

REQUEST FOR PROPOSAL: REVISED

IMPROVING HANDWRITING FOR PARKINSON'S
DISEASE PATIENTS

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W258-02

Abstract

The purpose of this request for proposal (RFP) is to encourage the development of a solution to resolve the problem of illegible handwriting resulting from hand tremors caused by Parkinson's disease. Patients of all ages who suffer from shaky hands and arms as a result of Parkinson's disease experience great difficulty in grasping and holding small objects, especially writing instruments, and are forced to depend on other people to write.^[1] Involuntary and uncontrollable shaking of either the arms or the hands disable the user from handwriting legibly; as a result, handwriting becomes a significant challenge in the absence of fine motor skills.^[2]

Research of and contact with the target community have identified the ability to handwrite as an important skill in daily life activities involving communication.^[1] Therefore, the ability to handwrite is identified as a quality of life issue to be addressed. The resolution of this need would significantly benefit the Parkinson's disease patients psychologically in addition to allowing them to write. Parkinson's disease patients are forced to rely on family members, close friends, or "caregivers" to write.^[3] As a result of this dependence, Parkinson's disease patients have often expressed feelings of incapability and reclusiveness.^[2] Therefore, resolving this need will potentially alleviate these psychological repercussions.

The evaluation of the solution must satisfy a number of constraints and criteria relating to overall efficacy of the solution. The key aspects of the metrics for assessing the solution include effectiveness of the solution at improving handwriting (assessed by the *Handwriting Assessment Protocol* and the *Minnesota Handwriting Assessment*), weight, ability for solution to be used by multiple users, cost, energy requirements, and safety. These requirements highlight the major aspects of the community need when it is framed as an engineering design problem. As a result, the solution is to also be evaluated using the same criteria.

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Table of Contents

1. Introduction.....	2
1.1 Defining the Community	2
1.2 Need of the Community	2
1.3 Genuineness of the Community and Need.....	2
2. Current Situations and Solutions.....	2
2.1 Current Medical Treatments Available.....	3
2.2 Psychosocial Aspects of Parkinson's Disease:	3
2.3 Reference Design/Solutions	4
2.3.1 Pen Again.....	4
2.3.2 Steady Write® Pen.....	5
2.3.3 Weighted Universal Holders	5
3. Stakeholders	6
3.1 Patients:.....	6
3.2 Caregivers	6
3.3 Ontario Government:	7
4. Requirements of the Solution.....	7
4.1 Standards and Measurements of Legibility.....	8
4.2 Metrics for Solution Assessment	9
5. Conclusion	152
Appendix A.....	163
Appendix B	163
Appendix C	174
Appendix D.....	17
<u>Bibliography</u>	18

1. Introduction

This Request for Proposal (RFP) aims for a solution to a problem faced by early stage Parkinson's Disease patients. Specifically, a solution is desired to help patients who has difficulty in handwriting. Early stage Parkinson's Disease patients experience uncontrolled tremors on parts of their bodies [1], resulting in serious inconvenience in many aspect of daily lives. This RFP specifically focuses on the problem of handwriting due to the uncontrolled tremor. As discussed in the current solutions section, there is no cure to the Parkinson's Disease. Therefore, to minimize the harm caused by the disease would be an efficient way to help the patients.

1.1 Defining the Community

Our group identified the definition of the community. A community is a group of individuals in which all members share a common idea or feature or unifying goal. The community in need defined in this RFP is the early stage patients of Parkinson's Disease who experience tremors in the hands or arms.

1.2 Need of the Community

A need is a desire for a physical object, course of action, or emotional satisfaction that will enable the community with the need to improve its quality of life. The community of early stage Parkinson's disease patients who experience tremors in the hands and arms need a way to help them write more independently.

1.3 Genuineness of the Community and Need

Parkinson's Disease, as the second most common neurodegenerative disease in the world, affects a significant number of people. [2] According to data from the Parkinson Society of Canada, there exists over 100,000 Parkinson's patients in Canada alone. [3]

In addition, patients often experience tremors in hands and arms. [3] These tremors result in great difficulties in handwriting. Writing is one of the main method of daily communication, so the inability to write poses significantly negative effects on communication with other people. [4] As a result of the large population of Parkinson's patients and their inability to communicate effectively through writing, serious social and psychological issues have arose. Marc Pell, a researcher at McGill's School of Communication Sciences and Disorders, discovered that many people may develop negative impressions about Parkinson's disease patients simply because of their disability in communication. [5] Then this negative impression will affect the patients' daily communication and undermine the relation between the Parkinson Society and other people. Therefore, the resolution of the need will not only allow the community to write more independently, but also allow its members to feel more capable and more involved in society.

