

Request for Proposal

REDUCING THE DISCOMFORT OF WEARING HEADSETS WITH
GLASSES FOR TORONTO POLICE COMMUNICATION OPERATORS

ABSTRACT

Reducing the discomfort of wearing headsets with glasses

Every year, the Toronto Police Service receives around 1.2 million emergency calls, out of which 730,000 calls are dispatched [1]. This is accomplished by the dedicated community of the Toronto Police Communication Operators. Two hundred and fifty in number, they are a group of well trained, constantly alert individuals who work 8 hour shifts with numerous technologies to deliver an appropriate and timely response to calls for help [2].

Although well equipped to handle emergency situations, the communication operators themselves face many restrictions due to their work. Among these is the need to wear a headset continuously throughout their eight hour shift. About one third of this community wear glasses and experience discomfort when they wear their headsets in addition to their glasses [3]. This Request for Proposal seeks a solution that reduces the discomfort caused by wearing headsets with glasses without compromising the efficiency of the communications service.

The need to relieve this discomfort and potential distraction comes from the context of emergencies and the need for them to multitask many tools; operators are constantly in a high stress situation, and any distraction will hinder them from making timely and accurate responses [3]. In response to this problem, a number of operators have switched to contact lenses [5], but this has not proved to be a satisfactory solution. The motivation for this unresolved problem is ensuring the comfort of a community of individuals that must put the needs of others before their own in preserving public safety.

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1. INTRODUCTION TO COMMUNITY

Communications Services is one of the specialized operational command services provided by the Toronto Police. Its purpose is ensuring the public have quick access to emergency services by providing an efficient communications centre. The call centre located at 703 Don Mills Road is the Public Safety Answer Point (PASP) for the city of Toronto. 250 Communications operators work at the centre, answering over 2,000,000 calls per year [1]. Among these, about 1.2 million calls are emergency (9-1-1), while the rest are non-emergency (416-808-2222) [2]. Figure 1 depicts how Communications Services fits into the overall structure of the Toronto Police.

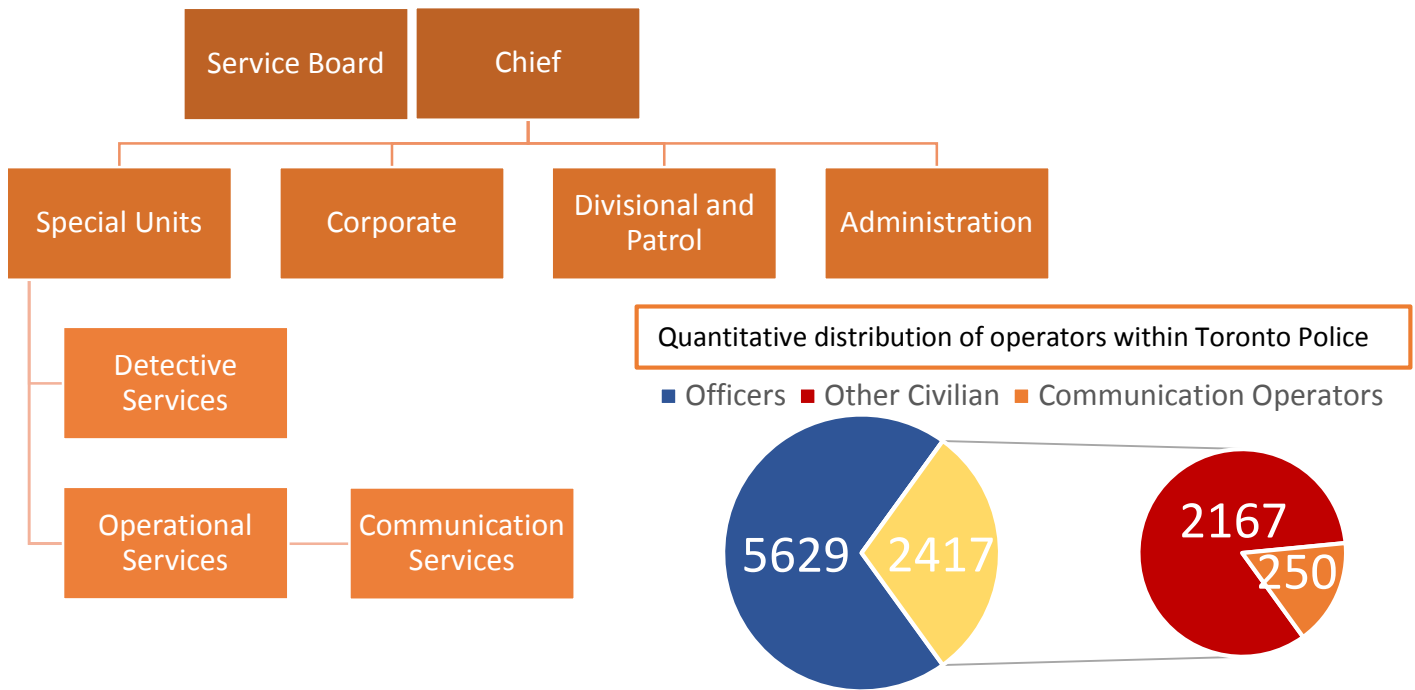


Figure 1. Organization and distribution of communication service operators within the Toronto Police [2].

