Beta Testing of the Pedestrian
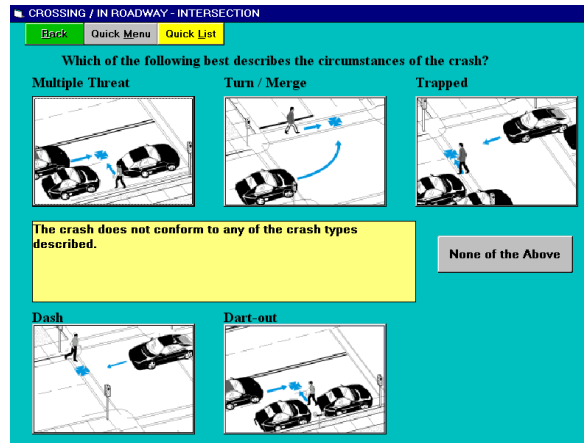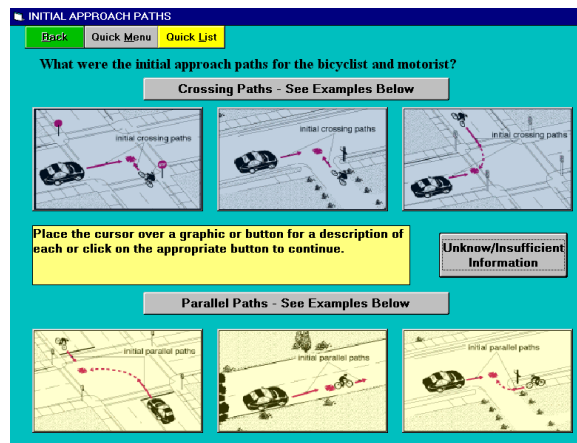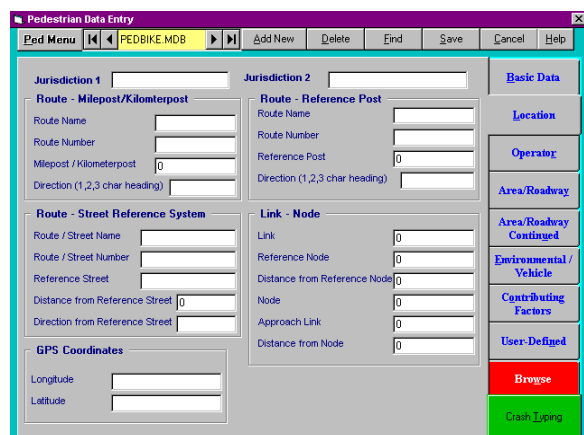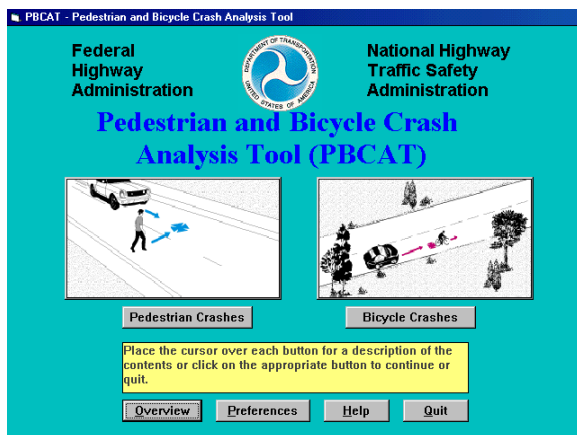
and Bicycle Crash Analysis Tool

Final Report

January 2001

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16. Abstract

The Pedestrian and Bicycle Crash Analysis Tool (**PBCAT**) is a software product intended to assist State and local bicycle coordinators, planners, and engineers with improving walking and bicycling safety through the development and analysis of a database containing details associated with crashes between motor vehicles and pedestrians or bicyclists. One of these details is the *crash type* which describes the pre-crash actions of the parties involved. This product was developed by the Federal Highway Administration in cooperation with the National Highway Traffic Safety Administration. The beta version of the software was completed in November 1999. Subsequently, the product underwent a limited beta test that involved a number of practitioners. This report documents the results of the test and provides recommended enhancements for future versions of **PBCAT**.

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Background

   The beta version of the *Pedestrian and Bicycle Crash Analysis Tool (PBCAT)* was completed in November 1999. That version of the software had undergone a number of revisions based on comments from both the project development team and a limited number of outside reviewers. Subsequently, this project was intended to expand the pool of practitioners using the software and conduct a formal evaluation of the product. The participants in the study included health and safety professionals, transportation planners, traffic engineers, and bicycle and pedestrian coordinators. Of the 20 people who agreed to participate in the effort, 12 actually completed the data entry, while 14 responded to the surveys. Provided below is a brief summary of the results from the crash typing, surveys, and follow-up evaluation.

Crash Typing Results

   Each participant in the study received a copy of the software on CD, a user's manual, 25 crash reports (13 pedestrian and 12 bicycle collisions), and several evaluation and comment forms. The first phase of the test was for the participant to enter the data from the collision report forms and "type" the crashes using the software. The completed data sets were then analyzed and compared to the "correct" answers. A complete set of results is attached. They are presented in terms of the percentage of responses that were correct, within one level of error, and greater than one level of error. Those responses that were correct had the same crash type as previously determined by the project team. The responses that were within one level of being correct were coded correctly up until the last decision was made. For example, a bicyclist being struck by an overtaking vehicle may have been coded as an overtaking vehicle that "misjudged the distance required to pass" as opposed to an overtaking vehicle that "did not detect the bicyclist." In general, these errors are not considered to be major mistakes due to the level of subjectivity still required from interpreting the crash reports and due to the fact that most countermeasures are appropriate to that level of error. Those responses that were more than one level away from being correct are considered to be more major mistakes. These types of errors generally occurred for two or three specific crashes and are discussed below.

   As shown in figure 1, 92 percent of the bicycle crashes and 89 percent of the pedestrian crashes were correctly typed to within one level of error. In general, the bicycle crashes had a higher percentage of correct answers (88 percent) compared to the pedestrian crashes (76 percent). As shown in Appendix A, only 1 of the 13 pedestrian crashes (#132105958) had an extremely high percentage of incorrect responses that was greater than one level of error. This particular collision was a very unique crash that involved a driverless vehicle, which is a very small percentage of real-world crashes. With respect to bicycle collisions, there was also one crash (#15185645) for which 33 percent of the responses were incorrect by more than one level of error. This collision involved a motorist making a right turn into a driveway and striking the bicyclist traveling in the same direction. From the crash report, however, it is

