

4. A score must be entered for each of the seven CHC broad ability areas. These data are necessary to generate the *g*-Value and later, the Intact Ability Estimate (IA-e; discussed in the section below describing the PSW Data Entry Tab).
5. Next to the boxes in which scores for each of the seven broad CHC areas were entered, users must select whether each score is judged to be adequate or *sufficient*, meaning that the individual's ability in that domain very likely contributes meaningfully to his or her overall cognitive functioning, particularly for the purpose of performing academic tasks. Evaluators typically judge cognitive abilities represented by standard scores that are approximately 90 or higher to contribute meaningfully to academic learning and achievement. Nevertheless, because many variables may facilitate or inhibit an individual's performance on psychological tests and because tests are not 100% reliable, it seems appropriate to allow evaluators to use clinical judgment when determining whether the abilities are sufficient. *Note that the* g-*Value is calculated based on the specific cognitive areas that were judged to be sufficient (i.e., the "Yes" and "No" button selections), not the scores that were entered.*

Figure H.2 shows that all CHC broad abilities were judged to be sufficient, except *Glr* and *Gsm*. Therefore, *g*-weights for five of the seven broad CHC abilities would be used to calculate the *g*-Value.

6. After entering a score in the appropriate cells on this tab, you must press the Enter key for the score to be accepted. If, after entering the final score the program appears to be stuck and does not allow selection of “Yes” or “No,” press the Enter key and try again.

Tab 2B: *g*-Value

1. There is no data entry necessary or user input required on this tab. The tab merely reports the *g*-Value (see Figure H.3), based on the “Yes” and “No” selections entered on the previous tab. The *g*-Value indicates how likely it is that the individual’s pattern of strengths indicates at least average overall cognitive ability, despite one or more specific cognitive weaknesses or deficits. The more weaknesses or deficits the individual demonstrates, the lower the *g*-Value is likely to be and the less likely it is that he or she has generally average overall ability (*g*).

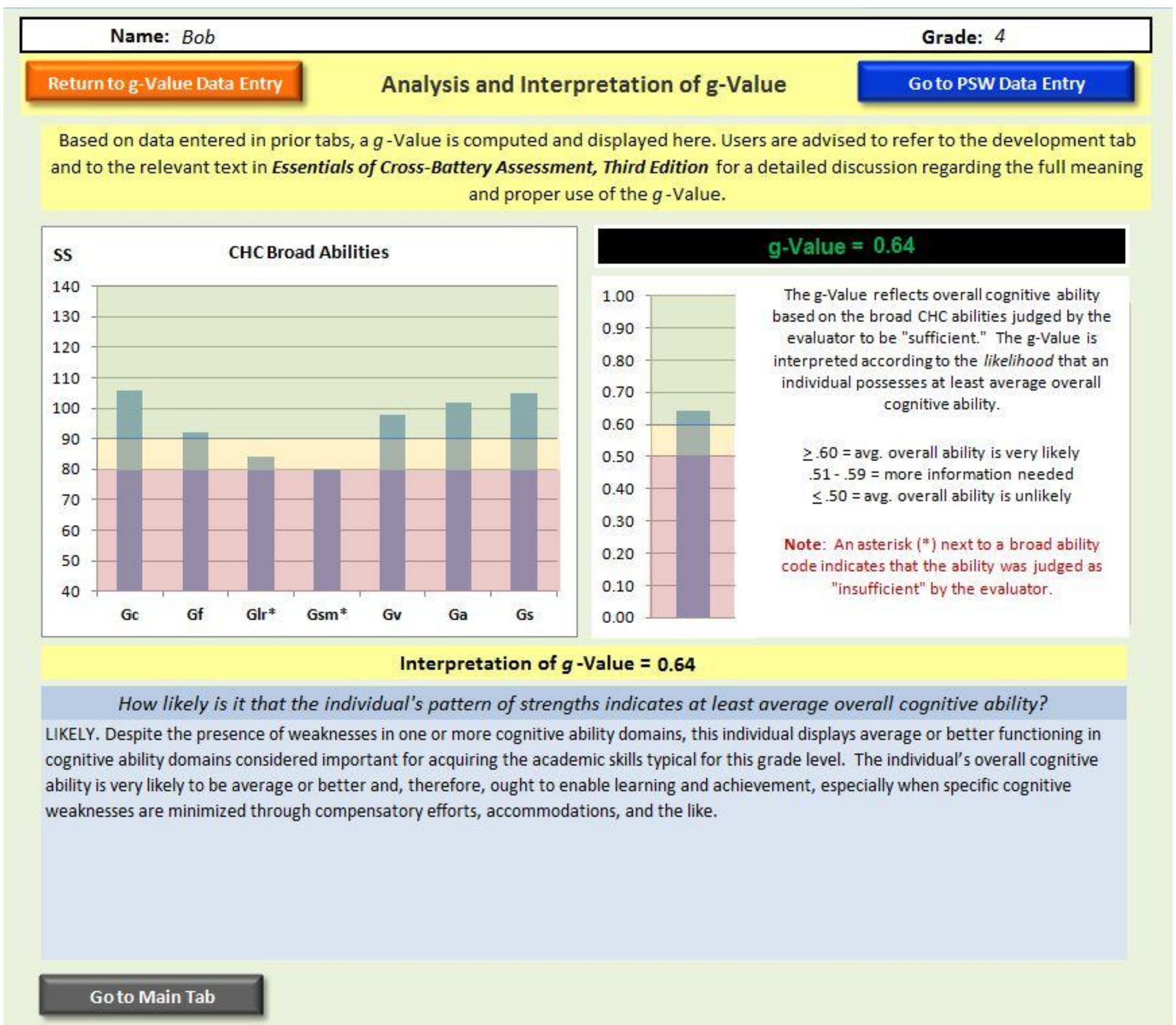


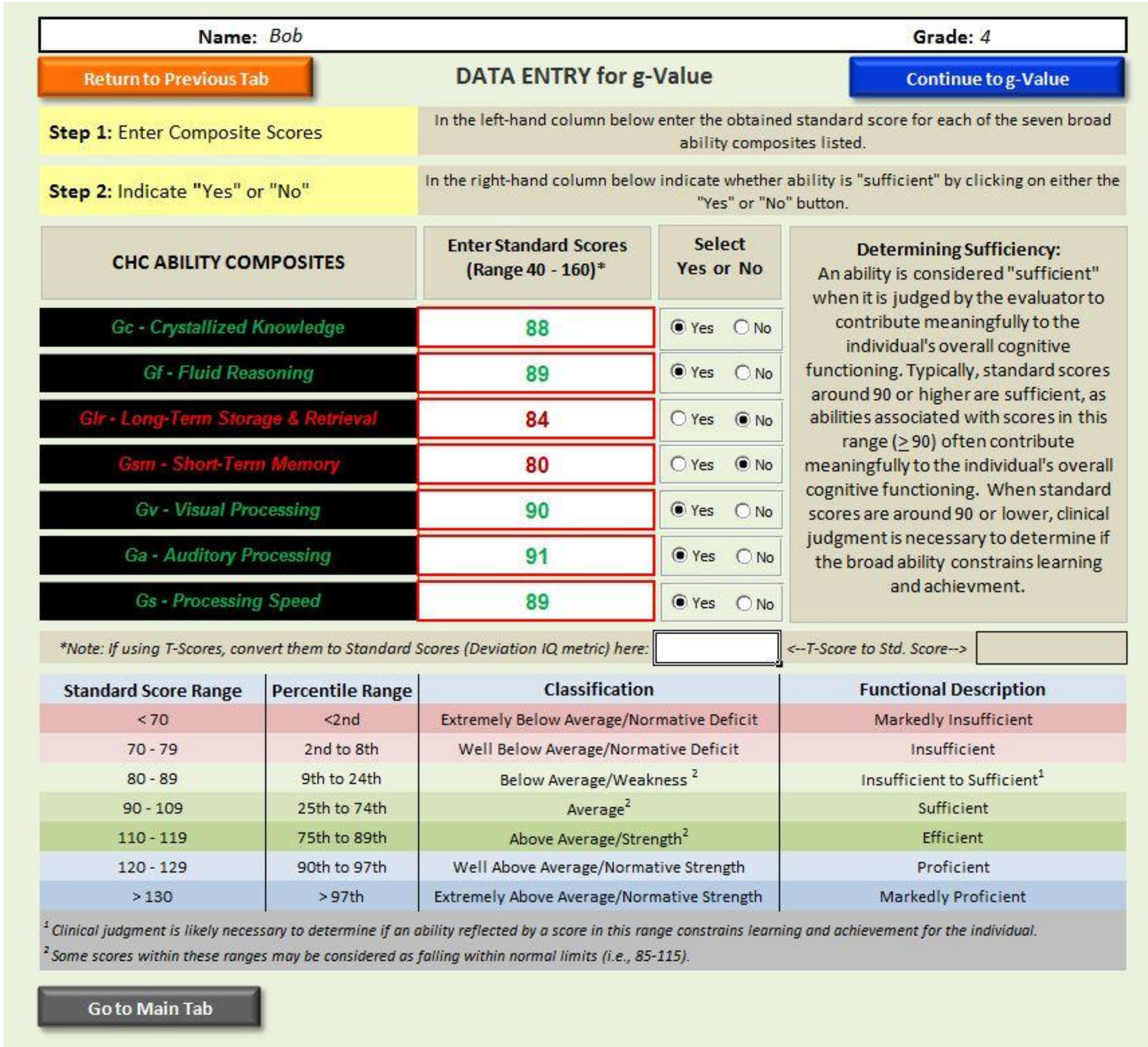
Figure H.3 *g*-Value Tab of the PSW-A v1.0