Operators at the communications centre are organized by task in order to generate an appropriate emergency response. Communication operators are split into two roles: call-taking and dispatching. Call-taking operators answer both the emergency and non-emergency calls and also handle internal requests. Those appointed for dispatch direct police officers on the road to answer calls for service, manage requests for information from officers and oversee multiple radio equipped units, including uniformed divisional, plain clothes, and specialized units [1].

A communications operator's role is to act as the first point of contact, initiate appropriate responses, collect and document critical information, and make quick, accurate, and critical decisions [3]. As will be described in the section to follow, the Communications Services centre attempts to provide its operators the equipment and environment to accomplish these tasks in the most effective manner.

2. COMMUNITY DETAILS

Details about the operators at the Communications Services centre have been subdivided into four sections below: the community's needs, values, work flow, work schedule, work equipment and existing measures to improve comfort.

.2.1 Needs [Appendix A] [4]

- Ability to easily read condensed information off of multiple monitors
- Ability to hear and relay information while operating Computer Aided Dispatch (software), portable radios, and telephones
- Ability to work effectively under high stress and rapid pacing

2.2 Values [2] [4] [5]

- High incoming and outgoing sound quality
- Convenience in putting on and removing headsets in between breaks
- Prevention of eyestrain
- Physical comfort during prolonged work

2.3 Work Flow [Appendix B] [6]

The Communications Service is split into 5 platoons, which is an organizational unit sharing the same schedule. Each platoon has a strength of about 40 and is divided between the roles of call takers and dispatchers. Call takers always receive the call first, transfer to fire or EMS as appropriate, but continue to listen to the call until the call is complete and forwarded to dispatch. Dispatchers then communicate with officers to coordinate arrival at the scene. Figure 2 illustrates this process.

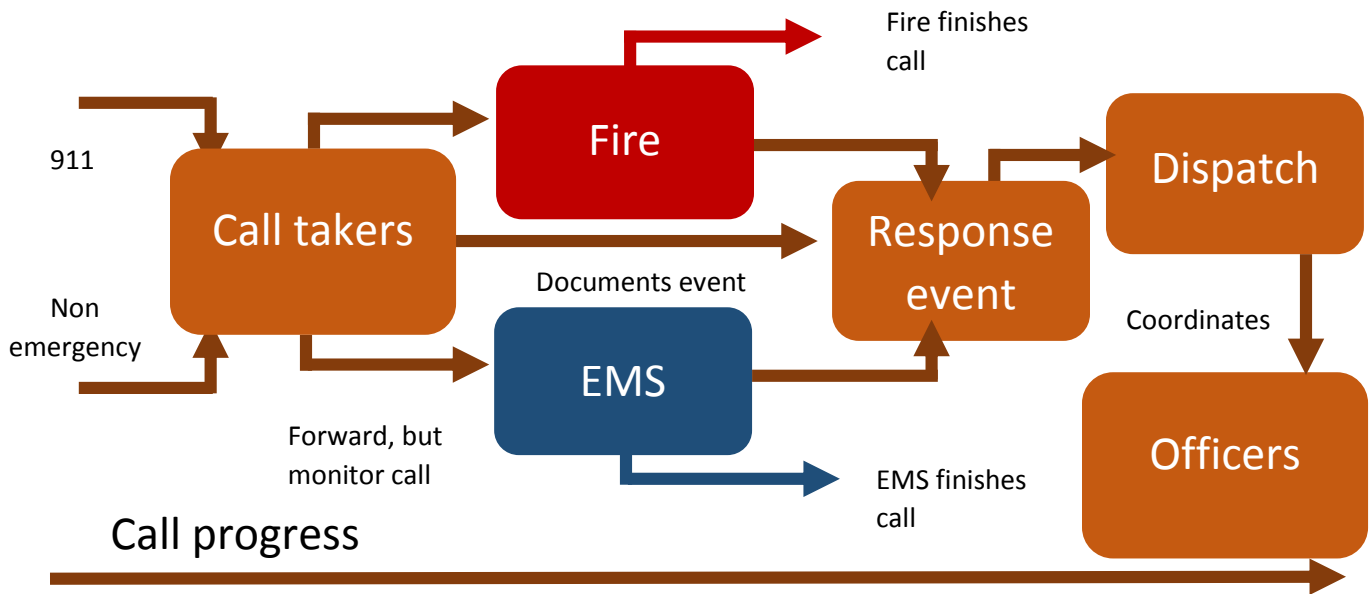


Figure 2. Flowchart of call progress.