2. Current Situations and Solutions

Solutions to the Parkinson's disease tremor problem have been attempted through various forms of writing instruments and medical treatments. However, these solutions introduce other issues that discredit their reliability. As a result, currently there exists no suitable or efficient method to resolve the handwriting tremor issue. Some solutions which involve redesigning the pen are illustrated below in addition to medicine-based solutions.

2.1 Current Medical Treatments Available

Parkinson's disease is a multicentric neurodegenerative disorder of the central nervous system. Most symptoms of Parkinson's disease result from the severe loss of cells that generating dopamine in parts of the midbrain. [6] The cause of this disease is unknown yet. [7] Tremors, rigidity and slowness of movement are the most common and noticeable symptoms of early stage Parkinson's disease. (See Appendix C for definitions of medical terms).

Current treatments are capable of controlling the Parkinson's symptoms and improving function capacity substantially, especially in early stages. Levodopa is the most widely used and most efficient drug to improve Parkinson's disease symptoms since. [7] Additional medications like dopamine agonists and MAO-B inhibitors also work effectively for different symptoms. [7] However, it is reported that long-term use of medication control will result in less responsive pharmaceutical effecting for postural instability. [6] Side effect brought by medication, for instance motor complications, is an additional challenge for Parkinson's Disease management. Although the control of motor symptoms has fast developed with new medical treatments, Parkinson's disease is still an incurable progressive disease. [6] No treatment can perfectly arrest the process of Parkinson's disease. Proper therapies for postural instability and cognitive impairment are inadequate. Even dopamine therapy, which is the most efficient treatment we have yet, is far from perfect. For early stage patients, rigidity get improved steadily over the first 3 months after starting treatment, but the tremors are more difficult to control. [6] A more comprehensive understanding of the cause of the disorder still should be seen as the core direction for future treatments and further research.

To conclude, thousands of Parkinson's Disease patients in early stage are still experiencing symptoms, especially hand tremors, due to the current medicine's imperfections. More technical and social supports are required critically to help people who suffer from Parkinson's disease and assist them in daily activities and actions like writing.

2.2 Psychosocial Aspects of Parkinson's Disease:

A research that investigates the situation of Parkinson's Disease patients across the United States, Canada, Japan, Italy, and Spain with a short questionnaire shows the mean age of patients in this survey is 68.35. 58.5% of them are male and 41.0% are female and over total 812 patients participates. [8] The research states that 30-40% of Parkinson's disease patients are constantly affected by non-motor symptoms like depression and anxiety. Depressive features largely result of neurotransmitter abnormalities in the brain. [9] Nevertheless, the decline in physical capacity due to impairment of motor function also will generate a feeling of anxiety and depression. [10] As the symptoms of Parkinson's disease grow progressively, patients will gradually experience the difficulty in maintaining independence, lowered self-esteem and limitations in social interaction. [10] And then, those difficulties and limitations will result in even more depressive emotions like disengagement from work, feeling of isolation from society and greater dependence on others. [10]

Depression and anxiety are important determinants of quality of life; therefore, early treatments and intervention are critical. However, pharmacological treatments of depression and anxiety can have negative side effects and can even exacerbate symptoms in patients with Parkinson's Disease. [11] There is a need for alternative treatment approaches to help Parkinson's Disease patients improve depression and anxiety by restore their physical capacity. Writing skill is a fundamental requirement of an individual to feel satisfied with his life. Thus, a efficient writing utensil can potentially go past the limitations of physical incapability, thereby reducing the probability of being diagnosed with depression.

2.3 Reference Design/Solutions

Available on the market currently are specialized pens designed to improve writing control and stability. These pens are not designed specifically for Parkinson's Disease patients with hand tremors; however, they gauge accurately what is currently available for improving handwriting legibility. As a result, a few of these products will be assessed for their design. These products include the Pen Again, the Steady Write Pen, and Weighted Universal Holders.