2. The seven CHC broad ability scores that were entered on the previous tab are also plotted in a graph on this tab to the left of the *g*-Value. An asterisk appears next to any broad ability that was judged by the evaluator to be *insufficient* (i.e., *Glr* and *Gsm* in Figure H.3). It is important to note that even if the bar extends into the green area (top portion) of the graph (meaning the score is ≥ 90), the evaluator may have judged the ability associated with this score to be insufficient. Likewise, an evaluator may judge an ability that falls in the yellow range (middle portion of the graph; i.e., scores of 80–89) as *sufficient*. While these judgments may seem inappropriate, they could actually be accurate in the context of other data sources. These examples demonstrate that the program was designed intentionally to allow users flexibility in the SLD determination process—a process that often requires clinical judgment when interpreting the results of psychological tests and other data sources. Experienced clinicians prefer to (and should) use their judgment (rather than relying on strict cutoffs), as standardized norm-referenced cognitive and achievement test performances must be interpreted within the context of other sources of quantitative and qualitative data. Test scores alone are an insufficient basis from which to determine SLD. Rather, all or nearly all data sources (including a Dual Discrepancy/Consistency [DD/C] pattern of strengths and weaknesses [PSW]) must converge, revealing multiple diagnostic markers of SLD, suggesting a high probability that the individual has a disability or is unable to learn and achieve at a rate and level commensurate with most people of the same age/grade and overall level of ability.
3. Unlike the scale used in the SLD Assistant v1.0 (Flanagan, Ortiz, & Alfonso, 2007), where the g-Value was centered on 1.0 and ranged above and below it, the *g*-Value in the XBA PSW-A v1.0 has been rescaled and now ranges from 0 to 1.0 and is reported in the black space above the graph on which it is plotted. The *g*-Value will appear in green when it is ≥ .60; yellow when between .51 and .59; and red when ≤ .50. These values represent the likelihood of an individual's overall cognitive ability being at least average. To understand how the *g*-Value scale was created, see the Development tab of the program which can be accessed easily from the Identifying Info tab. Note that values between .51 and .59 are difficult to interpret in isolation and without the benefit of other data sources. That is, it is difficult to determine whether the individual's scores reflect a generally average or better ability to think and reason (or average *g*). Additional data sources are needed to make such a determination. Therefore, it is incumbent upon evaluators to

determine whether an IA-e (discussed in the next section) that corresponds to a *g*-Value within the .51 to .59 range should be used in the subsequent analysis of the individual's PSW. In Figure H.3, the *g*-Value is .64 (which would appear in the color green). This value suggests that it is "likely" that the individual has at least average overall ability.

Note that when scores are in the upper 80s and low 90s, and *most of those scores are judged by the evaluator to be sufficient*, the *g*-Value still will be $\geq$ .60. This is because the *g*-Value is not sensitive to the magnitude of the scores entered. Figure H.4 provides an example of this situation. That is, scores ranging from 88 to 91 were judged by the evaluator to be sufficient. Figure H.5 shows that these scores produced a *g*-Value of .64, suggesting that overall ability is likely to be at least average. Nevertheless, the IA-e generated from the actual scores entered and judged to be sufficient was 86 (see Figure H.6) compared to 101 that was computed from the prior data (see Figure H.7), indicating that overall cognitive ability is below average. Thus, users should keep in mind that whenever a score is judged to be sufficient, the *g*-weight associated with that broad CHC ability is used to calculate the *g*-Value. The *g*-Value is based on *g*-weights only and does not take into consideration the actual normative range of the entered standard scores. If scores < 90 are judged to be sufficient, then the *g*-weights associated with those broad CHC abilities are used to determine the likelihood that the individual has at least average overall ability for the purpose of performing academic tasks at grade level (see interpretive statement in Figure H.5). When decisions regarding the sufficiency of scores are made based on our general rule (i.e., standard scores $\geq$ 90 are sufficient), and when there are "enough" broad CHC abilities judged to be sufficient (i.e., around 4), *g*-Values $\geq$ .60 will be associated with IA-e's of $\geq$ 90, which is of course more intuitive than the previous example.

4. Regardless of the magnitude of the *g*-Value, an *interpretive statement* is included at the bottom of this tab to assist practitioners in understanding its meaning.



Name: *Bob* Grade: *4*

Return to Previous Tab | DATA ENTRY for g-Value | Continue to g-Value

Step 1: Enter Composite Scores	In the left-hand column below enter the obtained standard score for each of the seven broad ability composites listed.
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Glr - Long-Term Storage & Retrieval	84	( ) Yes (•) No
Gsm - Short-Term Memory	80	( ) Yes (•) No
Gv - Visual Processing	90	(•) Yes ( ) No
Ga - Auditory Processing	91	(•) Yes ( ) No
Gs - Processing Speed	89	(•) Yes ( ) No

Determining Sufficiency: An ability is considered "sufficient" when it is judged by the evaluator to contribute meaningfully to the individual's overall cognitive functioning. Typically, standard scores around 90 or higher are sufficient, as abilities associated with scores in this range (≥ 90) often contribute meaningfully to the individual's overall cognitive functioning. When standard scores are around 90 or lower, clinical judgment is necessary to determine if the broad ability constrains learning and achievment.

**Note: If using T-Scores, convert them to Standard Scores (Deviation IQ metric) here:* *<--T-Score to Std. Score-->*

Standard Score Range	Percentile Range	Classification	Functional Description
< 70	<2nd	Extremely Below Average/Normative Deficit	Markedly Insufficient
70 - 79	2nd to 8th	Well Below Average/Normative Deficit	Insufficient
80 - 89	9th to 24th	Below Average/Weakness [2]	Insufficient to Sufficient[1]
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110 - 119	75th to 89th	Above Average/Strength[2]	Efficient
120 - 129	90th to 97th	Well Above Average/Normative Strength	Proficient
> 130	> 97th	Extremely Above Average/Normative Strength	Markedly Proficient

[1] *Clinical judgment is likely necessary to determine if an ability reflected by a score in this range constrains learning and achievement for the individual.*

[2] *Some scores within these ranges may be considered as falling within normal limits (i.e., 85-115).*