2.4 Work Schedule

At one time, 3 platoons are working and 2 are resting [6], according to the 35 day schedule cycle illustrated by Figure 3.

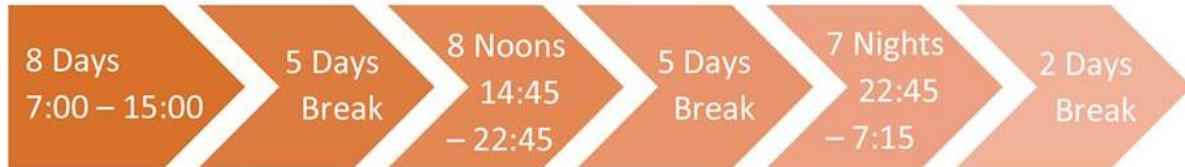


Figure 3. Operator 35 day schedule cycle and length of shifts.

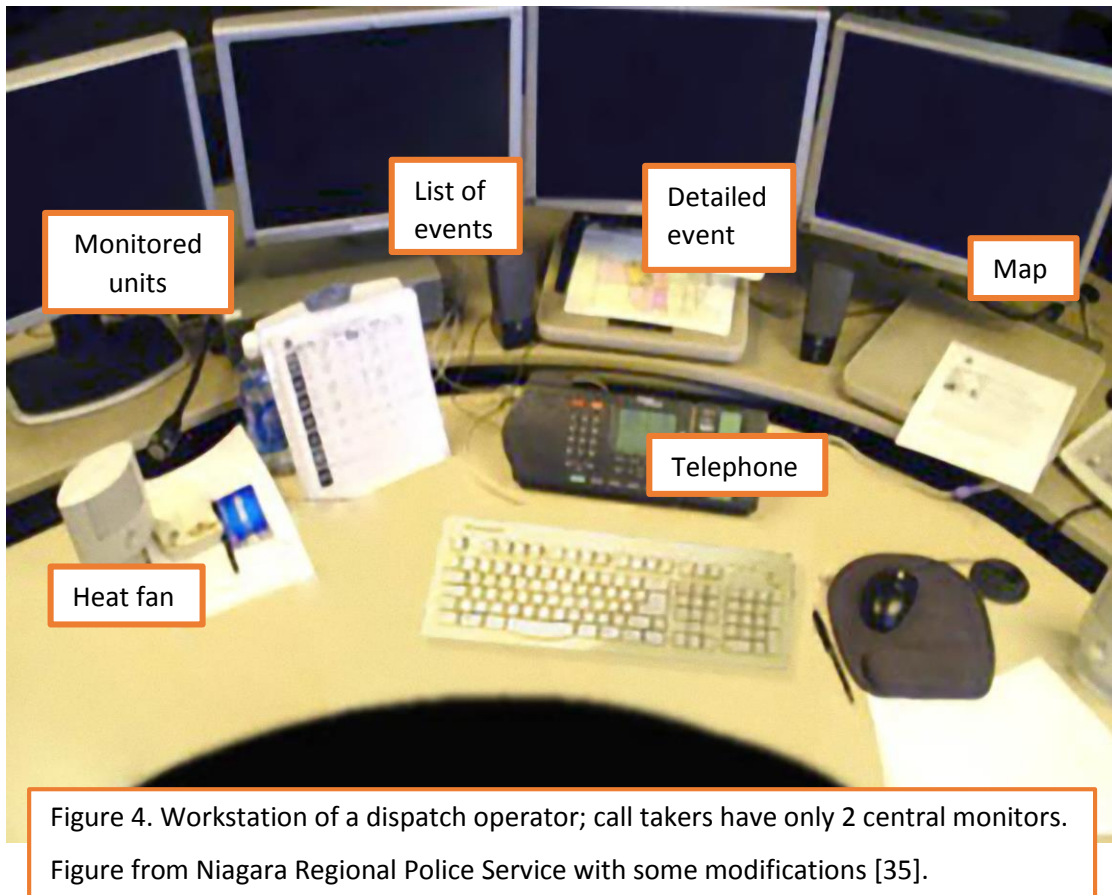
Each platoon is at a different stage of the cycle, ensuring each shift is covered by a platoon at all time. Apart from two scheduled 15 minute and one 45 minute break, each operator must remain at their desk for the entirety of their 8 hour shift [6]. Any additional breaks require permission from a supervisor. Further still, a pilot 12 hour shift schedule will be launched on February 17, 2014 [6], increasing the headset's continuous wear time.