2.3.1 Pen Again

Pen Again is an ergonomic writing device developed by Pacific Writing Instrument, Inc., designed to reduce the amount of stress normally experienced by users of standard pens. [12] This writing instrument is designed to be a Y- shaped pen in which the user's index finger fits inside the branch of the "Y". (Refer to Figure 2.21.1 and 2.21.2). [13] This design does benefit those with Parkinson's disease since it deals with three major hand-relating symptoms that early stage PD patients experience [14]; hand stiffness, joint swelling and hand tremors. It takes advantage of the natural shape of the hand, by allowing

the index finger, cradling inside the Y shape, to steady the hand. As a result, the stress caused by conventional pen writing can be spread out over the whole arm instead of just on fingers. Pen Again reduces the amount of gripping and provides guidance in the motion of writing, which compensates the loss of control for PD patients. [15]

However, although Pen Again promotes efficiency and comfort of writing, it has weaknesses. Pen Again cannot be refilled, and is expensive for a writing utensil. [13] The pen can be hard to pick up and may require lengthy learning time, especially for Parkinson's disease patients with tremors, to adapt to using it.



Figure 2.3.1.1 [13]



Figure 2.3.1.2 [13]

2.3.2 Steady Write® Pen

The Steady Write pen is writing instruments designed to help reduce the difficulties experienced by users with hand disabilities (i.e. Parkinson's disease patients and arthritis) and increase the smoothness and clearness of handwriting. This writing device has a base with a shape of triangle (refer to Figure 2.3.1.2), which enhances the stability of the instrument. In addition, this pen can be used both for left and right-handed people. Steady Write allows users to keep writing in the traditional way, which requires thumb and index finger to support each other from both sides of the writing device with the other three fingers (refer to Figure 2.3.1.1 [16]). The weighted base allows the pen to resolve the issue of hand shaking in the vertical direction. Moreover, Steady Write is refillable. And, the retail price of a single Steady Write pen is around six to eight dollars [16], which is more expensive compared to more common pens.

Another flaw of the Steady Write pen is its size; it occupies a large amount of space and is inconvenient to carry around. More importantly, for Parkinson's disease patients with hand tremors, the pen does little to prevent horizontal (parallel to page) shaking.



Figure 2.3.2.1 [16]

2.3.3 Weighted Universal Holders

Weighted Universal Holder is a writing device designed ease the process of writing by adding weight to the pen, making user's hand writing clearer and darker. The weighted penholder has plastic contoured handles to improve the user's grasp and control of the pen(refer to Figure 2.3.3.1 [17]). There are generally two models of these holders; the pediatric model and adult model. The pediatric model weights 4 oz. and is 3 1/2" long [17], which can hold pens up to 5/16" in diameter, whereas the adult metal has a weight of 7 oz. and length of 5" and allows pens of 1/8" to 7/16" to fit. The holders also come in plastic or metal.

One of the disadvantages of this product is the inconvenience with putting pens inside the weighted holder. In order to fit smaller pens into the holder, three long screws have to be used, causing significant inconvenience for users with hand controlling problem. The weighted pen alleviates some of the shaking problem, but still does not resolve the issue.



Figure 2.3.3.1 [18]

The above three designs have specific features that help solve handwriting problems experienced by early stage Parkinson's Disease patients. On the other hand, these writing instruments all present certain disadvantages, which are critical to the effectiveness of the problem being dealt. Pen Again is not refillable and has relatively high retail price compared to other writing devices [13]; Steady-Write pen has a bigger physical shape and little effect against horizontal shaking; and a Weighted Universal requires users to manually adjust the instrument to fit in pens with different sizes. The influences of these weaknesses may seem subtle on normal pen users, but can be extremely inconvenient for PD patients who have difficulty controlling their hands and suffer from hand tremor and stiffness.

3. Stakeholders

This section will discuss the relevant stakeholders including patients, caregivers, Hospital & Charity Associations and Government. Interviews were also conducted with stakeholders (see Appendix D).

3.1 Patients:

The Parkinson's disease patients are the most significant stakeholder. The annually cost of Parkinson's medications is about \$12,000. [3] However, the average income for working-age adults with disabilities is \$29,393, which is 22.5% lower than the average of \$37,994 for working-age adults without disabilities. [19] These data means it may be a problem for those patients with low income to afford the large expense of \$12,000.

Specifically, ease of use of design is an important factor that patients will interested in. It refers to how easily patients can implement the design independently. Ease of use is important because Parkinson's Disease patients will gradually lose independence of writing due to tremor and rigidity on muscle [20] and therefore they may have problems in handling complex instruments. Ease of use can help patients handle the design more easily and decrease the difficulty in writing.