Go to Main Tab

Figure H.4 Example of Data for CHC Broad Abilities

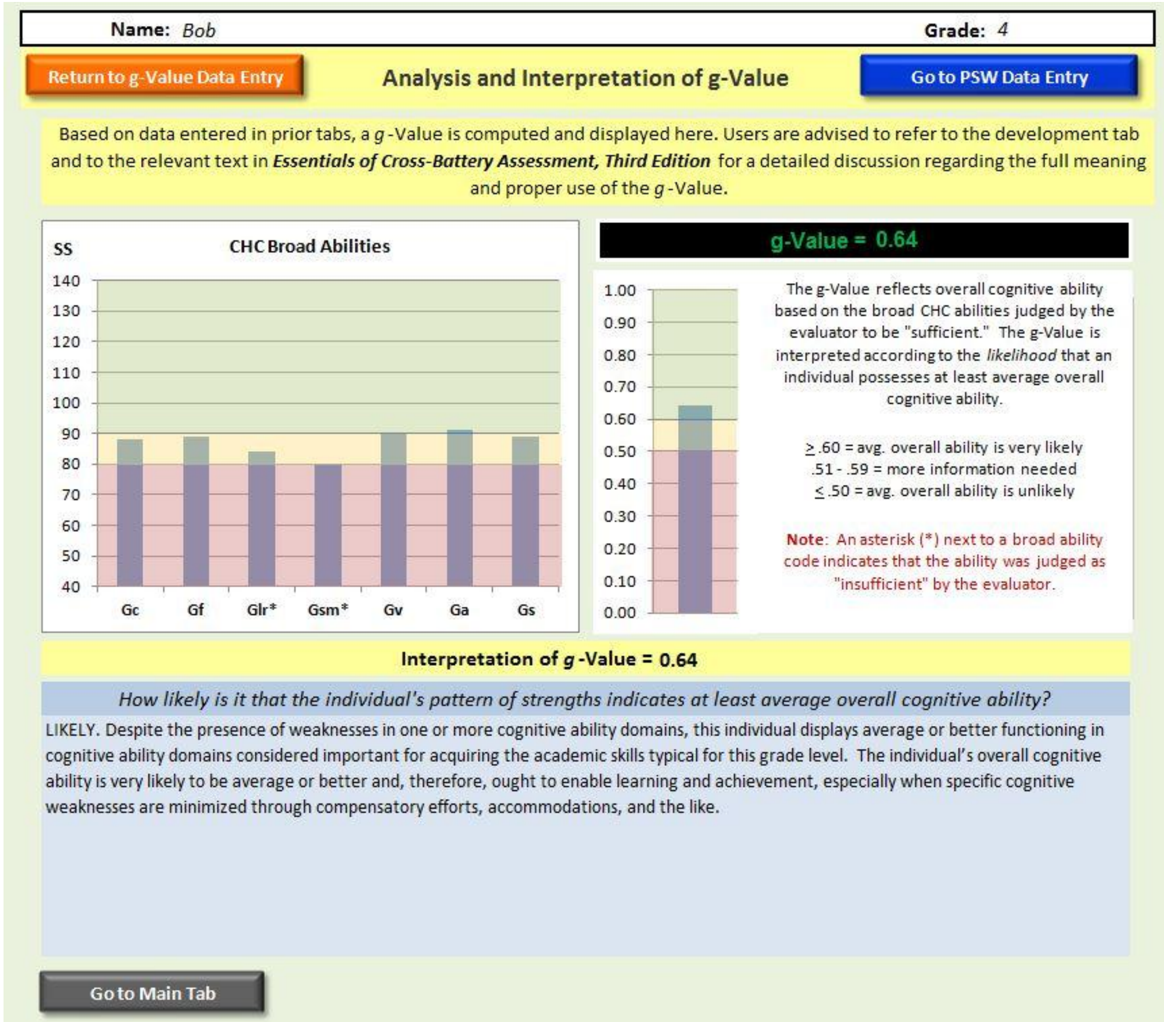

Figure H.5 Example of Interpretation of *g*-Value

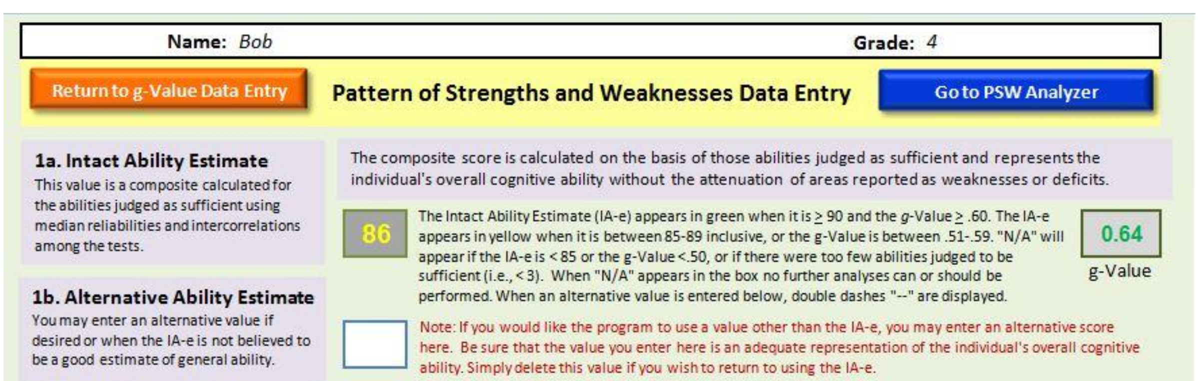

Figure H.6 Example of an IA-e that Requires Additional Information for Interpretation

Tab 3A: PSW Data Entry

1. At the very top, this tab reports a composite, similar to the total test composites on intelligence tests (e.g., FSIQ). However, the composite created by this program is calculated using only those scores that correspond to the abilities that were judged by the evaluator to be sufficient (on Tab 2A). Therefore, this composite is called the *Intact Ability estimate* (IA-e). For example, if the evaluator indicated that five out of the seven scores entered reflect abilities that contribute meaningfully to the individual's overall cognitive functioning (as in the example in Figure H.2), the IA-e is then generated using the five "sufficient" scores. Because actual norms for such a composite are not available (or even feasible within the context of true cross-battery evaluation), a mathematical formula is used to calculate it. The formula used in the program includes use of median reliabilities of CHC broad ability scores and median inter-correlations among them and, therefore, is psychometrically sound. Users are referred to the Development tab of the XBA PSW-A v1.0 for a more detailed description regarding the calculation and derivation of the IA-e including the specific formula, reliabilities, and intercorrelations used in its computation.
2. The IA-e is reported in a green-outlined box in the top left portion of this tab (in the section marked "1a"; see Figure H.7, where the program reports an IA-e of 101 based on the scores reported in Figure H.2). The IA-e appears in green, yellow, or red based on these criteria:

    a. The IA-e appears in green when it is $\geq$ 90 ***and*** corresponds to a *g*-Value of $\geq$ .60.
    b. The IA-e appears in yellow when it is between 85 and 89 (inclusive) ***or*** the g-Value is between .51 and .59.
    c. The IA-e appears in red when it is < 85 or the g-Value is $\leq$ .50 or there were too few abilities judged to be sufficient (i.e., < 3)

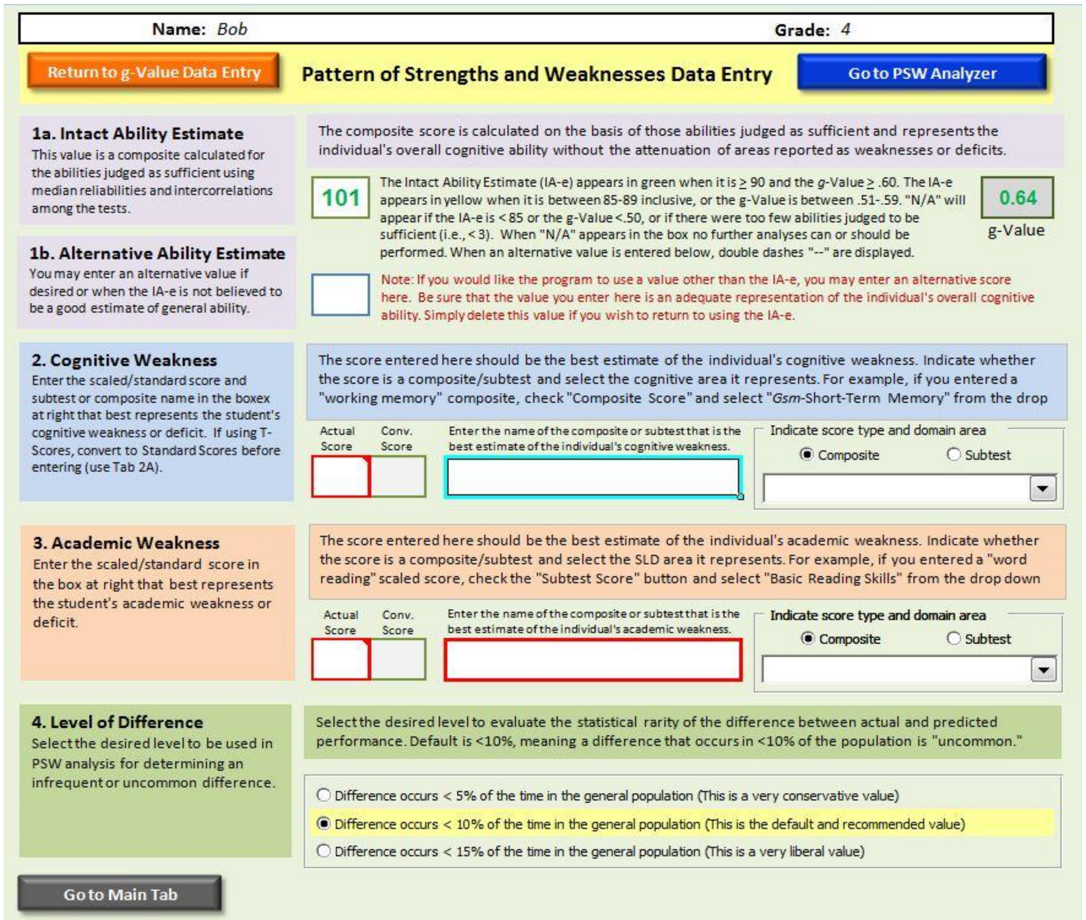

Figure H.7 PSW Data Entry Tab of the PSW-A v1.0

When any of the three conditions related to criterion c are present, the program will report "N/A" in the IA-e box and not allow the user to conduct any further analyses. The program was developed to be used primarily within the context of our DD/C operational definition of SLD, which includes generally average or higher overall cognitive ability as a marker for SLD. Nevertheless, the program will permit users to continue with an analysis of a PSW even when the IA-e is < 90 (but ≥ 85). In addition, if the IA-e appears in green or yellow, it will also be shown in green or yellow on the PSW Analyzer tab.