The irregular schedule requires constant changing of when the body goes to sleep, significantly hindering task concentration [7] [8], underscoring the importance of removing distractions and sources of discomfort to help operators focus on their task. Despite years of experience with this schedule, operators still report trouble adjusting to the irregular shifts, citing 3-5 hour sleep periods [9].

2.5 Work Equipment

In addition to irregular schedules, operators have to cope with the challenge of multitasking while receiving calls. Call takers have two monitors, receive external calls through their headset, and receive and make internal calls through a phone on their desk. In addition, they must electronically log each call, with a keyboard and mouse, while asking questions and forwarding the call to fire and or ambulance services. Then with Computer Aided Dispatch, the call takers electronically record the response event and pass the file on to a dispatch operator [Appendix B] [4].

Dispatch operators have four monitors and are responsible for coordinating the activity of police units. The four monitors display the activity of the units being monitored, a list of response events, the details of a response, and a map around the event respectively. To respond to an event, dispatchers communicate with officers exclusively through the headset via radio while making other calls with the phone [Appendix A2]. The dispatch workstation is depicted in Figure 4 below; the call taker workstation is identical except with two monitors instead of four.



Not depicted in figure 4 is the operator's radio and headset. Operators must wear their headset at all times excluding scheduled breaks. The headsets are wired, keeping each communications operator tethered to their desk [Appendix A4].

2.6 Existing Measures to Improve Comfort

The workspace of the communications operators has recently been updated to improve their level of comfort. Fans and heating units have been installed for each desk to suit individual preferences and needs. Moreover, hydraulic desks have been implemented that allow the operators to work in both a seated and standing configuration. [Appendix A2, A4]

Electronically, the newest version of software in use allows the user to adjust font size directly from the keyboard, but there is a trade-off between showing sufficient information on one page and having a large font size. Most officers choose smaller font sizes in order to display more information at once, but this necessitates the use of corrective eyewear for the vision impaired [10]. This conflicting interrelationship between comfort and the nature of communications operations is the primary motivation for this RFP.

3. PROBLEM DEFINITION

Given the demanding nature of their work and the implications of their irregular schedule, communications operators face many challenges focusing to provide timely and accurate responses to public safety [8] [11]. The problem for this RFP requests a solution to the discomfort experienced by communications operators when headsets are worn with glasses, in effect improving their lived experience. The following sections will address the definition of lived experience and discomfort, existing headsets in use, contact lenses and hygiene concerns.

3.1 Definition of Lived Experience

The Communication Services is a community defined by their shared work experience, so in the context of this community, lived experience refers to the everyday work routine of an operator, which is greatly influenced by their work environment [11].

3.2 Definition of Discomfort

Scholars widely agree that comfort is context specific and depends on the user [12]. In the context of headsets for communication service operators, discomfort can be framed as additional pressure exerted on various parts of the ear, in particular the post-auricular area as illustrated by Figure 5, and moisture accumulating inside the ear due to wearing the headset [12].

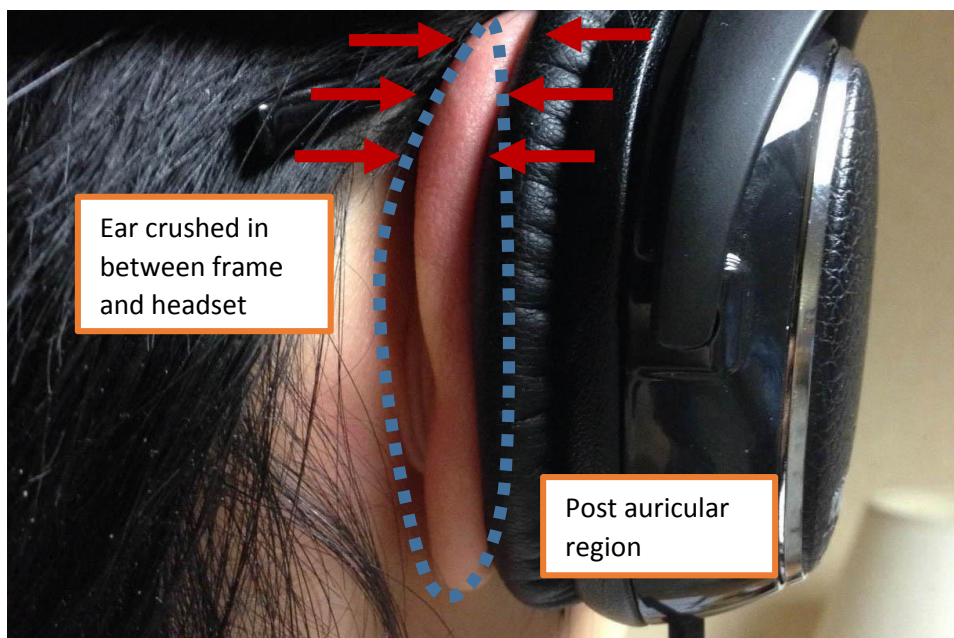


Figure 5. Illustration of ear being crushed between glasses and headset (original photograph).