In addition, as previously mentioned in the genuineness of need and the current treatment section, writing is a major way of communication and losing this ability may cause psychological issues such as depression and anxiety of patients. Therefore, by solving the problem of writing, not only the patients can write more independently and but also their ability of communication is strengthened.

3.2 Caregivers

Caregivers of Parkinson's Disease patients are a critical stakeholder in this community. Caregivers usually have a very close relationship with PD patients, as they are usually family members. Especially for more advanced Parkinson's disease patients caring for them is a fairly demanding task. The caregiver's burden refers to the strain of physical, mental, and socioeconomic problems experienced by the caregivers. [21]

According to the study paper that represent the perspective from caregivers of patients with Parkinson's disease, almost 75% of caregivers are spouse of the patients, 18% are patients' children and the rest have other relationships. [22] Thus, the major group of PD caregivers is not professional, which implies financial burdens due to time required to care for PD patients. An article from the Journal of Clinical Nursing took Singapore as a sample and conducted a thorough examination of the experiences of caregivers. [21] The research suggested that negative effects on the caregivers is a psychosocial issue that needs more concern. Many caregivers stated that care-giving had restricted their life and they now lacked the freedom to plan their schedule and lacked rest. [21] The research also revealed the needs of caregivers

for improved caregiver supports. Caregivers suggested that the health care system could be improved if a more integrated approach to providing PD services were adopted. [21] A caregiver stated:

"I keep saying we need better services and solutions. What we have now is not enough and it's all over the place. The hospital could package services into one center with one slot of time where you can do a speech (speech therapy), Physio (physiotherapy) and all that." [21]

A similar conclusion is given by another study journal which aims at assessing the quality of life of caregivers and identifying the causes related to caregiver strain. [23] The improvement of patients' disability may reduce caregiver psychosocial burden like strain.

Impact of Parkinson's disease on quality of life of related people has been a significant issue not only in psychosocial aspect but also in the economic aspect. Parkinson's disease is associated with a significant burden of illness and direct cost such as hospital care, drugs, physician care, and rehabilitation. Direct medical, physician care and hospital care only take about 15% of the total economic burden in Canada [3]. Indirect cost like long-term motor disability is the heaviest burden, which accounts for 71% in total cost for Canadians. [3] Efficient facilities and aids are required to liberate both patients and caregivers from the restriction and high cost of home health care. If there are devices that can help patients to work and live more independently, for instance, a device that benefits patients in terms of writing, the quality of both patients' and caregivers' lives will improve considerably.

3.3 Ontario Government:

The Ontario Government has invested a large amount of money to help Parkinson's community. With the increasing trend in the number of Parkinson's patients, [24] the government funding in Parkinson's Disease has increased to 100 million dollars per year including hospital care, drugs, physician care and research. [3] Furthermore, there are over 400 million dollars indirect cost to the society due to premature mortality and long-term disability of patients caused by Parkinson's Disease.

Solving the writing problem of Parkinson's Disease patients is beneficial to the Ontario Government from the economical aspect and social aspect. Firstly, increasing the Parkinson's Disease patients' writing ability can relieve their disability and strengthen their working ability in employment. [19] This will release a lot of labour force and therefore decrease the indirect cost to the society due to premature mortality and long-term disability. Also, the cost of the Government on caregiving will decrease. Secondly, as discussed before in the genuineness of need and the current treatment section that inability to writing may cause some psychological issues. Due to the large population of Parkinson's Disease patients in Ontario, [3] the psychological issues of Parkinson's Disease patients may result in more serious social problem. [3] Therefore, solving the writing problem of Parkinson's Society can maintain the social stability.

4. Requirements of the Solution

The problem of Parkinson's Disease patients to handwrite illegibly arises from the hand tremors they experience. The multidirectional shaking of the patients' hands makes grasping and holding in place a writing utensil very difficult as the tremors are involuntary and uncontrollable. As a result, the inability to control the hand tremors is the problem that solutions must address.

This section will outline the objectives, standards for solution assessment, criteria, and constraints for the solution to improving handwriting for patients affected by tremors caused by the Parkinson's Disease. Several factors regarding aspects of the solution, such as cost, weight, universality, etc, will be categorized with metrics by comparison to statistical research and standards.