3. There may be cases where the program provides an IA-e, but for various reasons, users may wish to use an alternate value. The program provides the flexibility to use alternate values and when the program has already generated an IA-e, users merely need to enter a score that is believed to represent a more appropriate or accurate "Alternative Ability Estimate" in the space provided and the program will use this new value rather than the IA-e. This alternate score should be one that is judged to be the

best representation of the individual's overall cognitive ability and a more appropriate value than the IA-e, otherwise, use of the IA-e is recommended. For example, a total test score from an intelligence test (e.g., Wechsler FSIQ, KABC-II MPC) may be used in place of the IA-e as well as any other valid estimate of overall cognitive ability that may be available (e.g., Wechsler General Ability Index, or GAI).

4. Note that when an IA-e is not calculated and the IA-e box reads "N/A," *we do not recommend that users seek or find a higher value somewhere and use it as the Alternative Ability Estimate*. Because "N/A" suggests that the individual's overall cognitive ability is very likely below average or lower, it would be rare to have an alternative overall ability estimate that suggests otherwise. Therefore, when N/A appears in the IA-e box, no further analyses should be conducted (unless there is significant and compelling evidence that the program should be overridden to allow continued evaluation of an individual's PSW).
5. In the majority of cases, at least four different CHC abilities need to be judged as sufficient to produce a viable IA-e. If only two, or in some cases only three, broad CHC abilities are represented by standard scores of ≥ 90 and the remaining five or four standard scores are below average or lower, it is very likely that the individual's overall cognitive ability is below average, and, therefore, an IA-e will not be calculated. In situations where there are fewer than three broad ability scores judged to be insufficient, for example, the *g*-Value will be $\leq .50$ and the program will produce this interpretive statement on the *g*-Value tab: *According to the data provided, there are at least three weaknesses in cognitive ability domains that are important for acquiring the academic skills typical for this grade level. The individual's overall cognitive ability is not likely to be in the average range of functioning and, therefore, learning will be challenging, as ability weaknesses constrain learning and achievement*.

   In this situation, the individual's learning difficulties may be due to more pervasive cognitive weaknesses or deficits and not *specific and circumscribed* cognitive processing weaknesses or deficits, the latter of which are consistent with SLD. Therefore, the individual's learning difficulties are more generalized, affecting all or nearly all cognitive and academic areas. Individuals with generally below-average overall cognitive ability tend to need a longer time for initial learning as compared to their average achieving peers (*and* as compared to individuals with SLD); they tend to be more dependent or concrete learners who often have poor retrieval and poor comprehension. While individuals with below-average overall ability and concomitant difficulties in general learning and achievement need intervention, they typically do not meet criteria for SLD (following third-method approaches, such as the DD/C operational definition of SLD), and, therefore, a consideration of eligibility for special education services is typically not warranted. These individuals would be served well with Tier II (small-group standard treatment protocols) and Tier III (small-group or one-to-one, intensive interventions) services in a response to intervention (RTI) service delivery model. Individuals with SLD are better served in a special education setting where services are (or ought to be) *individualized* or tailored to their unique learning needs. We recognize that differentially diagnosing individuals with SLD from individuals with general learning difficulties (i.e., "slow learners") is controversial. However, in districts that have a well-run RTI service delivery model in place and that use a third-method approach to identify individuals with SLD, there is little disagreement with regard to where these individuals (SLD and "slow learner") *with vastly different learning needs and cognitive and academic ability profiles* are served. These districts (some of which are listed in Rapid Reference H.1) are exemplars of the effective integration of RTI and alternative research-based approaches to SLD identification, a combination of methods that many consider the best approach that meets IDEA statutory and regulatory requirements (e.g., Decker, 2008; Hale et al., 2010).

Rapid Reference H.1

Selected Schools and Districts that Are Exemplars of the Effective Integration of RTI and Alternative Research-Based Approaches to SLD Identification

Eugene School District 4J, Eugene, Oregon

Greenville County Schools, Greenville, South Carolina

Loudon County Public Schools, Virginia

Portland Public Schools, Portland, Oregon

Victoria Independent School District, Victoria, Texas

Washington Elementary School District #6, Phoenix, Arizona

6. In Step 2, *enter the individual's cognitive weakness or deficit score*. After enteing this score, enter the name of the composite in the space provided (optional) and then indicate whether it is a composite or a subtest score and select the cognitive area it represents from the drop-down menu (i.e., *Gc*, *Gf*, *Glr*, *Gsm*, *Gv*, *Ga*, *Gs*). This is necessary to allow the program to select the appropriate median reliability coefficient

for the score you entered (for use in subsequent analyses). This process is repeated in Step 3 for the academic weakness score. Note that if you enter a scaled score, it will be converted to a standard score automatically. In Figure H.8, note that the scores of 84 and 81 that were entered also appear in an adjacent box. This is because the scores entered were standard scores (based on a mean of 100 and an SD of 15). If a scaled score of 7 was entered in either section 2 or section 3 of this tab, for example, a standard score of 85 would appear in the adjacent box.

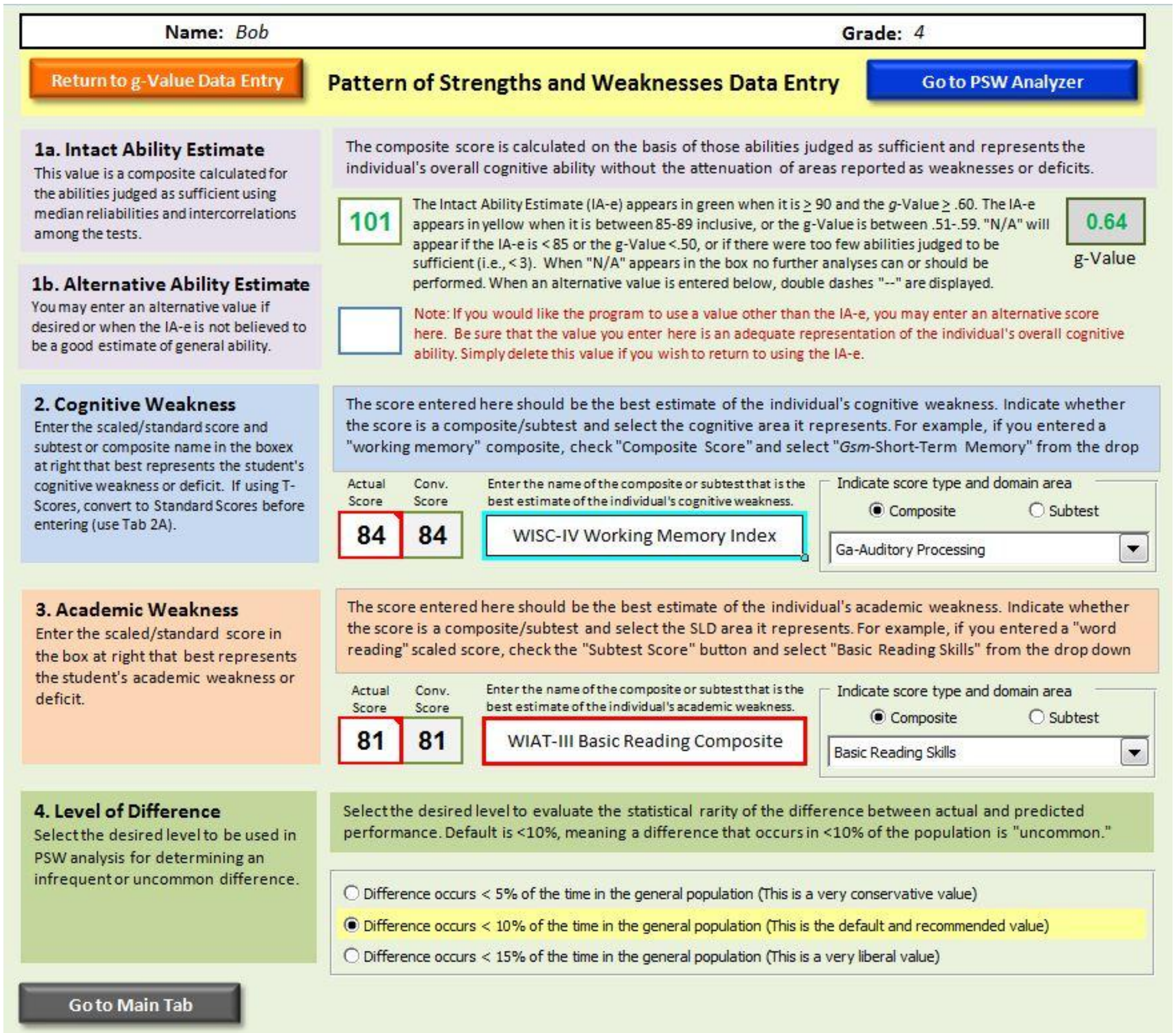

Figure H.8 Example of Values Entered for Cognitive Weakness and Academic Weakness

Note that the score you enter for a "cognitive weakness" may be a score representing an ability that you judged to be insufficient on Tab

2A. Alternatively, the score may be one that represents a cognitive area not listed on Tab 2A (e.g., executive function; orthographic processing; any one of the various narrow abilities and processes subsumed by the broad CHC abilities, such as Naming Facility [a narrow *Glr* ability] or Visual Memory [a narrow *Gv* ability]), or any broad or narrow ability composite generated by the CHC tab of the XBA DMIA v2.0.