Bicycle Crash Type Assignment Error

8%

4%

Correct

Within 1 level of error

Greater than 1 level of error

88%

Pedestrian Crash Type Assignment Error

11%

13%

Correct

Within 1 level of error
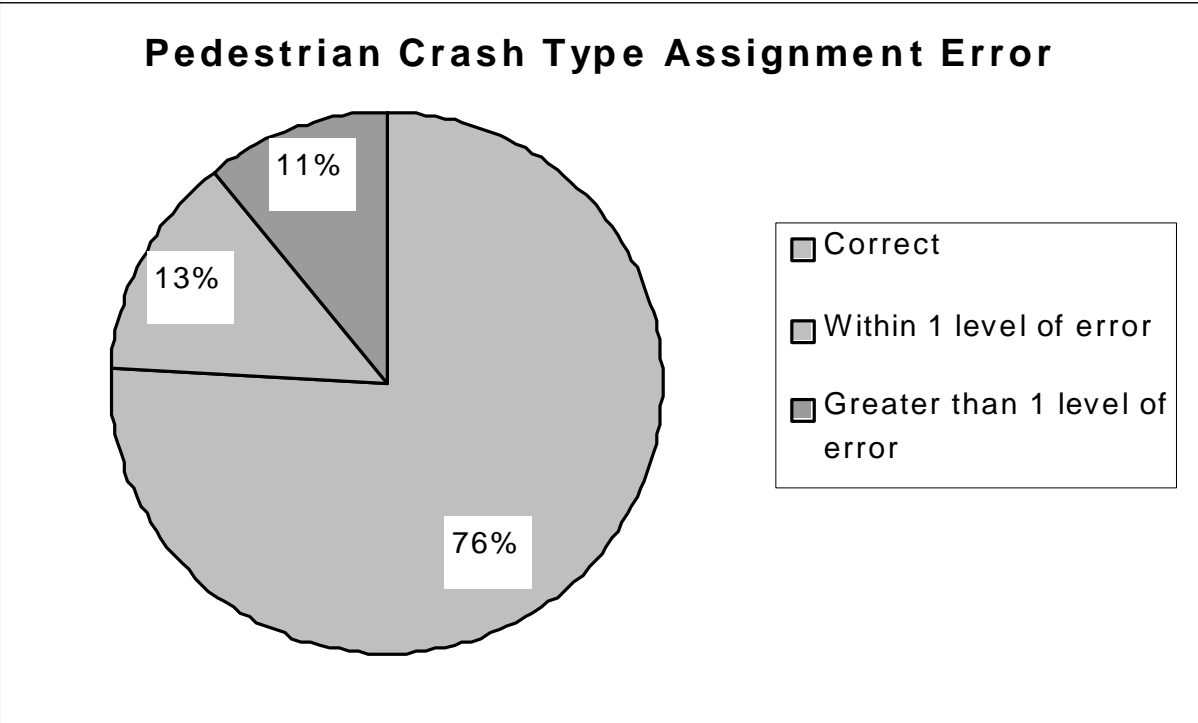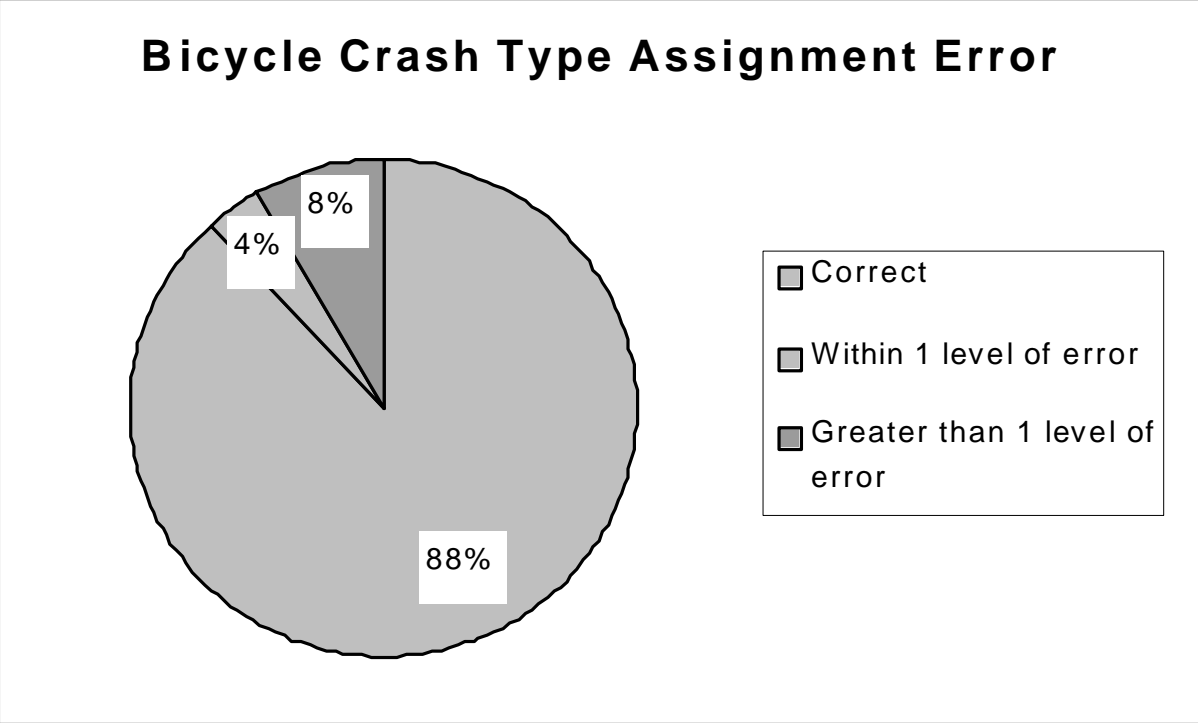
Greater than 1 level of error

76%

Figure 1. Summary of results from the pedestrian and bicycle crash typing beta test.

understandable how this crash could have been typed as an overtaking collision as opposed to a turning collision. This crash is a very good example of how the subjectivity in this methodology can never be totally removed.

Survey Results

The second phase of the study was to experiment with the other modules of the software and to assess the efficiency and utility of the product. The participants were asked to rate, on a scale of 1 to 10, each of the modules with respect to ease of use, clarity, functionality, and practicality. The complete results are provided in Appendix B. The module that received the lowest ratings, both for the software and the manual, was the database transfer application of the software. These results were not surprising, considering the fact that a person attempting to transfer data into or out of the software needs to have a limited amount of skill at manipulating databases. Unfortunately at this time, there is not an easy way to simplify this process.

Finally, the users were asked to record specific comments and errors on a separate form. These results have also been summarized and are provided in Appendix C. The errors noted by the users that have since been corrected are denoted with an asterisk. The remaining comments were addressed to the extent possible under this effort. Other comments will require follow up to more fully understand them and may be addressed as part of an updated version of the software.

Follow-Up Process Evaluation

This follow-up evaluation was designed to examine the *process* of the beta test to determine the extent to which its results can be generalized. The current assessment was also focused on obtaining a broad picture of the extent to which the participants thought PBCAT was a useful product and any suggestions they might have for improving future versions. The current process evaluation specifically excluded any focus on program "bugs" in order to maintain the discussions on a broader level.

Approach

All data for this follow-up evaluation were collected through one-on-one telephone discussions with beta test subjects. The discussions followed a topic list which was used as a guide – not as a questionnaire. These topics are presented below under "Results." Nine of the beta test participants provided input to this evaluation. The two subjects who did not provide typing data as part of the beta test were not approached, and one of the subjects could not be reached in the time available. The cooperation of all participants was excellent. There was clear and obvious enthusiasm for PBCAT.

<u>Results</u>

The telephone discussions focused on a set of eight questions or topic areas. Before turning to these specific findings, however, it is of interest to present some general results from the discussions:

C There were several bugs in the PBCAT version that was sent to the beta testers. These bugs were not debilitating and did not materially influence the results of the test.

C PBCAT generally made an extremely favorable impression on the participants. There was unanimous agreement that the program has utility for anyone who has to analyze pedestrian or bicycle crashes.

C It was apparent that PBCAT served as an excellent vehicle for teaching the concept of crash types and their relationship to countermeasures.