3.3 Additional Information

Plantronics is the current Vendor of Record [6] for the Communication Services and provides all their headsets. An onsite visit to the Public Safety Answering Point on 703 Don Mills Road revealed the three models currently in use; photographs of these are pictured below. Each operator can choose the type of headset they prefer; headsets are not shared due to hygiene concerns.

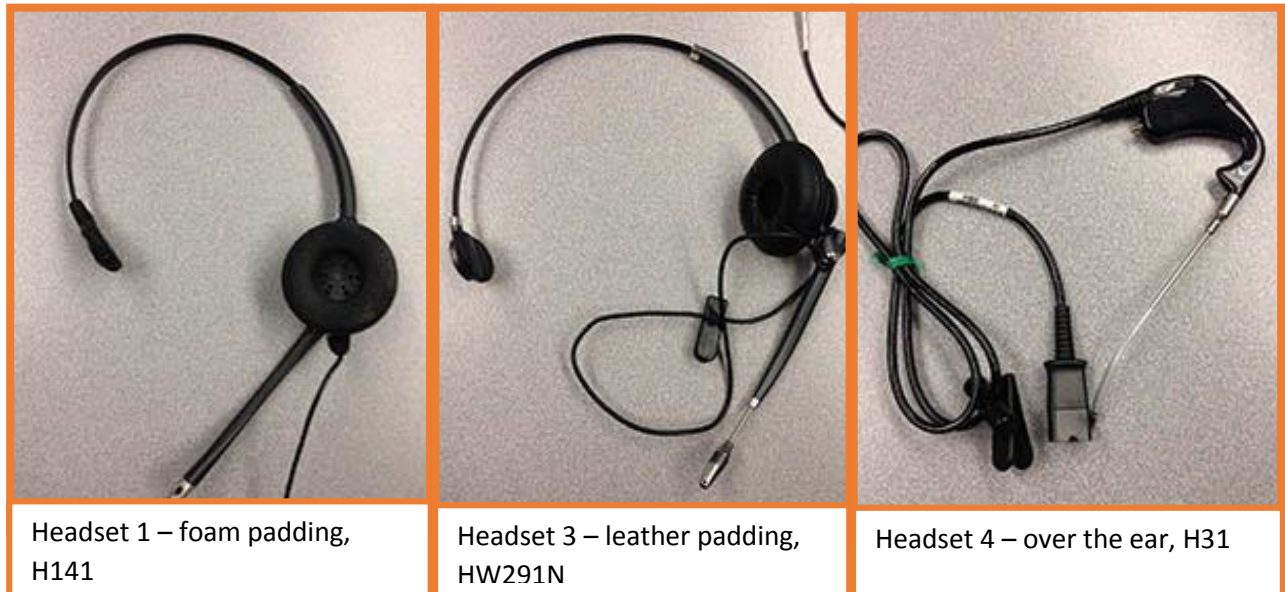


Figure 6. Headset models in use.

As Figure 6 show, the headsets only occupy one ear to allow operators to take calls from the telephone with the other ear. Each operator chooses and keeps their own pair of headsets. All models are all wired and have clips that can clip on to the operators clothes.

Engaging with some of the operators at the communications centre confirmed that the uncomfortable interface between headsets and glasses is a real problem that has yet to be addressed [Appendix B]. One operator reported bringing her headsets with her when buying new glasses to ensure that they are compatible [5]. Other operators use contacts [13] [14], but, as will be discussed below, contacts presents problems of their own.

3.4 Contact Lenses

Some operators wear contact lenses during their dayshifts as they eliminate pressure from glasses on the ear entirely [Appendix B]. Contacts have the added advantage of being compatible with all ear sizes and existing headsets, however, they also have drawbacks that inhibit operators' work.

Their largest drawback is interfere with corneal tear film tissue, drying the eyes [15]. This can be accompanied by redness and irritation, causing discomfort when worn for extended periods of time [18]. Communication operators confirmed these disadvantages of contact lenses during an onsite visit [16].

Two of the operators among the five interviewed wore contacts, and they each reported that they cannot wear their lenses during night shifts due to drying of eyes worsened by fatigue and glare [13] [16]. This makes contacts only a partial solution as there is still a need for reducing discomfort when the operators have to wear glasses.

3.5 Hygiene Concerns

An older headset design at the PSAP required an ear-bud that would insert into the operator's ear. Operators reported a buildup of moisture in the ear, causing this design to be discontinued for hygiene concerns as well as additional discomfort inside the ear [10].