7. Based on an evaluation of an individual suspected of having an SLD, the practitioner may have identified, for example, only one area of cognitive weakness or deficit (e.g., phonological processing) or more than one (e.g., phonological processing and working memory). For the purpose of this program, the user should enter the score (in the "Cognitive Weakness" section of this tab; i.e., Step 2) that is the best reflection of the individual's most salient cognitive weakness or deficit (e.g., in Figure H.8, a standard score of 84 was entered). Note that if the user has data to support that the individual has more than one cognitive weakness or deficit, he or she may run additional PSW analyses using the best estimate of the second area of cognitive weakness or deficit. However, *because the program does not correct for multiple comparisons, users should not conduct the PSW analysis (Tab 3B) more than twice for the same individual*. Consider this example:

    Bob has a deficit in basic reading (e.g., a standard score of 81 on the WIAT-III Basic Reading Composite). He also has a deficit in phonetic coding (e.g., a standard score of 83 on the WIAT-III Early Reading Skills subtest and a standard score of 80 on the WJ III NU COG Phonemic Awareness Cluster), as well as a cognitive weakness in working memory (e.g., A WISC-IV Working Memory Index of 84). In this example, it is not recommended or necessary to run the program multiple times, using the standard score of 83 first, the standard score of 84 second, and so forth. Instead, you should run the program using the best estimate of the individual's cognitive processing deficit (e.g., the Phonemic Awareness Cluster) and the best estimate of the individual's academic skill deficit (i.e., the WIAT-III Basic Reading Composite). If the pattern emerges, the user can support it further with additional quantitative data (along with work samples, teacher reports, and other converging data sources) as well as with the below-average working memory performance (based on the fact that working memory is a weakness for Bob and has a strong relationship with reading achievement). Alternatively, the user could run the analysis again with the working memory score of 86 to demonstrate that it is also a core weakness (assuming the SLD pattern emerges). Whether the pattern emerges or not for working memory, it is clear that: (a) Bob has a core phonetic coding deficit that significantly interferes with his ability to read, as demonstrated by a DD/C pattern consistent with SLD; and (b) Bob has a weakness in working memory that very likely contributes to his reading difficulties.

In general, it is not necessary to demonstrate the DD/C pattern more than once. This is because the DD/C pattern is not the only characteristic of SLD but rather is one of many diagnostic markers.

8. Like the cognitive area of weakness, the practitioner may have one or more scores that reflect the individual's area(s) of academic weakness. The user should enter the score in the "Academic Weakness" section of this tab that is believed to be the best reflection of the individual's most salient academic weakness or deficit. As before, indicate the name of the composite or subtest if desired, and whether the score is a composite or subtest score and select the academic area it represents from the drop-down menu (e.g., basic reading skill, reading comprehension, math calculation). Note that "spelling" is listed in the drop-down menu along with the eight areas of academic achievement included in the IDEA federal definition of SLD, although it is not an area of eligibility in the schools. Indicating the area of academic difficulty is also important for the purposes of the program because it allows the selection of both the median reliability of the specific academic area as well as the median intercorrelations between the cognitive weakness identified previously and the academic weakness being indicated at this step. Use of these values is necessary for subsequent statistical analysis of the individual's PSW.
9. The final information to consider on this tab is the cutoff level for evaluating the size or "severity" of the difference between scores in terms of degree of statistical rarity. Many state and local agencies provide guidelines for making such a determination and often specify it in terms of standard deviation units (e.g., 1.5SD) or specific score points (i.e., 23 points). Such standards represent crude attempts to ensure that the difference is large enough to be considered unusually large or severely discrepant. This concept has often been greatly misunderstood and in the context of the PSW-A, it is both improved and simplified by adopting a standard hypothesis testing model that uses actual statistical probability and its traditional cutoff values. Specifically, when determining two specific markers for SLD—that is, "domain- specific" cognitive weakness and "unexpected underachievement"— the magnitude of the difference between actual and predicted performance is evaluated to determine whether it is uncommon and would occur infrequently. The program defaults at a probability of < 10%, meaning that, given the reliabilities and intercorrelations for the specific abilities involved, as well as correction for avoiding false negatives (failure to

identify SLD when it is in fact present), the difference between actual and predicted performance would be expected to occur < 10% of the time. However, users may select a probability level of either < 5% or < 15% if there is a desire or need to use a more or less conservative level, respectively. This method is substantially better than a simple standard deviation of point score cutoff because it avoids the problems concerning imperfect correlation between and unreliability of the test scores. The bottommost portion of Figure H.8 shows that the program recommends and will automatically default to the < 10% value as this has been suggested as the most appropriate for such purposes (Reynolds, 1984–1985). Users need to physically select a probability level other than < 10% if so desired.

Tab 3B: PSW Analyzer

1. This tab reports the results of the PSW analysis based on the information that was entered on the previous tab (i.e., Tab 3A). Like the *g*-Value tab, there is no need for any user input and there is no data entry permitted on this tab. It is solely informational. Figure H.9 includes an example of an analysis of the data seen in Figure H.8.

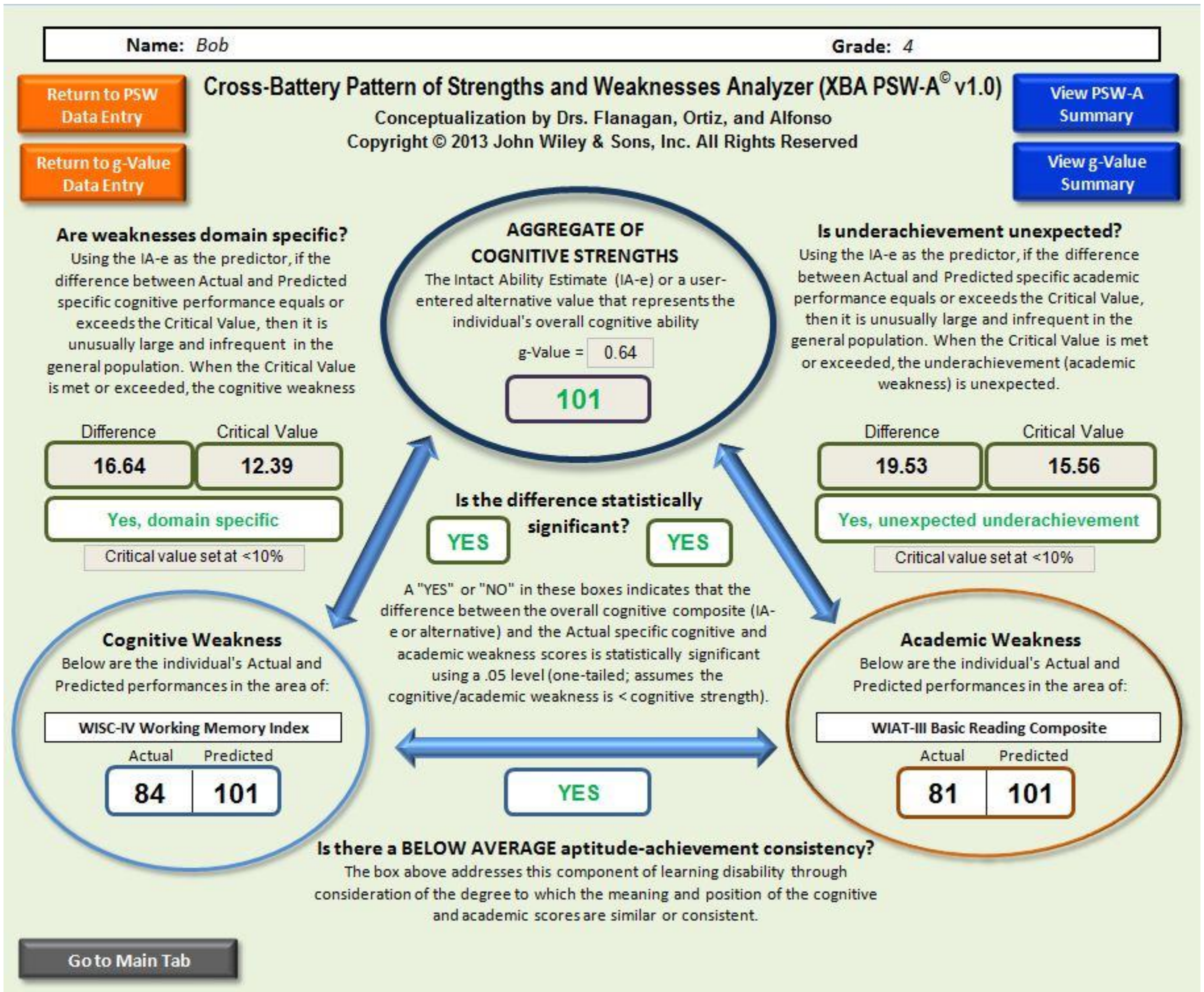

Figure H.9 PSW Analyzer Tab of the PSW-A v1.0

2. The top oval on this tab represents the individual's overall cognitive ability based on the IA-e or the alternative ability estimate (if one was used in place of the IA-e). The overall cognitive ability score is used in two specific analyses: (a) to determine if the differences between the IA-e and the scores representing the cognitive and academic weaknesses are statistically significant and (b) to predict where the individual is expected to perform in the cognitive and academic areas that were identified as weaknesses.