C PBCAT was considered easy to use. As discussed below, the beta testers were a computer literate group. Nevertheless, the discussions clearly suggested that even less experienced computer users should have no problem with the program.

How much time did you spend working with PBCAT?

Half the participants spent about three hours working with PBCAT while the balance spent approximately two days with the program. The difference was whether only the beta test assignment was completed or the tester also attempted to use the software for a real task. In either case, PBCAT was well liked and it met or exceeded expectations.

Do you think you were at the plateau on the learning curve for PBCAT when you coded the test crash reports? If yes, how long did it take? If no, why not and how long do you think it would take to get proficient?

All nine respondents felt they were at or near plateau on the learning curve for the PBCAT modules they used, primarily the crash typing module. All believed the program was easy to learn and to use.

Do you think the software functioned as if it were release quality? In other words, was the test realistic with respect to software maturity?

There was also unanimous agreement that the software had the look and feel of a release quality product. The respondents did not have the impression that they were dealing with a test version. Several volunteered that, absent the bugs that they had reported, PBCAT was ready for release.

How would you characterize your computer skills on a scale of expert to novice?

Eight of the nine participants in this follow-up evaluation judged their computer literacy as at least intermediate or higher. None encountered significant problems installing PBCAT, although several mentioned that it would only install on a "C" drive. There were numerous positive comments concerning the graphical interface of the program. There was also general agreement that it did not take a computer expert to install or operate PBCAT. The one participant, who rated himself as "close to novice" in computer skills had no problems running the program but did ask a "computer specialist" in his organization to install it for him.

Was the test representative of a real use situation? If no, why not (spent more time, spent less time, wouldn't have done it yourself)?

All participants said the test was representative of a real use situation of inputting and crash typing. Few used the output modules because their use was not part of the beta test. A few participants indicated that they would probably assign the routine use of PBCAT to support personnel in their organization.

What is your job responsibility?

The nine participants represented a broad range of job responsibilities potentially related to an interest in looking at pedestrian and/or bicycle crash data. These included:

C Researcher/program evaluator/data analysis specialist

C Bicycle/pedestrian coordinator

C Planner

C Coordinator of a broad-based community safety program.

Varying levels of management responsibility were also represented in the sample.

Would you or your organization use PBCAT? If so, for what? If not, who should use it (what is its niche)?

All participants indicated that they, their organization or the appropriate member of a partnership or coalition they belonged to would use PBCAT if and when the need to analyze pedestrian or bicycle crashes arose.

How could PBCAT be improved functionally?

In discussing this topic, it was made clear to the participants that the focus was on functions and not on more microscopic design issues such as the appearance of

screens or the methods of navigating through the program. Other than this delimitation of the scope of the question, the participants were given no specific choices for additional functionality. Their responses were totally unaided and therefore can be considered as stronger arguments for the suggested additional functions than if the choices arose from a selection list.

This topic prompted the suggestion that a link be created to a mapping or graphical information system (GIS) from virtually every respondent. The participants have become accustomed to using mapping programs to display and analyze data. They saw great potential in linking PBCAT to a GIS program so that double entry of data would be avoided. They also expressed their belief in the benefits of graphical analyses for crash data.

Many of the participants also suggested a stronger, more definitive link to recommended countermeasures. There was even the suggestion to extend this link to the single crash level. This would allow the analyst to obtain countermeasure recommendations on a crash-by-crash basis. Since few of the testers were pedestrian or bicycle countermeasure implementors, it is not surprising that they wanted additional and more precise links between the crashes they coded and the countermeasures to be employed.

Other functions that were mentioned at least once in response to this question included a module to permit the scanning of police crash reports for entry (to eliminate or minimize keying) and a link to the NHTSA standard laptop police crash reporting software.

Discussion

Almost all of the beta test subjects participated in this follow-up assessment. Therefore, it can be considered a complete picture of the test process without sampling bias. Overall, the participants found PBCAT to be utilitarian, easy to understand and simple to use. All would readily use it if they had a need to analyze pedestrian or bicycle crashes with motor vehicles.

The ability to extend the beta test results beyond the test population could be limited by several factors. First, the subject test participants did not include people who were already familiar with and using pedestrian and bicycle crash types. This led to novelty and learning factors which could have increased interest in and acceptance of PBCAT. Second, there were no police officers or police support personnel in the test. These are groups that traditionally do extensive work with crash data. Third, the participants were quite high in computer literacy. Fourth, the beta test only covered the entry and crash typing modules. There were no structured exercises for the other modules, although some of the subjects did, in fact, use them.

Although all four of the foregoing factors could potentially limit the ability to generalize the results of the beta test, it is fair to conclude that their effects were not

debilitating. Although there was a clear novelty and learning effect from the test, the participants volunteered that they considered PBCAT to be a useful long-term tool. They also were convinced that PBCAT was a time and work saver. This assessment of effectiveness should readily transfer to police or other groups that would have need of the functionality of PBCAT.

It should be noted that law enforcement personnel were also recruited to participate in this effort, since they would be another group that may be a candidate user for the software. Unfortunately, none of the individuals contacted were able to participate. The absence of police personnel in the beta test group appears to be largely an issue of face validity. While police departments are regular users of crash data, they do not typically conduct analyses that would differ markedly from those of interest to any other groups concerned with pedestrian or bicycle safety. On the contrary, it is reasonable to postulate that planners and pedestrian/bicycle coordinators involved in safety efforts would have interests that are quite similar to those of police personnel.

The high computer literacy of the test group certainly assisted them in getting beyond the few program bugs that surfaced in the test version of the software. Beyond that advantage, the above average computer skills of the participants appeared to have little impact on the beta test. Moreover, even though these people were expert, they clearly understood the limitations of novice computer users and stated the belief that even a beginner would have no problem with PBCAT, particularly after it was installed.

Since the test only covered the entry and typing modules, it could not shed light on the functionality of the other parts of PBCAT. The user interface of the program, however, was well liked by all participants and is uniform across all of the modules. It is therefore fair to conclude that the participants would also have appreciated the operational ease of the balance of PBCAT.

Conclusions

This follow-up assessment leads to the following conclusions:

C The beta test was reasonably representative of foreseeable situations of the actual use of PBCAT. Even though the sample size was relatively small, the process of the test was sufficient to have identified any major problems with the product, if they existed.

C PBCAT can be an excellent tool for introducing crash typing to a previously uninitiated audience. This is a potentially interesting additional use of the software.

C The interface design of PBCAT is good, clear, straightforward and consistent with prevailing usage for software designed to operate under Windows®.

C The instructions and program navigation are clear and intuitive. The conversations did suggest, however, that some of the users might appreciate a more complete discussion of the end-to-end process of collecting, entering, typing and analyzing pedestrian and bicycle crash data. This may be an artifact of the fact that most of the participants did not routinely work with these data.
C Their experience with PBCAT appears to have convinced the participants to use the software whenever they have a need to analyze pedestrian or bicyclist crash data. This suggests that demonstrations will be an effective tool in gaining the widespread adoption of PBCAT.

Overall, the PBCAT beta test appeared to have fully achieved the objectives of this type of assessment. The participants spent sufficient time with the software to develop an opinion about its design and its functionality. Their feedback on the test itself and during this follow-up assessment appears to have been genuine, constructive and often enthusiastic. The test results, together with the findings of this follow-up can be used with confidence by the sponsors in making decisions with respect to distribution of and enhancements to PBCAT.