4.1 Standards and Measurements of Legibility

The overall legibility of handwriting is due to a significant number of smaller factors. (Presented in the table below.) Resources such as the CanChild Handwriting Assessment Protocol 2 ed, measure factors such as pen grip position, writing speed, pressure of the grip on writing utensil, deviation of letters from marked lines, etc. [25] However, other writing standards, such as the Minnesota Handwriting Assessment (MHA), assess the quality and legibility of hand-written words by considering factors such as the relative sizes of the letters, the average spacing between words, and how distorted a letter appears to a reader. [26]

These qualifiers of legible handwriting are used primarily to assess the writing proficiency of young children, typically those who are in early grade school. Very few resources were found that actually measured writing legibility in adults or even older children. Since the assessments are concerned only with the legibility of written work, and do not present any correlations between the age of a writer and the legibility of his/ her written work, it is reasonable to use these standards and assessments in the metrics for the purpose of this RFP.

The CanChild Handwriting Assessment Protocol considers the presence of tremors to be a significant factor in the assessment for legibility, however research shows that the way in which a writing utensil is gripped does not affect legibility. [25] [27] See Appendix A. As a result, the solution need not be specialized for specific writing styles, enabling the design space to remain open-ended.

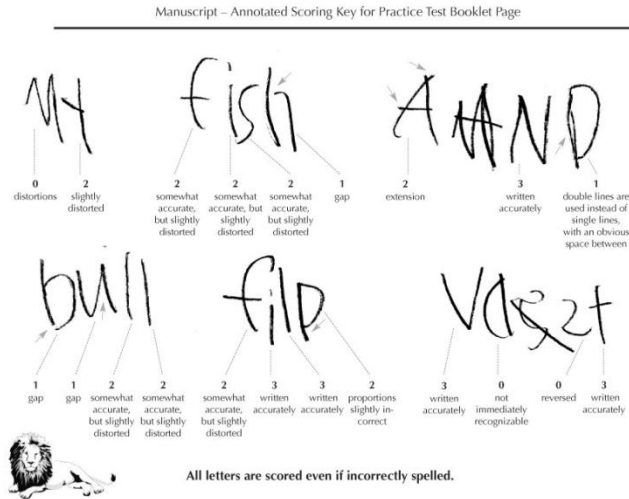


Fig 4.1.1 Sample of Handwriting Assessment from the MHA [26]

4.2 Metrics for Solution Assessment

The metrics in the table below will provide a criteria for the efficiency of the solution in improving the legibility of writing as well as physical design aspects of the solution. The handwriting standards and protocols, mainly the Handwriting Assessment Protocol and the MHA, will be used mainly in providing metrics for assessing legibility.

High-level objectives for the solution include the ability to allow Parkinson's Disease patients of all ages to handwrite in a way that is simple and easy to implement.

Table 4.2.1 Evaluation Metrics, Criteria, and Constraints for Potential Solution

Design Aspect	Objective	Metric	Constraint	Criteria
Legibility of Handwriting with Solution				
Writing Speed	To enable the user to write at a speed equivalent to the writing speed of a person without hand tremors [25]	The words per minute (WPM) written count will determine the writing speed [28]		The WPM count should fall within an acceptable range of the average WPM for the particular age group. See the average handwriting speeds in Appendix B

Evidence of Vibration in Writing	To allow the user to produce text that shows no signs of vibrations or writing utensil oscillations/ shaking	The presence of wavy or shaky lines in letters and words will be checked and counted	The solution should also show a noticeable improvement in letter smoothness compared to handwriting without the solution's aid	
Relative Size of Letters	To allow the user to write the letters within the lines of a ruled sheet of paper	Have no letters exceed the boundaries of the ruled lines/ margins [29]	The solution must allow the user to write letters that fit within the horizontal lines of ruled note paper [29]	
Width of Spacing between Words	To allow the user to position words at an appropriate distance from each other [25]	The average distance between words relative to the size of the letters will be measured	The spacing between letters should be no more than the width of two letters	
Darkness of the Writing	Darkness of the writing is an indication of the pressure exerted on the writing utensil by the user. [28] Solution should aim to allow the user to write without pressing too hard	The number of smudges caused by pressing the writing utensil too hard is an indication of how dark the writing is/ how hard the user is pressing and how violently the user's hands shake		Almost no smudges present in writing
Letter Positions Relative to Each Other	To enable users to write letters on the same line/ parallel with each other [25]	If a straight line can be drawn across the bottom of every letter		To have most of the letters be on the same line according to the MHA