   The results of the first type of analysis are reported inside the "triangle" of ovals depicted in Figure H.9. The two boxes in the center of the triangle next to the double headed arrows contain either the word "Yes" or "No," indicating whether a difference between the corresponding pairs of scores is statistically significant. For example, a "Yes" in the left center box indicates that there is a statistically significant difference ($p < .05$) between the overall cognitive ability score (top oval; IA-e of 101 in Figure H.9) and the actual score representing the specific cognitive area of weakness (bottom left oval; cognitive weakness of 84). A "Yes" in the right center box indicates that there is a statistically significant difference between the IA-e and the actual score representing the specific academic area of weakness (bottom right oval; academic weakness of 81). The evaluation of statistically significant differences here is accomplished via use of both the intercorrelation between and the reliability of each score. It is only intended to represent whether the difference is real or is a true difference, not whether the size or magnitude of the difference is unusual. In many cases a statistically significant difference may not be very large or unusual.

When the difference between the score in the top oval and either of the actual scores in the bottom ovals is not statistically significant, the program will report a "No" in the corresponding boxes in the center right and left of the triangle formed by the ovals. When "No" is reported in either box, it indicates that the difference between the pairs of scores (IA-e and actual cognitive weakness or IA-e and actual academic weakness) is not significant, suggesting that the difference was most likely due to inherent unreliability or a chance occurrence. Because the two scores are not different enough to represent a true or real difference, there is no need for further analyses regarding whether the difference is unusual. By definition, a difference that is not statistically significant cannot then be unusually large or infrequent. As a result, the corresponding outside boxes will contain only dashes indicating that no further analyses or calculations were carried out. For example, Figure H.10 shows that the difference between a hypothetical IA-e of 91 and the actual cognitive weakness of 84 is not statistically significant. As such, the difference between predicted and actual performance would be commonplace, and, therefore, no values are reported in the outside left boxes.

The results of the second type of analysis are reported outside the triangle of ovals in Figure H.9. The bottom left oval includes two values; one is the individual's *actual* (or obtained) score in a specific cognitive area, and the other is the individual's *predicted* (or expected) specific cognitive score, which represents where he or she was expected to perform, given his or her IA-e. *Note that the predicted score is rounded to the nearest whole number*.

Like the bottom left oval, the bottom right oval also includes two values; one is the individual's actual (or obtained) performance in a specific academic area, and the other is the individual's predicted (or expected) specific achievement score, which represents where he or she was expected to perform given his or her IA-e. The predicted score in this oval is also rounded to the nearest whole number.

There are two boxes outside and to the left of the triangle of ovals labeled “difference” and “critical value.” The value reported in the “difference” box (i.e., 16.64 in Figure H.9) is the difference between the predicted and actual cognitive scores (from the bottom left oval). Because the predicted score is also carried out two decimal places (although not visible in the program), the “difference” reported in the program is not a whole number (i.e., it is not 17 [or the difference between 101 minus 84]) but a decimal (i.e., 16.64). To clarify, the predicted score is actually 100.64 but was rounded to 101 by the program. Therefore, the difference value of 16.64 was derived by subtracting 84 (actual score) from 100.64 (predicted score). The “critical value” of 12.39 is the value needed for the difference to be considered rare or uncommon (based on the probability level selected on the PSW Data Entry tab). Because 16.64 meets or exceeds 12.39, the magnitude of the difference can be considered to be substantial and unusual given that a difference of that size would only be expected to occur < 5% of the time.

If the inside left box displays “Yes” and the difference value in the outside left box meets or exceeds the critical value, the program displays the phrase “Yes, domain specific” in the rectangle below the “Difference” and “Critical Value” boxes (as may be seen in Figure H.9). As such, the individual’s cognitive weakness can be determined to be isolated or circumscribed (i.e., does not substantially interfere with overall cognitive ability; is domain specific) but, nevertheless, very likely contributes significantly to his or her academic difficulties.

If the inside right box displays “Yes” and the difference value in the outside right box meets or exceeds the critical value, the program displays the phrase “Yes, unexpected underachievement” in the rectangle below the “Difference” and “Critical Value” boxes. This means that the magnitude of the difference between the individual’s predicted and actual academic scores can be considered to be substantial and unusual given that a difference of that size would only be expected to occur < 5% of the time. Specifically, the individual’s academic weakness (underachievement) is unexpected, primarily because his or her overall cognitive ability is at least average, and the academic weakness is low enough in comparison to be viewed as unusual for an individual with this level of general intelligence.

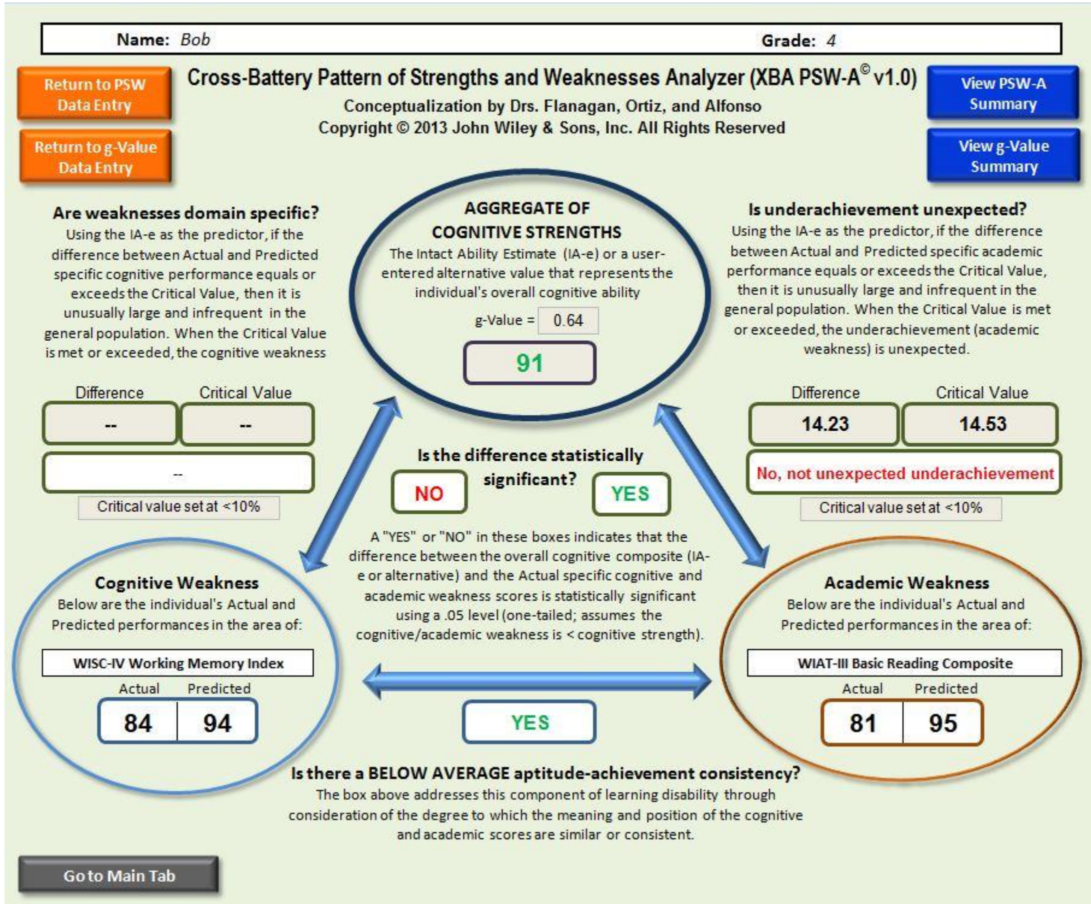

Figure H.10 Example of Scores that Do Not Meet the DD/C Pattern

There are also cases in which the inside box displays a "Yes" and the outside rectangle reports "No," meaning that a particular SLD marker is not present. For example, in Figure H.10, the inside right box displays a "Yes," indicating that there is a statistically significant difference between the IA-e and the actual academic score of 81. However, despite the fact that the difference between these two scores can be considered real and not due to chance or error, the computed difference between the predicted and actual academic scores is not greater than the critical value necessary to establish it as statistically rare or unusual, indicating that the observed difference, albeit real, would be expected to occur relatively frequently. As such, the criterion or SLD marker of "unexpected underachievement" is not met.