Recommendations

In general, most of the participants in this test, and the last one conducted for FHWA, were pleased with the software. However, there is always room for improvement. Using the results from these tests and comments from our own project staff, the following improvements should be considered for future versions of the product:

1) Possibly reduce the number of crash types to a level that corresponds to the types of countermeasures suggested. This approach was considered when PBCAT was first conceptualized, but dropped from consideration because of the clamor for more detail from some practitioners. This issue should be revisited and considered from the viewpoints of both the researcher and the practitioner.

2) Develop a network version that would allow data entry to be completed on multiple machines in multiple offices. The data base would reside in a central location and be accessible to all remote sites.

3) Develop a web-based version that could be used on the Pedestrian and Bicycle Information Center web site. The data storage would be managed by the PBIC staff. This approach would allow for the creation of a "national" data set.

4) Enhance the countermeasures portion of the product. The countermeasures need to be more closely linked with the crash types. At the same time, there needs to be a better system for allowing users to select countermeasures. There are projects underway that will address some of these concerns. The results of these efforts need to be incorporated into future versions of the software.

5) Continue to make the product as user-friendly as possible. As the development software improves, more can be done to improve the features of the product. The version of Visual Basic available now, versus what was used to develop the software, would allow for a significant number of improvements.

6) Provide some level of product support. Currently, there is no mechanism in place to provide technical assistance to users of the software. In the short-term, this is being addressed through the PBIC.

7) Develop a long range strategy for the product, including marketing products and iterative improvements, with a goal of creating a national data set that could be used to better define pedestrian and bicycle crashes.

Appendix A - Pedestrian Crash Type Results

Reports with no type assignment error:

Report number	Crash type	Description
132105487	140	Vehicle: vehicle/object
15501971	342	School Bus-Related
93544138	214	Backing Vehicle: parking lot

Reports with type assignment error:

Report #133318204
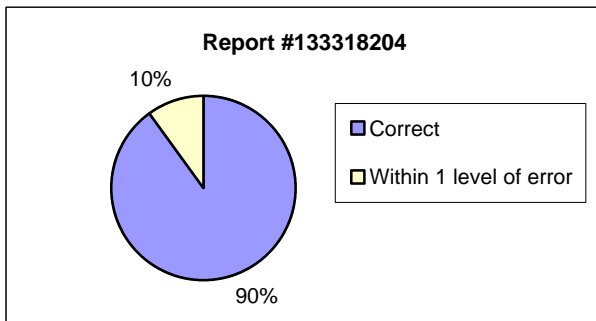
Correct

Crash type	N	Description
741	9	Dash

Within 1 level of error

Crash type	N	Description
761	1	Pedestrian Failed to Yield: walked into vehicle

Report #15393458
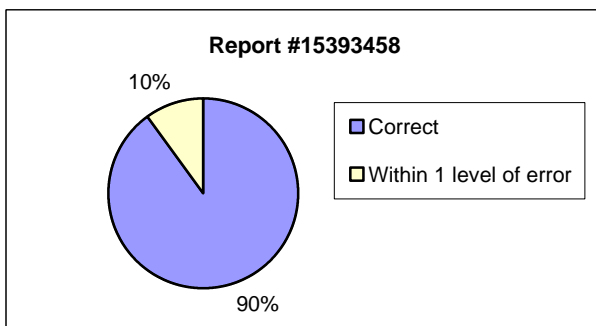
Correct

Crash type	N	Description
410	9	Walking along Roadway: with traffic, from behind

Within 1 level of error

Crash type	N	Description
490	1	Walking along Roadway: position unknown

Report #131382772
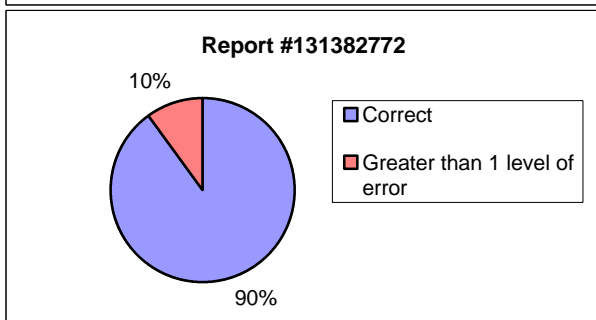
Correct

Crash type	N	Description
311	9	Working in Roadway

Greater than 1 level of error

Crash type	N	Description
770	1	Crossing/In Roadway

Report #15213139

- 20% Greater than 1 level of error
- 80% Correct
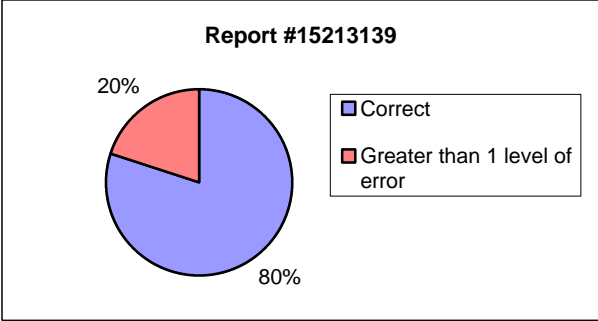
Correct		
Crash type	*N*	*Description*
710	8	Multiple Threat

Greater than 1 level of error		
Crash type	*N*	*Description*
910	2	Crossing and Expressway

Report #15329980

- 30% Within 1 level of error
- 70% Correct
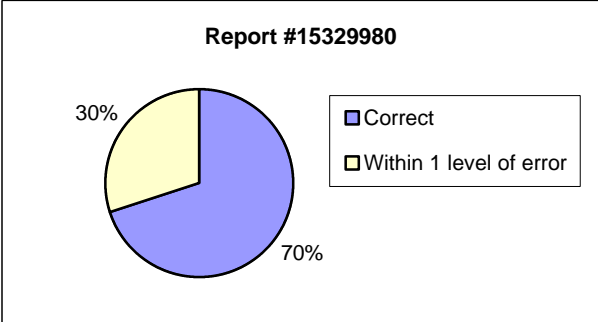
Correct		
Crash type	*N*	*Description*
724	7	Left-Turn: opposite direction

Within 1 level of error		
Crash type	*N*	*Description*
723	1	Left-Turn: same direction
770	2	Motorist Failed to Yield

Report #16320705

- 30% Within 1 level of error
- 70% Correct
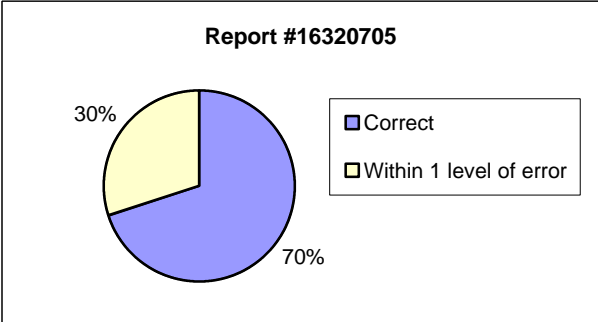
Correct		
Crash type	*N*	*Description*
770	7	Motorist Failed to Yield

Within 1 level of error		
Crash type	*N*	*Description*
729	3	Turn/Merge: direction unknown