Figure 7. Allways Bluetooth headset worn on right hand side [23].

One example of an in-ear ear-bud design is the Allways Bluetooth headset by Cardo systems pictured in figure 7. It has many features that reduce the discomfort experienced by operators- its flexible plastic attachment easily clips around any frame, and it is very light at 11g [32]. Despite this, the hygienic needs of communications operators is an important factor incorporated into the earlier definition of comfort and so designs such as the Allways Bluetooth headset cannot be considered a satisfactory solution.

4. STAKEHOLDERS

The stakeholders and their interrelationships are summarized by Figure 8, with detailed consideration of each stakeholder following.

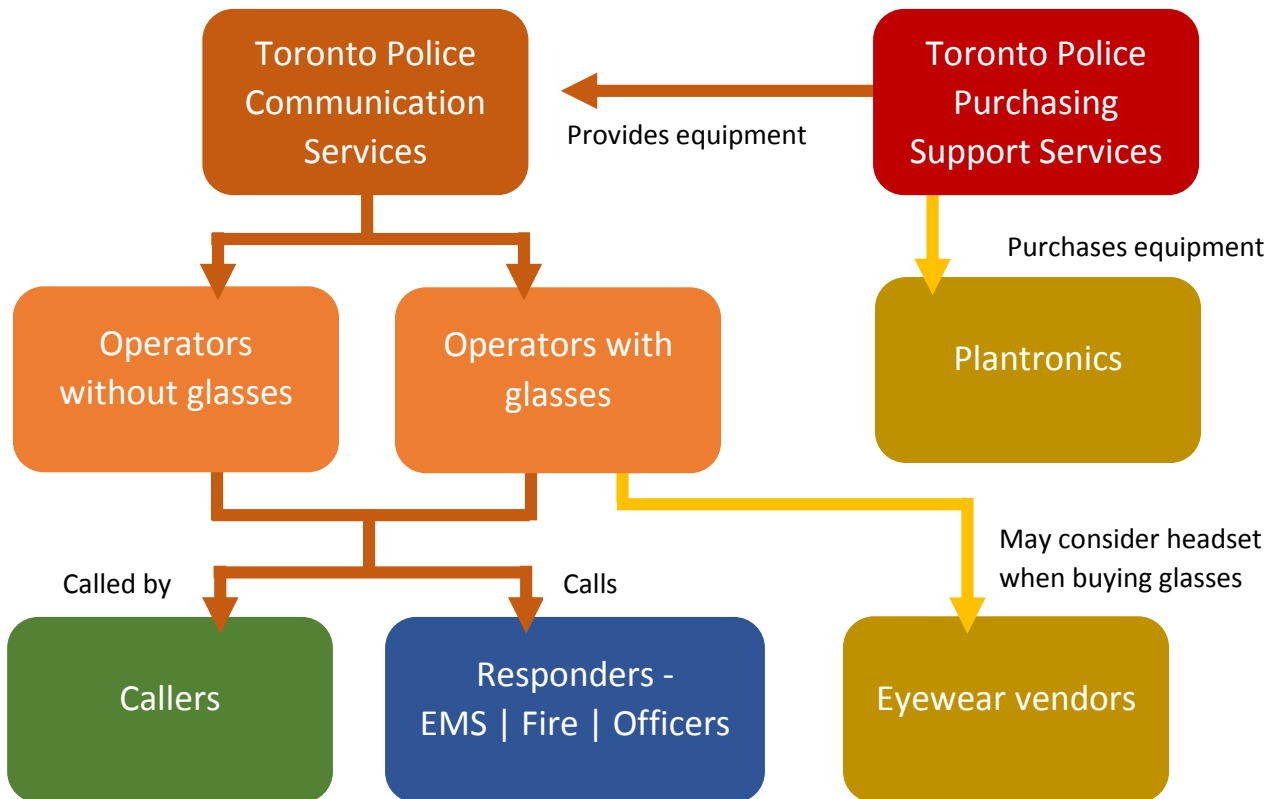


Figure 8. Wants of stakeholders and their inter-relationships.

4.1 Primary Stakeholders

a) **Communications Operators**

Call takers and dispatchers that wear glasses are the primary stakeholders for this project. Any solution that minimizes their discomfort would improve the lived experience of these operators and could potentially improve their productivity [11] [17]. The operators would prefer solutions that are compatible with their glasses and have minimal impact on their lifestyle.