3. A PSW that is consistent with SLD is marked, in part, by two specific deficits and one specific consistency (i.e., DD/C), as required at Level IV of our operational definition. All characteristics of the PSW that are consistent with SLD according to our DD/C operational definition

include.

a. Overall average or better cognitive ability (top oval includes a score of $\geq$ 90)
b. Cognitive weakness or deficit (bottom left oval includes an observed score of < 90 or, more typically, a score that is approximately 1 standard deviation or more below the mean; i.e., $\leq$ 85)
c. Academic weakness or deficit (bottom right oval includes an observed score of < 90 or, more typically, a score that is approximately 1 standard deviation or more below the mean; i.e., $\leq$ 85)
d. A statistically significant difference ($p < .05$) between the scores representing the individual’s overall cognitive ability and the cognitive area of weakness, indicating that the difference is not due to measurement error or chance
e. A statistically significant difference ($p < .05$) between the scores representing the individual’s overall cognitive ability and the academic area of weakness, indicating that the difference is not due to measurement error or chance
f. **Discrepancy 1.** A difference between the individual’s predicted and actual performance in the cognitive area that was identified as a weakness where the magnitude of the difference is infrequent or uncommon. When the size or magnitude of the difference between the predicted and actual scores is uncommon (e.g., likely to occur< 5% of the time), the individual’s learning difficulties are considered to be *domain specific* (i.e., the learning difficulties are due to *circumscribed* cognitive weaknesses or deficits, as opposed to pervasive ones).
g. **Discrepancy 2.** A difference between the individual’s predicted and actual performance in the academic skill area that was identified as a weakness where the magnitude of the difference is infrequent or uncommon. When the size of or magnitude of the difference between the predicted and actual achievement scores is uncommon (e.g., likely to occur <5% of the time), the individual’s *underachievement* (as represented by the *actual* academic score in the bottom right oval) is considered *unexpected*.
h. **Consistency.** *Below-average* cognitive aptitude–achievement consistency, indicating that the specific areas of cognitive and academic *weakness or deficit* are similar in value or magnitude or have similar meaning (i.e., they are both indicative of true weaknesses or deficits). The specific rules for making this

determination are provided on the development tab and interested users are referred to it for more information.

Note that in some alternative research-based (or third method) approaches to SLD identification, there is a criterion of a nonsignificant difference between the scores that represent specific cognitive and academic weaknesses or deficits (e.g., Hale et al., 2011). In our definition, we recognize that there may be times when the difference between the scores representing the related areas of cognitive and academic weakness or deficit is statistically significant. For example, an individual may have weaknesses or deficits in related cognitive and academic areas, but the cognitive area is significantly lower than the academic area. This situation may arise or be evident when a student has been exposed to interventions, has been taught compensatory strategies and has benefited from accommodations and curricular modifications, for example. Because the specific area of cognitive weakness only *contributes to* the explanation of academic difficulty but does not explain it fully, it is important to consider other factors that influence academic achievement. In this case, the individual had a number of *facilitators* to academic performance that served to minimize the effects of his or her cognitive weakness or deficit thereby leading to a statistically significant difference between the below-average cognitive and achievement scores.

As another example, an individual may have weaknesses or deficits in related cognitive and academic areas, but the academic area is significantly lower than the cognitive area. This situation may arise or be evident when a student has not been exposed consistently to quality instruction or has changed schools several times in one academic year, for example. Again, because the specific area of cognitive weakness only contributes to the explanation of academic difficulty but does not explain it fully, it is important to consider other factors that influence academic achievement. In this case, the individual had a number of *inhibitors* to academic performance that served to adversely affect achievement beyond what would have been expected based on the specific cognitive weakness or deficit alone.

Tab 4A: Print *g*-Value

1. This tab may be accessed directly from the PSW Analyzer tab by clicking the “View *g*-Value Summary” button. This tab is provided mainly as a convenience to facilitate summary and printing of the information generated by the program. At the very top right corner of this tab is a “Print Page” button (see Figure H.11) that will call up the print dialog window automatically. Other than this button and the

black/white font and shading, it is very similar to Tab 2B (the *g*-Value tab). This tab is meant to be printed, if desired, for inclusion in a psychological report, educational folder, meeting, and so on. That is, because the tab is in black/white and not color (like Tab 2B), it will print more quickly as well as use less ink when printing on ink jet printers.

2. The printed page displays a bar graph of the seven broad cognitive abilities, as well as the *g*-Value and an interpretation of the *g*-Value. A printout of this page may be helpful when explaining that an individual can have overall average ability to think and reason, despite one or more specific cognitive weaknesses.

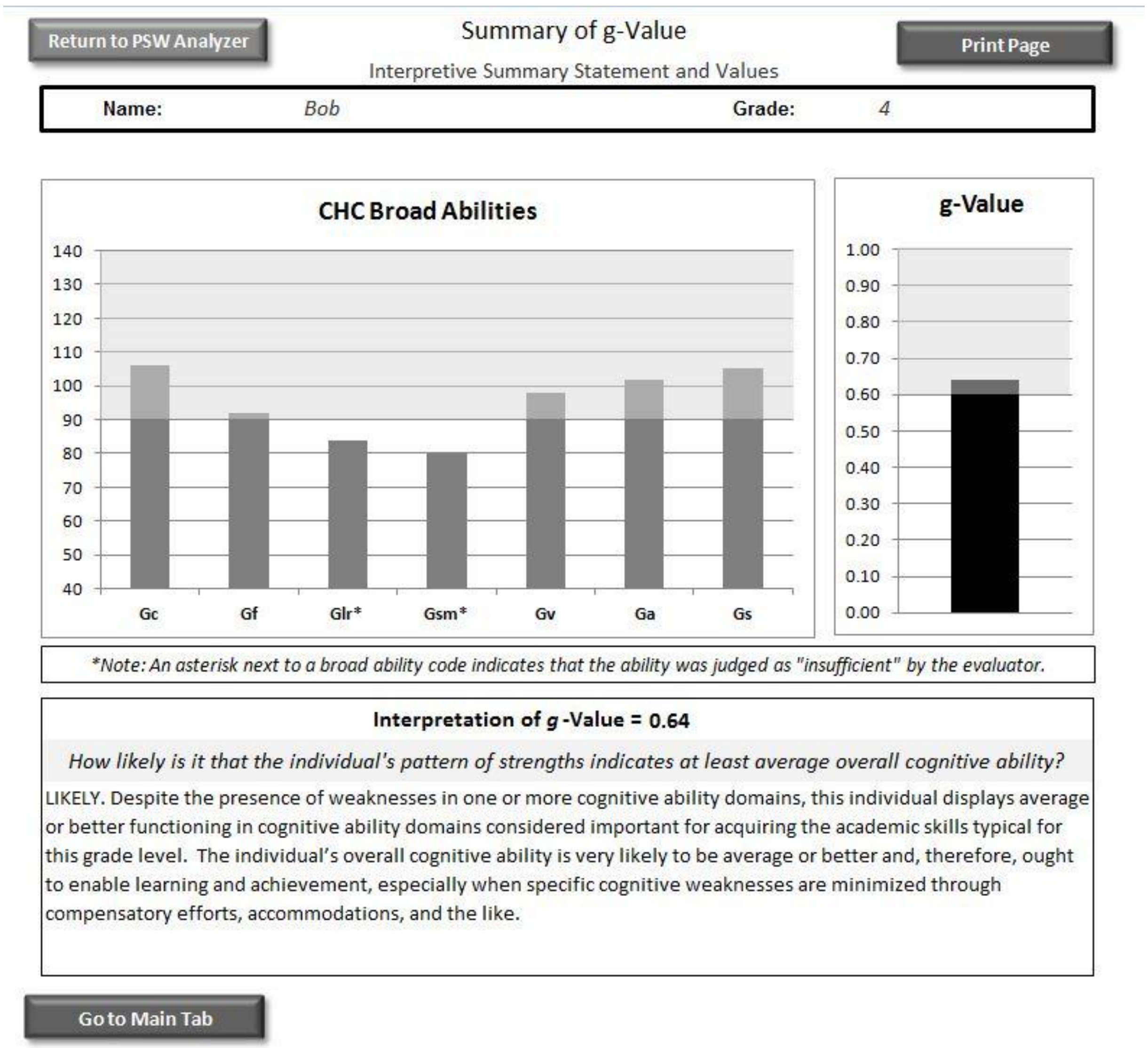

Figure H.11 Print g-Value Tab of the PSW-A v1.0

Tab 4B: PSW-A Summary

1. This tab may be the single most important tab included in the program because it answers four important questions about SLD based on the data entered:
    a. Did the individual's observed cognitive and academic performances meet criteria for a PSW consistent with SLD?
    b. Is there evidence of domain specific weaknesses in cognitive functioning?
    c. Is there evidence of unexpected underachievement?
    d. Is there evidence of below-average aptitude–achievement consistency?
2. Like the tab for printing a summary of the *g*-Value and related information, this tab, displayed in Figure H.12, has a "Print Page" button at the top right-hand corner. The information on this page appears in black/white for fast and economical printing and may be included in a psychological report or educational folder, distributed at multidisciplinary meetings, and the like. In addition, this tab contains a second page that is also a black-and-white version of the PSW Analyzer Tab that is meant to be more printer friendly. It contains all of the same information as contained on the PSW Analyzer Tab and maintains the exact same format and graphical presentation (see Figure H.13).