Report #94511532

- 30% Greater than 1 level of error
- 70% Correct
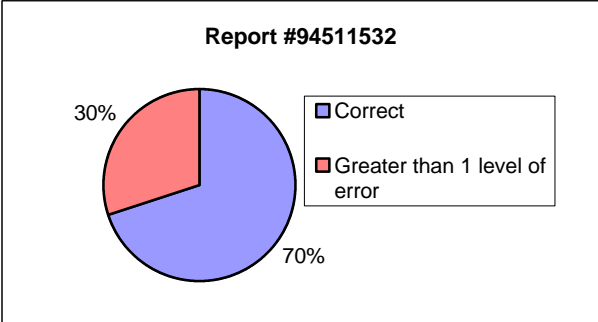
Correct		
Crash type	*N*	*Description*
820	7	Off Roadway: vehicle exiting driveway/alley

Greater than 1 level of error		
Crash type	*N*	*Description*
770	2	Motorist Failed to Yield
729	1	Turn/Merge: direction unknown

Report #132890039

45% Correct
33% Within 1 level of error
22% Greater than 1 level of error
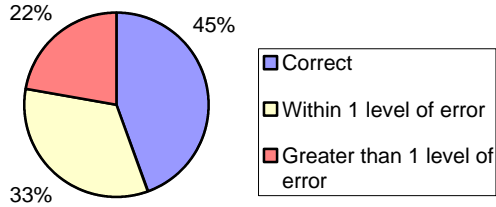
Correct

Crash type	N	Description
440	4	Walking along Roadway: against traffic, from front

Within 1 level of error

Crash type	N	Description
490	3	Walking along Roadway: position unknown

Greater than 1 level of error

Crash type	N	Description
620	1	Other: walking in roadway
761	1	Pedestrian Failed to Yield: walked into vehicle

Report #14034066

40% Correct
60% Within 1 level of error
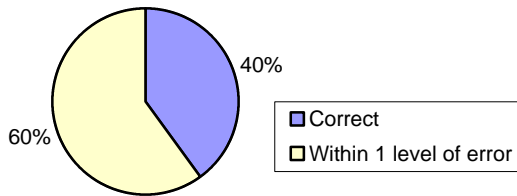
Correct

Crash type	N	Description
761	4	Pedestrian Failed to Yield: walked into vehicle

Within 1 level of error

Crash type	N	Description
741	5	Dash
742	1	Dart-Out

Report #132105958

40% Correct
60% Greater than 1 level of error
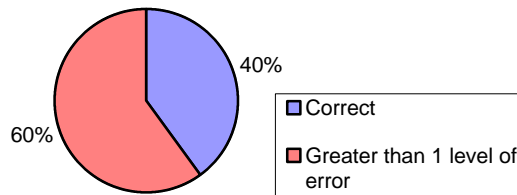
Correct

Crash type	N	Description
220	4	Driverless Vehicle

Greater than 1 level of error

Crash type	N	Description
130	6	Pedestrian on Vehicle

Appendix A - Bicycle Crash Type Results

Reports with no type assignment error:

Report number	Crash type	Description
118423979	155	Bicyclist Ride-Through: signal control intersection
122532195	311	Bicyclist Ride-Out: residential driveway
124159732	243	Bicyclist Overtaking: parked vehicle
129258570	600	Backing Vehicle
16281809	111	Motorist Turning Error: left turn

Reports with type assignment error:

Report #132769738

11%

89%

- Correct
- Greater than 1 level of error
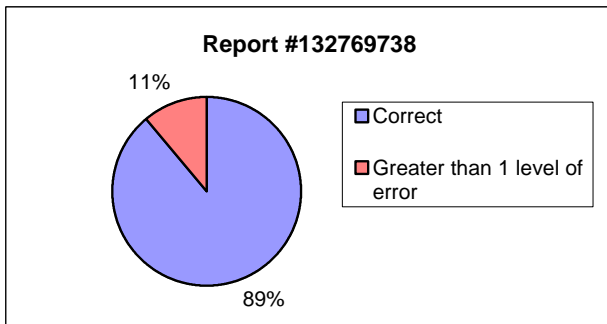
Correct

Crash type	N	Description
222	8	Bicyclist Left Turn: opposite direction

Greater than 1 level of error

Crash type	N	Description
116	1	Bicyclist Turning Error: other

Report #14947930

11%

89%

- Correct
- Greater than 1 level of error
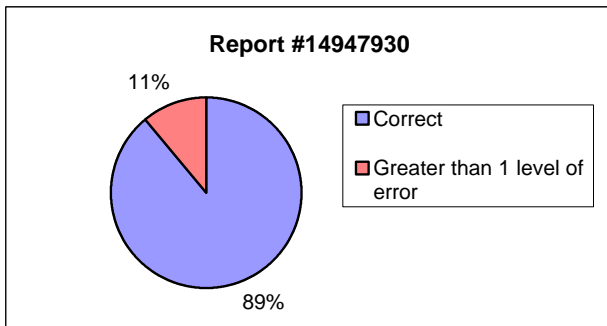
Correct

Crash type	N	Description
231	8	Motorist Overtaking: undetected bicyclist

Greater than 1 level of error

Crash type	N	Description
280	1	Parallel Path: other

Report #15222106

11%

89%

- Correct
- Greater than 1 level of error
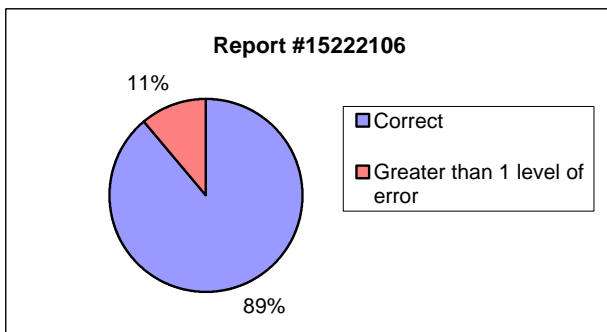
Correct

Crash type	N	Description
250	8	Head-On

Greater than 1 level of error

Crash type	N	Description
213	1	Motorist Right Turn: same direction

Report #13878309
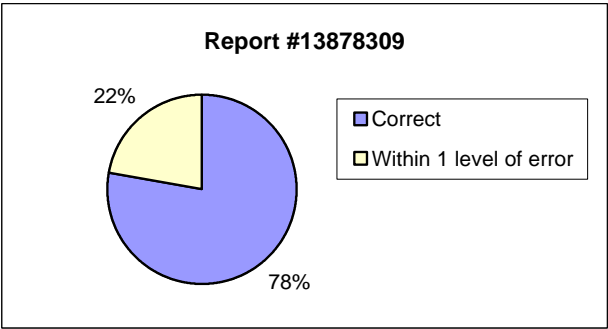
Correct

Crash type	N	Description
143	7	Motorist Drive-Through: sign control intersection

Within 1 level of error

Crash type	N	Description
144	1	Bicyclist Ride-Through: signal control intersection
141	1	Motorist Drive-Out: sign control intersection