Operators that do not wear glasses may be affected if the solution changes the type of headset or method of communication used for all call takers and dispatchers. Most importantly, operators would like the sound quality to be maintained or improved, as an increase in background noise would reduce their ability to hear callers and provide an appropriate emergency response [18].

b) **The Toronto Police Communications Services Division**

The Toronto Police Communications Services division is committed to providing an efficient, effective communications centre and ensuring that the public has quick access to emergency and non-emergency police services. Solutions targeting this stakeholder should focus on contributing to this goal. In addition, the division would be responsible for distribution of potential solutions to its operators [3], and would prefer solutions that are compatible with existing equipment as this would make their task of implementation much easier.

c) **Callers**

Callers are the people who call emergency and non-emergency lines that expect a quick and clear response to their problems. Depending on the severity of the situation, their safety and wellbeing relies on the ability of the communications operators to accurately initiate the appropriate police response. A solution that maintains or improves the speed and accuracy with which a communications operator is able to respond to a call therefore represents a positive impact to this stakeholder.

d) **Responders: Toronto EMS, Fire Services, and Divisional Police Officers**

The Toronto Emergency Medical Services (EMS) and Toronto Fire Services are usually the first emergency service dispatched in response to calls received at the PSAP [6]. The information relay time, and subsequently their response time, is dependent on the operators' outgoing sound quality. This stakeholder would be interested in a solution that allows communication operators to relay dispatch information in the same or less time and with the same or improved sound quality.

e) **The Toronto Police Purchasing Services Department (Financial Management Division)**

This division is responsible for purchasing, accounting and facilities management for the Toronto Police [2]. They are stakeholders with regards to the cost of implementing the new solution because they are responsible for dividing out the budget of the Toronto Police [19].

4.2 Secondary Stakeholders

a) **Plantronics**

As the current vendor of record for the Toronto Police Communications Services Division, Plantronics has an interest in continuing this contract. Solutions that completely change the headset equipment could negatively impact Plantronics due to loss of business, unless, however, Plantronics could potentially acquire a contract to produce the design.

b) **Eyeglasses Vendors**

Although any solution that eliminates the need for operators to purchase glasses would negatively affect this stakeholder, the solution could encourage more sales if it attracts those who wear contacts to switch to glasses. In that situation, eyewear vendors would be interested in solutions that are compatible with a variety of glasses frames.

5. Objectives and Requirements

Proposed solutions will be judged on their performance against the detailed objectives in Figure 7 below. These detailed objectives are organized under high level objectives which mandate that the solution:

1. Must reduce or eliminate discomfort caused by wearing glasses together with headsets for all operators wearing glasses.
2. Must not hinder any operators from performing their task.
3. Should be compatible with existing equipment and budgets.

5.1 Binary Project Constraints

A proposed solution cannot:

- Require a piece of equipment to go inside the ear
- Occupy the ear used to answer telephones
- Require major changes to an operator's daily routine and style of living

5.2 Detailed Objectives and Requirements

Detailed Objective	Metric	Criteria	Constraint
High Level Objective 1			
Accommodate different ear sizes	Height and width of ear supported (inches).	Wider range is better	Height: 2.7"-2.9" Width: 1.5"-1.7" 99% of population lies in this range [20]
Minimize strain on ear	Weight (g) of solution with headset	Less is better	< 36g - weight of average headset in use [21] [22]
	Decrease in maximum pressure (kPa) on all parts of the ear compared to current setup	More is better	> 14% decrease – boundary of noticeable difference for static pressure [23]
Prevent moisture buildup in ear	Increase in relative humidity (%) over 8 hour shift	Lower is better	< 20% - the difference between normal and infected ears [24]
High Level Objective 2			
Preserve incoming and outgoing sound quality	Range of intelligibility (dB) caller volume range, measured on their phone, that can be accurately heard by operator	More is better	>20dB - difference between quiet whispering and normal conversation [18] (can be measured using SpeakerTweaker phone app)
	Level of operator background noise heard by caller (dB)	Lower is better	< 50 dB [18] (can be measured using SpeakerTweaker phone app)
Prevent operators having to adjust headset	Average times (number) adjustment required per 8 hour shift	Lower is better	< 3 - one for each scheduled break
High Level Objective 3			
Be compatible with different glass frame sizes	Range of lens widths supported (mm)	Larger is better	44mm-52mm lens width frames [25] [26]
Be within equipment budget	Wholesale cost (dollars).	Less is better	< \$13,300 for all operators – communication equipment budget of 2014 [19]
Be compatible with existing headsets	Number of headset models compatible	More is better	> 0 - at least one headset should work with solution

Figure 9. Table of detailed objectives with their associated metrics, criteria, and constraints.

6. PAST SOLUTION

Pince-nez Armless Glasses, a style of spectacles popular in the 19th century, could be a potential solution to this problem. As depicted in Figure 9, it is fixed onto the user's face using a 'bridge' which clips onto the bridge of the nose. Since there are no earpieces, pressure on the ears from glasses is eliminated entirely, but transferred to the nose. Another strength of the Pince-nez is that it is compatible with all existing headsets and ear sizes.