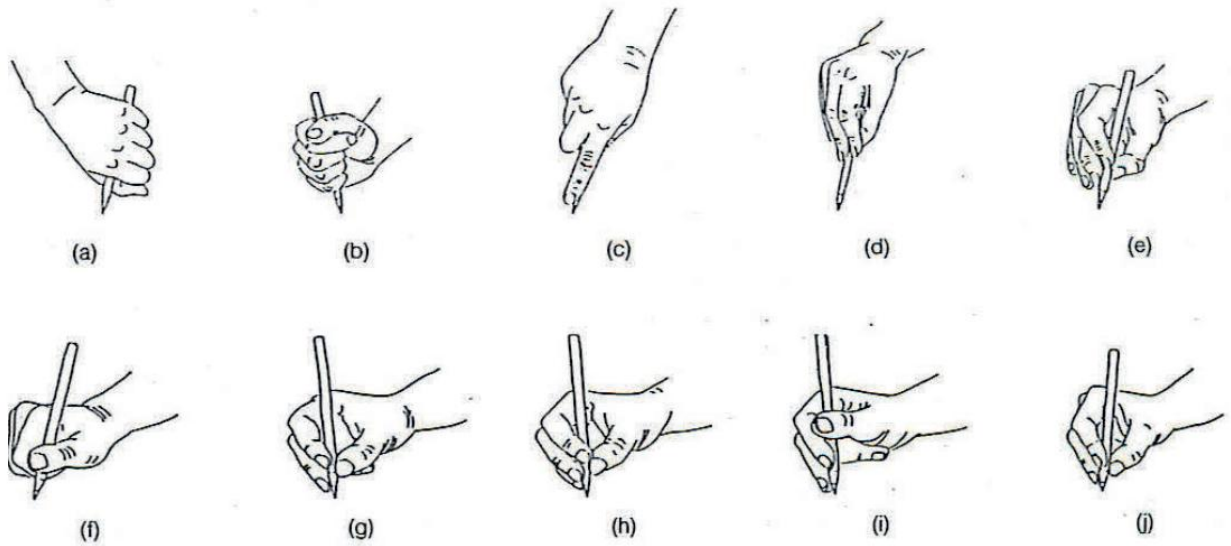
The Solution				
Complaint of Pain or Fatigue	To allow the user to write comfortably [27]	If the user complains about pain in the fingers or fatigue in the hand caused by the solution	The solution should not cause significant pain or fatigue in the hands, fingers, or arm	
Cost	To allow the solution to be affordable for most people	The total cost of the solution (production costs and material costs in dollars) will be used to determine its value		It is preferred that the cost be lower than or equal to the cost for current similar solution attempts, for instance the PenAgain™ [13]
Universality	To allow multiple users of all ages/ hand sizes to be able to use the solution	If similar results can be achieved for all users of the solution		An improvement in the legibility of handwriting regardless of the hand physique of the user
Writing Utensil Costs	To allow for as much supplies to be used as would an ordinary writing utensil	If the solution requires pen ink, then the rate at which it uses ink should be no greater than that of a traditional office pen		Similar ink/ refill requirements as office writing utensils
Operational Energy Costs	To allow for simple operation as the absence of batteries or external power supplies would make the solution easier to operate as well as reduce its weight	The presence of energy requirements (batteries, cables, etc)		No external energy requirements for solution to operate

Physical Size	To allow the user to easily move the solution/ carry with the user	Comparison to the size of a pen/ glove	Must not exceed the size of an average hand. (8.4cm by 18.9cm) Solution would be too cumbersome [30]	
Weight	To allow the user to use the solution for extended periods of time without feeling fatigue	Physical weight. Comparison to the weight of a normal writing apparatus.	Should not exceed the weight of a heavy writing utensil, such as a marker. Otherwise, the solution would be too fatiguing to use for extended periods of time.	

5. Conclusion

Through investigating the community of patients experiencing Parkinson's early stage symptoms, it is discovered that the problems associated with writing due to hand tremor and stiffness can be extremely inconvenient, and can even result in social and psychological issues. Since there is currently no cure for Parkinson's disease or medication that effectively deals with hand tremors and muscle stiffness specifically for Parkinson's disease patients, the community needs a solution to allow Parkinson's disease patients to feel more capable through writing independently. Some suggestions for the next step in the design process will be to gather more information about human hand ergonomics and relate the knowledge to the design of a helpful solution for Parkinson's disease patients.