Report #15410808
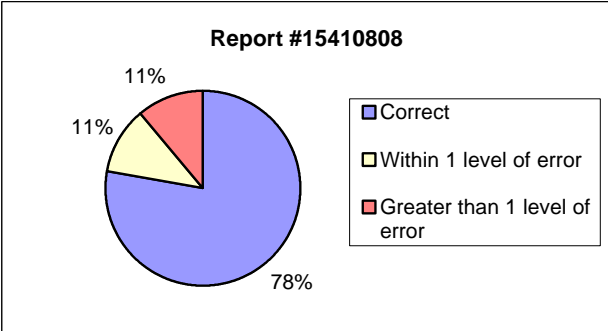
Correct

Crash type	N	Description
129	7	Bicyclist Lost Control: other/unknown

Within 1 level of error

Crash type	N	Description
124	1	Bicyclist Lost Control: surface conditions

Greater than 1 level of error

Crash type	N	Description
250	1	Head-On

Report #16448973
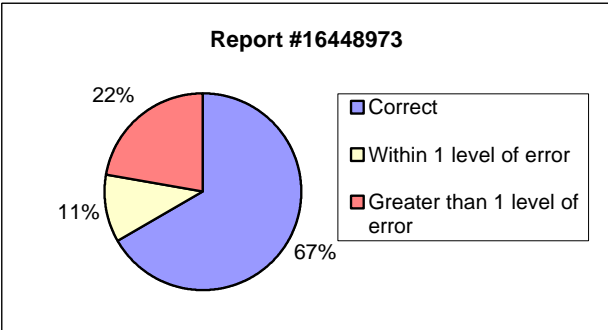
Correct

Crash type	N	Description
322	6	Motorist Drive-Out: commercial driveway/alley

Within 1 level of error

Crash type	N	Description
328	1	Motorist Drive-Out: non-intersection other

Greater than 1 level of error

Crash type	N	Description
910	2	Non-Roadway: other

Report #15185645
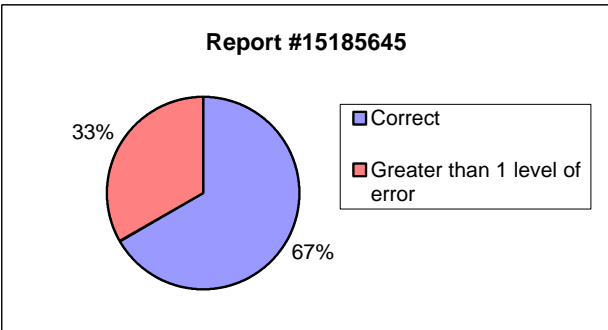
Correct

Crash type	N	Description
213	6	Motorist Right Turn: same direction

Greater than 1 level of error

Crash type	N	Description
232	2	Motorist Overtaking: misjudged space
129	1	Bicyclist Lost Control: other/unknown

		USER														SUMMARY		
Appendix B PBCAT Software Ratings		1	2	3	4	5	6	7	8	9	10	11	12	13	14	# of responses	response rate	average
Installation	Ease of use	10	7	10	10	10	10	9	10	10	5	10	10	10	9	14	100%	9.3
	Clarity	10	9	10	10	10	10	9	10	10	10	10	10	9	8	14	100%	9.6
	Functionality	10	8	10	10	8	10	7	10	10	NA	10	10	10	9	13	93%	9.4
	Practicality	10	8	10	10	10	10	8	NA	10	NA	10	10	10	9	12	86%	9.6
Startup - Overview	Ease of use	10	10	10	10	NA	10	9	10	10	10	10	10	10	8	13	93%	9.8
	Clarity	10	9	10	10	NA	10	9	10	10	8	10	10	8	7	13	93%	9.3
	Functionality	10	7	10	10	NA	10	9	10	10	8	10	10	9	8	13	93%	9.3
	Practicality	10	7	10	10	NA	10	9	NA	5	8	10	10	9	8	12	86%	8.8
Startup - Preferences	Ease of use	9	9	10	NA	NA	10	8	10	10	10	10	10	10	9	12	86%	9.6
	Clarity	9	8	10	NA	NA	10	8	10	10	8	10	10	8	9	12	86%	9.2
	Functionality	9	8	10	NA	NA	10	7	10	10	8	10	10	10	9	12	86%	9.3
	Practicality	9	8	10	NA	NA	10	7	NA	10	8	10	10	10	9	11	79%	9.2
Pedestrian																		
Introduction - Purpose	Ease of use	10	10	10	NA	NA	9	10	10	10	10	10	10	10	10	12	86%	9.9
	Clarity	10	10	10	NA	NA	9	10	10	10	10	10	10	9	10	12	86%	9.8
	Functionality	10	9	10	NA	NA	9	8	10	10	10	10	10	9	10	12	86%	9.6
	Practicality	10	10	10	NA	NA	9	7	10	10	10	10	10	9	10	12	86%	9.6
Introduction - Examples	Ease of use	10	9	10	NA	NA	8	10	10	10	10	10	10	8	10	12	86%	9.6
	Clarity	10	9	10	NA	NA	8	10	10	10	8	10	10	8	9	12	86%	9.3
	Functionality	10	9	10	NA	NA	8	9	10	10	8	10	10	9	10	12	86%	9.4
	Practicality	10	8	10	NA	NA	8	9	10	10	8	10	10	9	10	12	86%	9.3
Database Transfer	Ease of use	NA	NA	10	NA	NA	NA	NA	1	10	NA	5	10	NA	4	6	43%	6.7
	Clarity	NA	NA	10	NA	NA	NA	NA	5	10	NA	5	10	NA	4	6	43%	7.3
	Functionality	NA	NA	10	NA	NA	NA	NA	5	9	NA	NA	10	NA	3	5	36%	7.4
	Practicality	NA	NA	10	NA	NA	NA	NA	8	10	NA	NA	10	NA	4	5	36%	8.4
Crash Typing - Data Entry	Ease of use	10	10	10	10	10	7	10	8	10	10	10	8	8	10	14	100%	9.4
	Clarity	10	10	8	10	10	7	9	9	10	10	10	8	6	7	14	100%	8.9
	Functionality	10	10	10	10	7	7	10	10	10	10	8	8	8	10	14	100%	9.1
	Practicality	10	10	10	10	9	7	10	10	10	6	8	8	8	10	14	100%	9.0
Crash Typing - Typing	Ease of use	10	8	10	10	10	7	10	10	8	8	10	6	8	7	14	100%	8.7
	Clarity	10	10	5	10	10	7	9	9	8	8	10	6	6	6	14	100%	8.1
	Functionality	10	10	NA	10	10	7	10	10	9	8	7	6	8	10	13	93%	8.8
	Practicality	10	9	NA	10	10	7	10	10	9	8	8	6	8	10	13	93%	8.8
Crash Reports	Ease of use	NA	9	NA	NA	8	7	1	10	8	NA	NA	NA	NA	9	7	50%	7.4
	Clarity	NA	10	NA	NA	9	7	NA	10	8	NA	NA	NA	NA	10	6	43%	9.0
	Functionality	NA	8	NA	NA	10	7	1	10	10	NA	NA	NA	NA	10	7	50%	8.0
	Practicality	NA	8	NA	NA	10	7	NA	10	10	NA	NA	NA	NA	10	6	43%	9.2
Countermeasures	Ease of use	NA	8	NA	10	NA	NA	8	10	NA	NA	NA	NA	8	NA	5	36%	8.8
	Clarity	NA	10	NA	10	NA	5	10	10	NA	NA	NA	NA	7	NA	6	43%	8.7
	Functionality	NA	7	NA	9	NA	5	5	10	NA	NA	NA	NA	9	NA	6	43%	7.5
	Practicality	NA	7	NA	9	NA	5	5	10	NA	NA	NA	NA	9	NA	6	43%	7.5