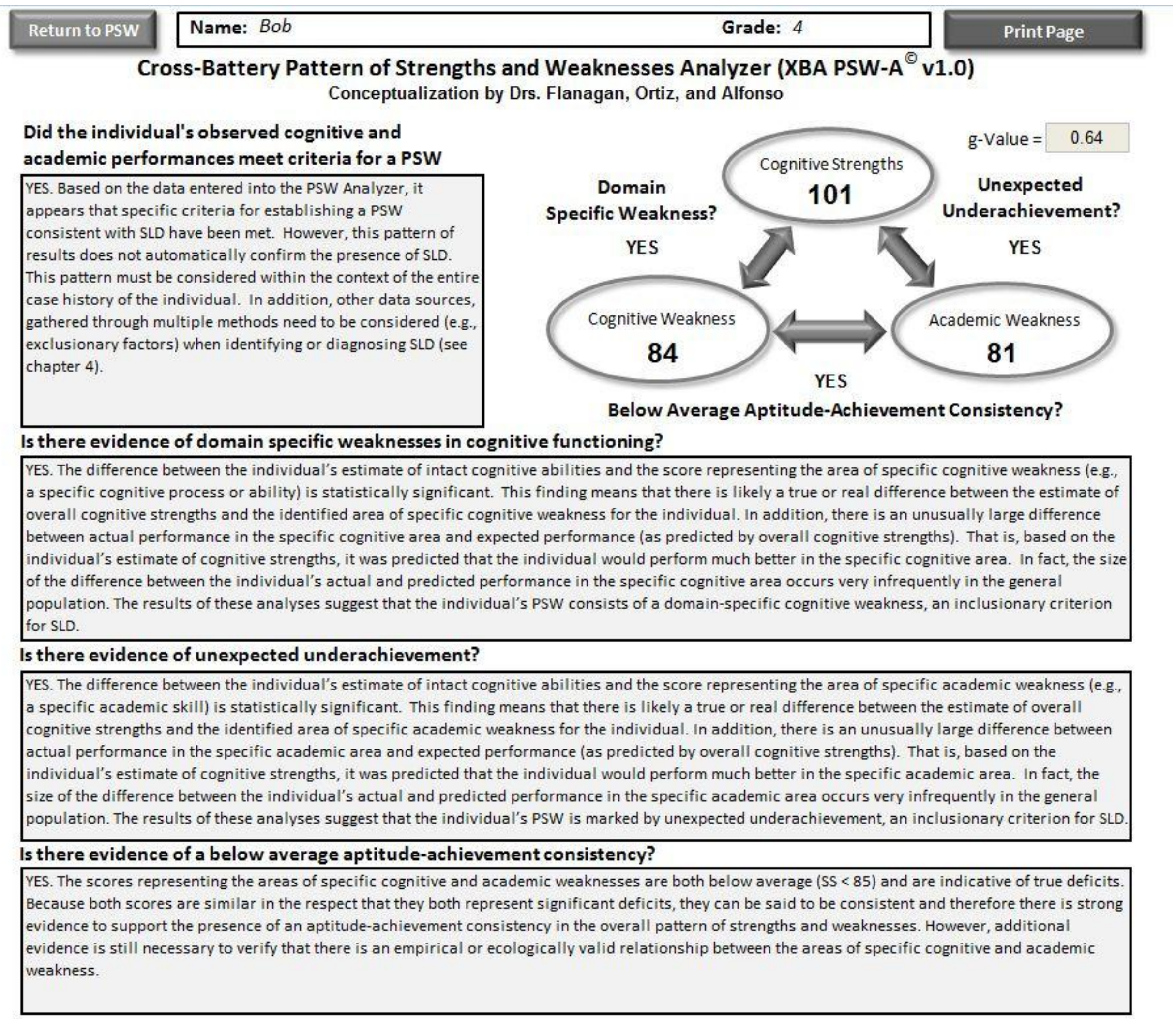

Figure H.12 PSW-A Summary Tab of the PSW-A v1.0

3. It is important to understand that if (a) a student did not respond well to quality instruction and intervention, (b) the *inclusionary* PSW criteria stated above are met, and (c) *exclusionary* factors have been ruled out as the *primary* cause of academic difficulties, it is *highly probable* that the individual is an individual with an SLD. However, the determination of SLD rests with the practitioner's evaluation of the totality of current data sources in the context of the entire case history of the individual.

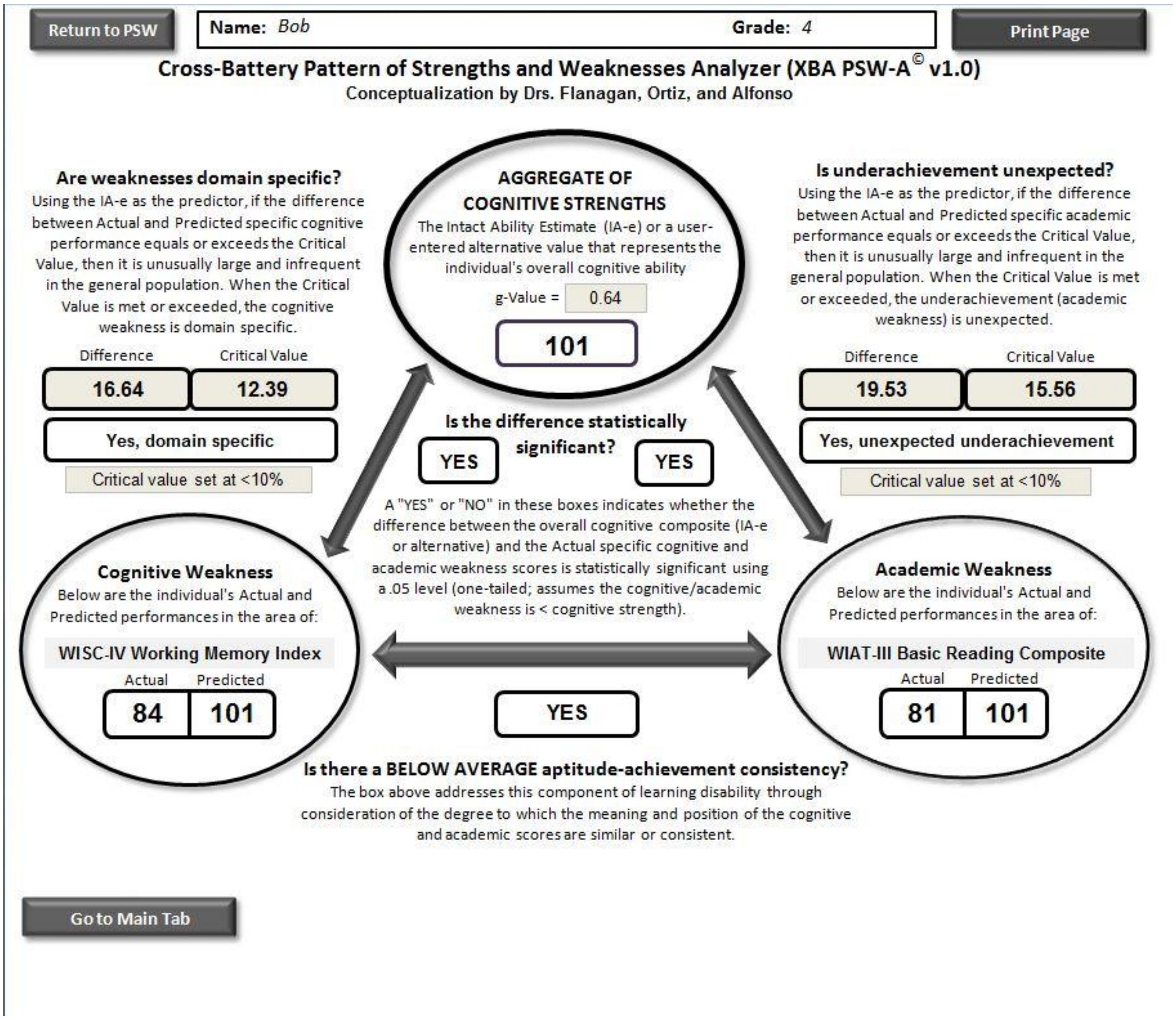

Figure H.13. PSW-A Summary Tab (Page 2 of 2) of the PSW-A v1.0

Tab 5: Notes, Instruction, and Development

1. This tab includes detailed and technical information regarding use and development of the XBA PSW-A v1.0 program, including a description of the data on which the *g*-Value is based, the formula used to calculate the IA-e, the manner in which median reliabilities and intercorrelations were obtained, and so forth. Upon reading the information on the Notes tab, it is expected that users will have a complete understanding of the specific data and formulas used in the development and programming of this software.

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