Appendix A



(a) radial cross palmar grasp; (b) palmar supinate grasp; (c) digital pronate grasp, only finger extended; (d) brush grasp; (e) grasp with extended fingers; (f) cross thumb grasp; (g) static tripod grasp; (h) four fingers grasp; (i) lateral tripod grasp; (j) dynamic tripod grasp. Retrieved from Schneck & Henderson (1990), used with permission.

Appendix B

Table 1: Descriptive statistics for typing and handwriting to dictation.

	Mean	Group 1 (N=439)		Group 2 (N=513)		All (N=952)	
		SD	Mean	SD	Mean	SD	
Typing	No. of words typed	150.45	51.79	157.55	46.78	154.28	49.26
	Typing speed (wpm)	21.49	7.40	22.51	6.68	22.04	7.04
Handwriting	No. of words handwritten [computer estimation]	146.57	34.82	149.13	27.89	147.93	31.32
	Handwriting speed (wpm) [computer estimation]	20.94	4.97	21.30	3.98	21.13	4.47
	No. of words handwritten [human count]	145.27	34.65	147.76	27.71	146.60	31.14
	Handwriting speed (wpm) [human count]	20.75	4.95	21.11	3.96	20.94	4.45

Appendix C

Medical words and phrases are defined in this appendix section. [31] [32] [33] [34]

multicentric neurodegenerative:

Of, relating to, or being a progressive loss of neurologic functions in multiple centers.

dopamine:

a neurotransmitter in the central nervous system, retina, and sympathetic ganglia, acting within the brain to help regulate movement and emotion: its depletion may cause Parkinson's disease.

Levodopa:

a synthetic substance, $C_9H_{11}NO_4$, that is converted in the brain to dopamine: used chiefly in the treatment of parkinsonism.

dopamine agonists :

A type of medicine with similar effects as Levodopa.

<http://www.webmd.com/parkinsons-disease/dopamine-agonists-for-parkinsons-disease>

MAO-B inhibitors

Monoamine oxidase inhibitors (MAOIs),

for more information, visit <http://www.everydayhealth.com/health-center/mao-b-inhibitors-for-parkinsons-disease.aspx>

pharmaceutical effecting

of or relating to drugs used in medical treatment

motor complications

A complication is a medical problem that occurs as a result of another illness or disease

Appendix D

The following questions and responses were from a stakeholder interview. Karen Ray, the Manager and Knowledge Translator from Saint Elizabeth Health Care provided the following answers to the questions.

1. What is the average duration of the early stages of Parkinson's disease?

Not sure there is an average duration....

2. At what age do tremors usually occur in Parkinson's disease patients?

Again not sure there is a defined age....look at Michael J Fox...

3. What difficulties do tremors pose in handwriting?

Well there are several Symptoms that are classic to Parkinson's....the tremors themselves are problematic....and the disease also makes joints and tissues very stiff....as well there is a classic symptom they call 'pill rolling tremor'...and lastly symptoms are usually worse in the distal limbs.....so I think all these things make handwriting or any hand work difficult.

4. What are some early stage Parkinson's disease symptoms involving hands other than hand tremors?

As far as I know tremors are the usual early stage

5. What are some social and psychological results of patients who are unable to handwrite due to tremors?

I would imagine that the loss of any function would be difficult...these days with computers....I would think the loss of handwriting per se wouldn't be that problematic....but maybe other abilities with your hands

6. Do the tremors make the patients feel incapable/ dependent when writing?

These days with computers maybe not? But maybe if you had a hobby or activity that is dependent on handwriting maybe?

7. What percentage of PD early stage patients have trouble writing things (holding pens) due to hand tremors?

I think the holding and writing may be shaky....sorry have no idea about the percentage....might find that online?

8. How do the hands respond in holding objects or pressing things down? (i.e. a pen in writing)

Not sure exactly what you are trying to get at here....I don't think the pressure is the problem.....shaking, stiffness and pain or usually the problem

9. Are there current solutions to solve or alleviate the problem of handwriting caused by the tremors? If so, what are they?

you need to ask the OT this question....

10. How do you think the resolution of the handwriting problem would benefit the social and psychological well being of the patients?

I am sure it would be the problem but again today people are probably using more computers....having said that that may not be possible if the tremors are really bad....I think though that the loss of function would be psychologically difficult....more because it indicated probably the first of many losses...

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