Appendix B
PBCAT Software Ratings

		USER														SUMMARY		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	# of responses	response rate	average
Bicycle																		
Introduction - Purpose	Ease of use	10	10	10	NA	NA	10	10	10	10	10	10	NA	10	10	11	79%	10.0
	Clarity	10	10	10	NA	NA	10	10	10	10	10	10	NA	9	10	11	79%	9.9
	Functionality	10	9	10	NA	NA	10	8	10	10	10	10	NA	9	10	11	79%	9.6
	Practicality	10	10	10	NA	NA	10	7	10	10	10	10	NA	9	10	11	79%	9.6
Introduction - Examples	Ease of use	10	9	10	NA	NA	10	10	10	NA	10	10	NA	8	10	10	71%	9.7
	Clarity	10	9	10	NA	NA	10	10	10	NA	8	10	NA	8	9	10	71%	9.4
	Functionality	10	9	10	NA	NA	10	9	10	NA	8	10	NA	9	10	10	71%	9.5
	Practicality	10	8	10	NA	NA	10	9	10	NA	8	10	NA	9	10	10	71%	9.4
Database Transfer	Ease of use	NA	NA	10	NA	NA	NA	NA	1	10	NA	NA	NA	NA	4	4	29%	6.3
	Clarity	NA	NA	10	NA	NA	NA	NA	5	10	NA	NA	NA	NA	4	4	29%	7.3
	Functionality	NA	NA	10	NA	NA	NA	NA	5	9	NA	NA	NA	NA	3	4	29%	6.8
	Practicality	NA	NA	10	NA	NA	NA	NA	8	10	NA	NA	NA	NA	4	4	29%	8.0
Crash Typing - Data Entry	Ease of use	10	10	10	9	10	7	10	8	10	10	10	NA	8	10	13	93%	9.4
	Clarity	10	10	8	9	10	7	9	8	10	10	10	NA	6	7	13	93%	8.8
	Functionality	10	10	10	10	7	7	10	10	10	10	8	NA	8	10	13	93%	9.2
	Practicality	10	10	10	10	9	7	10	10	10	6	8	NA	8	10	13	93%	9.1
Crash Typing - Typing	Ease of use	8	9	10	9	10	7	10	10	8	8	10	NA	8	7	13	93%	8.8
	Clarity	8	9	10	9	8	7	9	9	8	8	10	NA	6	8	13	93%	8.4
	Functionality	8	10	10	10	10	7	10	10	9	8	7	NA	8	10	13	93%	9.0
	Practicality	9	9	10	10	10	7	10	10	9	8	8	NA	8	10	13	93%	9.1
Crash Reports	Ease of use	NA	9	NA	NA	8	7	1	10	NA	NA	NA	NA	NA	9	6	43%	7.3
	Clarity	NA	10	NA	NA	9	7	NA	10	NA	NA	NA	NA	NA	10	5	36%	9.2
	Functionality	NA	8	NA	NA	10	7	1	10	NA	NA	NA	NA	NA	10	6	43%	7.7
	Practicality	NA	8	NA	NA	10	7	NA	10	NA	NA	NA	NA	NA	10	5	36%	9.0
Countermeasures	Ease of use	NA	8	NA	10	NA	NA	NA	10	NA	NA	NA	NA	8	NA	4	29%	9.0
	Clarity	NA	10	NA	10	NA	NA	NA	10	NA	NA	NA	NA	7	NA	4	29%	9.3
	Functionality	NA	7	NA	9	NA	NA	NA	10	NA	NA	NA	NA	9	NA	4	29%	8.8
	Practicality	NA	7	NA	9	NA	NA	NA	10	NA	NA	NA	NA	9	NA	4	29%	8.8

Appendix B PBCAT User Manual Ratings		USER														SUMMARY		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	# of responses	response rate	average
Installation	Ease of use	10	10		10	10		7	10			10	10			8	57%	9.6
	Clarity	10	10		10	10		9	10			10	10			8	57%	9.9
	Functionality	10	9		10	10		9	10			10	10			8	57%	9.8
	Practicality	10	10		10	10		9	NA			10	10			7	50%	9.9
Startup - Overview	Ease of use	10	10		10	10			10			10	10			7	50%	10.0
	Clarity	10	10		10	10			10			10	10			7	50%	10.0
	Functionality	10	10		10	10			10			10	10			7	50%	10.0
	Practicality	10	10		10	10			NA			10	10			6	43%	10.0
Startup - Preferences	Ease of use	10	10		10				10			10	10			6	43%	10.0
	Clarity	10	10		10				10			10	10			6	43%	10.0
	Functionality	10	10		10				10			10	10			6	43%	10.0
	Practicality	10	10		10				NA			10	10			5	36%	10.0
Pedestrian																		
Introduction - Purpose	Ease of use	10	9		10				10			10	10		10	7	50%	9.9
	Clarity	10	10		10				10			10	10		10	7	50%	10.0
	Functionality	10	10		10				10			10	10		10	7	50%	10.0
	Practicality	10	10		10				NA			10	10		10	6	43%	10.0
Introduction - Examples	Ease of use	10	9		8				10			10	10		10	7	50%	9.6
	Clarity	10	10		8				10			10	10		10	7	50%	9.7
	Functionality	10	10		8				10			10	10		10	7	50%	9.7
	Practicality	10	10		8				NA			10	10		10	6	43%	9.7
Database Transfer	Ease of use	10	9		NA				5			5	10		4	6	43%	7.2
	Clarity	9	9		NA				5			5	10		4	6	43%	7.0
	Functionality	8	9		NA				5			NA	10		4	5	36%	7.2
	Practicality	9	9		NA				8			NA	10		4	5	36%	8.0
Crash Typing - Data Entry	Ease of use	10	9		10				9			10	10		8	7	50%	9.4
	Clarity	10	8		10				9			10	10		6	7	50%	9.0
	Functionality	10	9		10				10			8	10		8	7	50%	9.3
	Practicality	10	9		10				10			8	10		8	7	50%	9.3
Crash Typing - Typing	Ease of use	10	8		10				10			10	10		10	7	50%	9.7
	Clarity	10	7		10				10			10	10		10	7	50%	9.6
	Functionality	10	9		10				10			7	10		10	7	50%	9.4
	Practicality	10	9		10				NA			8	10		10	6	43%	9.5
Crash Reports	Ease of use	8			10				10			NA	10		9	5	36%	9.4
	Clarity	7			10				10			NA	10		9	5	36%	9.2
	Functionality	9			9				10			NA	10		10	5	36%	9.6
	Practicality	9			8				NA			NA	10		10	4	29%	9.3
Countermeasures	Ease of use	7	NA		10				10			NA	10		NA	4	29%	9.3
	Clarity	7	NA		10				10			NA	10		NA	4	29%	9.3
	Functionality	8	NA		10				10			NA	10		NA	4	29%	9.5
	Practicality	7	NA		10				NA			NA	10		NA	3	21%	9.0