Figure 10. Pince nez-style glasses with special elastic bridge. [28]

However, pince-nez glasses have their own disadvantages. The shifting of the entire weight to rest only on the nose may be a source of discomfort itself. There is also the discomfort that is experienced because of the design of the elastic bridge. This style of spectacles did not survive its revival in the 19th century because it can cause discomfort to the bridge of the nose after extended periods of use [36]. Moreover, since the nose is the only point of contact, Pince-nez glasses are highly specific to nose shape and size and were tailored for each user, weakening their strength of compatibility [37].

7. CONCLUSION

The discomfort faced by Toronto Police Communications Operators who wear headsets in combination with glasses is yet to be resolved. Proposals to this problem must take into account stakeholder's needs, with focus on improving comfort while adhering to the values of the Toronto Police Communications Operations. Solutions must meet the outlined requirements and should improve the operators' lived experience without compromising the needs of callers and responders.

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APPENDIX

Appendix A: Correspondence Transcript

Source: Unit Commander Dion Evelyn. Telephone Conversation. February 4th, 2014

1. Schedules

- Division is split into 5 platoons
- 3 platoons are working at a time, 2 are resting
- 3 spots of the day (morning 7am-3pm; afternoon 2:45pm-10:45pm; night 10:30pm-7:15am)
- A platoon cycles between 8 days of morning, 5 days of rest, 8 days of afternoon, 5 days of rest, then 7 days of night, and 2 days of rest for a 35 day cycle schedule
- effective since 1985, new 12 hour schedule has been pending approval for 3 years
- new 12 hour schedule will be tested for 60 weeks starting Feb 17, 2014

2. Tools

- 2 separate roles, call taker and dispatcher
- very intensive training (2% graduation rate) to learn all the tools
- has extensive phone and switch system
- computer aided dispatch
- location validation software
- set of questions that should be asked each time
- transfer to other services (call takers take almost all kinds of calls)
- very ergonomically optimized workspace (hydraulic desks, individual heating units)

3. General information

- recent decline of calls due to successful public awareness campaign (4-6% from year before)
- pocket dialing is also in the process of being resolved
- 27% female:male ratio
- down time between calls is decreasing (almost no down time now)

4. Workspace

- Individual fans and heading units
- There are many chair styles to suit the needs of different operators, including those that have head-pad, with arm-rests, soft leather surface, hard surface, and etc.
- Desk have hydraulic stands. Monitors and keyboard/phone on different panel, so they can have different height.
- Sit stand configuration, meaning the height can be adjusted for operators to answer phone calls while standing.

Appendix B: PSAP Visit, February 11th

Training Coordinator

- Approximately ⅓ of the operators wear glasses
- Community mandate is serving the people of Toronto
- Each call lasts only a few minutes, but the headset must be worn for the entire shift (currently 8 hours excluding two 15minute breaks and 45 minute lunch break).
- About 250 operators in total, but only about 30 of them are present during each shift.
- There is a mandate forcing a certain number of operators to remain online all the time.
- Staffing is based on number of calls coming in. More operators online during peak hours.
- Weekly alternating day/night work shifts. Current morning shift: 7am-3pm
- All breaks and lunches are fully scheduled. Need permission to go on break.
- Call takers always receive the call first, transfer to fire or EMS as appropriate, but continue to listen to the call until the call is complete and forwarded to dispatch. The dispatch then communicates with officers to coordinate arrival at scene
- Need to pick phone up if no radio communication, so the headset is just for radio
- All headsets are wired to minimize expenditure
- There are three main models of headsets provided by Plantronics under contract: H141, HW291N, and H31. Other models exists with the difference of microphone piece.
- Operators have different number of monitors on their desks according to their role: callers have 2, dispatchers have 4, and administrative call takers have 1.

Operator 1

- Prefers to use high-contrast version of the map rather than the bird-eye-view version.
- Fonts on the screens are adjustable, but larger font means less information.
- Dislikes headset model that sticks in ear because of hygiene concerns.
- Preference for lightweight headset over the ear

Operator 2

- Incoming and outgoing sound quality is the highest priority
- Takes headset with her when choosing new glasses.

Operator 3

- Chooses not to wear contacts because of dry eyes during night shifts. Only wears contacts during day shifts.

Operator 4

- “Can’t wear contacts, too dry.”

Operator 5

- “I wear contacts because the area around my ear is a bit cramped. Even then I still need glasses at night”

Supervisor 1

- “I still only get 3-5 hours of sleep after working here for 20 years.”

Supervisor 2

- Difficulty dealing with the light in the night due to glare. Tried transition lenses, but the result was not satisfactory; reason why some wear glasses