Appendix B
PBCAT User Manual Ratings

		USER														SUMMARY		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	# of responses	response rate	average
Bicycle																		
Introduction - Purpose	Ease of use	10	9		10				10			10			10	6	43%	9.8
	Clarity	10	10		10				10			10			10	6	43%	10.0
	Functionality	10	10		10				10			10			10	6	43%	10.0
	Practicality	10	10		10				NA			10			10	5	36%	10.0
Introduction - Examples	Ease of use	10	9		8				10			10			10	6	43%	9.5
	Clarity	10	10		8				10			10			10	6	43%	9.7
	Functionality	10	10		8				10			10			10	6	43%	9.7
	Practicality	10	10		8				NA			10			10	5	36%	9.6
Database Transfer	Ease of use	10	9		NA				5			5			4	5	36%	6.6
	Clarity	10	9		NA				5			5			4	5	36%	6.6
	Functionality	10	9		NA				5			NA			4	4	29%	7.0
	Practicality	9	9		NA				8			NA			4	4	29%	7.5
Crash Typing - Data Entry	Ease of use	10	10		10				9			10			8	6	43%	9.5
	Clarity	10	9		10				9			10			6	6	43%	9.0
	Functionality	10	9		10				10			8			8	6	43%	9.2
	Practicality	10	10		10				10			8			8	6	43%	9.3
Crash Typing - Typing	Ease of use	10	8		10				10			10			10	6	43%	9.7
	Clarity	10	8		10				10			10			10	6	43%	9.7
	Functionality	10	9		10				10			7			10	6	43%	9.3
	Practicality	10	9		10				NA			8			10	5	36%	9.4
Crash Reports	Ease of use	8	8		10				10			NA			9	5	36%	9.0
	Clarity	7	8		10				10			NA			9	5	36%	8.8
	Functionality	7	8		9				10			NA			10	5	36%	8.8
	Practicality	8	7		8				NA			NA			10	4	29%	8.3
Countermeasures	Ease of use	7	NA		10				10			NA			NA	3	21%	9.0
	Clarity	7	NA		10				10			NA			NA	3	21%	9.0
	Functionality	7	NA		10				10			NA			NA	3	21%	9.0
	Practicality	7	NA		10				NA			NA			NA	2	14%	8.5

Appendix C - PBCAT User Comments

Note: Those comments with an asterisk were addressed as part of the final version known as release 1.00.

PBCAT Software

Installation
- We were required to close running apps prior to setup.
- Installed smoothly.
- Installed easy.
- Installation was very easy.
- Installing to D: drive resulted in errors; C: drive ok.*
- Definitely recommended to close out other programs prior to installation.
- Had to install three times before it would run, kept getting "run time 76" error message.*
- Very easy and well laid-out.
- I did not install but read thru as co-worker installed it.

Startup – Overview
- Very clear.
- This is explained in literature, so repetitive.
- Clear -- may want to add additional examples of possible variable fields (you list one example -- county).

Startup – Preferences
- Somewhat overwhelming at first, but as I began experimenting I enjoyed the extra user control.
- Good selection along with variable user defined.
- The written documentation was helpful here.
- Recommend users create database in a root directory.

Pedestrian

Introduction – Purpose
- Informative.
- Easy to understand.
- Clear.

Introduction – Examples
- Excellent.
- Good intro and runs the screens well.
- Same as bike.
- Clear.

Database Transfer
- Did not have an opportunity to use.
- Trouble with dates, year.*
- Database transfer was very hard to read.
- Did not use this feature, but instructions seemed clear.
- Didn't use.
- Not used. Did try briefly but no luck (probably due to my inexperience).
- I had a lot of trouble with the database transfer -- trouble with names of files and renaming.

Crash Typing – Data Entry
- Data entered inconsistent with data in final report. (e.g. data field).
- Very easy.
- Entered 1992 and 2092 appeared.*
- At times I wasn't sure which variable to choose. It happened very rarely.
- Confusion about codes for novices.
- After doing a few entries I started to get a good feel for the options and I felt it was straightforward.
- Simple to enter data, lots of fields (necessary) adds to input time.
- You can't tab through hit & run menu—you must use mouse to select.*
- Entry is simple, however, there was constant change between hand entries and using the mouse.*

Crash Typing – Typing
- Very interesting/engaging.
- Had to re-enter.
- Need clearer instruction to direct to the codes; need to know how to calculate military time quickly.
- On a couple of the Florida crash reports, I wanted more choices for turning movement conflicts. All directions of potential conflicts should be given as choices -- not the case as you move through the software.
- No "blame" assigned.
- I entered the whole ped data three times and was surprised to fine that I occasionally did not arrive at the same results each time.

Crash Reports
- Different format took getting used to.
- Did not use.
- Sometimes overwhelming and remembering what is what on the fields.
- Very simple and easy to use.
- Same as bike.
- Didn't use on test #2.

Countermeasures
- Did not use.
- Reviewed several, very general.
- Very useful tool.
- If you select crash group only (backing vehicle) and select view countermeasures you get crash type 110 not 211. Not clear on difference between crash type vs. crash group. Need back navigator button.
- Very broad overly general countermeasures for some crash types.
- Would rather use a cross-reference table on paper.
- Didn't use on test #2.

Bicycle

Introduction – Purpose
- Instructive.
- Easy to understand.
- Clear.

Introduction – Examples
- Nice walk-through.
- Typo in "single variable summary" -- interset --> interest.*

- Clear -- clarity of scanned graphics varies.

Database Transfer
- Did not use.
- Same trouble with dates 1992-2092.*
- Hard to read.
- Did not use this feature, again instructions appeared straightforward.
- Didn't utilize.
- Not attempted for bicycle crash reports.
- I had a lot of trouble with the database transfer -- trouble with names of files and renaming.

Crash Typing – Data Entry
- Same as ped "crash typing data entry."
- Clear and easy.
- Once familiar with the hierarchy.
- Had a little more difficulty with this batch than with ped. More to enter.
- Again clarity of instruction.
- The bicycle section took a little more getting used to the 3 choices for parallel or crossing paths.
- Very much liked more detailed options compared to old cross-fisher typing.
- Simple to enter data.
- Entry is simple, however, there was constant change between hand entries and using the mouse.

Crash Typing – Typing
- In some instances crash typing might get confusing.
- More difficult than pedestrian segment.
- Too general.
- Took a little getting used to. I did not initially realize that each picture led to different choices.
- Fine.
- No "blame" assigned -- would be useful for educational purposes.
- I entered the whole bike data three times and was surprised to find that I occasionally did not arrive at the same results each time. Determining type was easier than for ped. Differing between veh 1 and veh 2 was time consuming, but "doable."

Crash Reports
- Same as ped "crash reports."
- Did not use.
- Can help to identify.
- Very simple and easy to use.
- Still getting run-time error '383' .*
- Didn't use.

Countermeasures
- Did not use.
- Not sure these are all that useful, general fixes that border on the obvious.
- Very useful tool.
- Include bike helmet recommendation.
- Very broad overly general countermeasures for some crash types.
- Would rather use a cross-reference table on paper.
- Didn't use.

Manual Comments

Installation
- Minimum free drive space needs to be increased.*
- Prefer to use printed copy to on-screen PDF.
- I did not install but read thru it.

Startup – Overview
- The manual is very well done. Use of color is probably expensive, but really helps improve ease of use (clearly connects to what is on screen). A "searchable online" manual would be great. Overall, 8-10 for ease, clarity, function, practicality.

Pedestrian

Database Transfer
- Not done, but directions OK.
- Not enough detailed info for those who are working off higher access versions.*

Crash Typing – Data Entry
- More info regarding "save" feature.

Crash Typing – Typing
- Clear and easy to find crash type.

Crash Reports
- Not done.

Countermeasures
- Not done.
- Didn't really use this feature.

Bicycle

Database Transfer
- Not done, but directions OK.
- Not enough detailed info for those who are working off higher access versions.

Crash Typing – Data Entry
- More info regarding "save" feature.

Crash Typing – Typing
- Clear and easy to find crash type.

Crash Reports
- Very brief in manual, covered well in software example.
- Not done.