Three Essays on the Effects of Bilingualism on the
Response in the Two Languages


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A Thesis

In

The John Molson School of Business


Presented in Partial Fulfillment of the Requirements

For the Degree of

Doctor Of Philosophy (Business Administration – Marketing) at

Concordia University

Montreal, Quebec, Canada


January 2019

## CONCORDIA UNIVERSITY

## SCHOOL OF GRADUATE STUDIES

This is to certify that the thesis prepared

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Entitled:      Three Essays on the effects of bilingualism on the response in the two languages

and submitted in partial fulfillment of the requirements for the degree of

Doctor Of Philosophy (Business Administration - Marketing)

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**Abstract**

**Three Essays on the Effects of Bilingualism on the**
**Response in the Two Languages**

**Golam Mohammad Moshiuddin Aurup, Ph.D.**

**Concordia University, 2019**

This study tries to understand how the bilinguals in Canada show differential responses to questionnaires and advertisements in the two languages. Three essays are developed in this regard. In the first essay, acculturation to the two cultures, as shown by the bilingual English and French Canadians, was studied. A common factorial structure with three correlated factors- English/French Media use, English/French social interaction, and English/French cultural attachment emerged from this analysis. The effects of ethnicity and language of questionnaire on these factors were then analyzed. Overall advertising involvement with informative and emotional advertisements was then studied in the second essay. A common structure of the advertising involvement concept was proposed for the four conditions- the two language version responses by these two ethnic groups. The effects of ethnicity and language of questionnaire were then observed. This essay also developed path models for the causal relationship involving advertising involvement, brand attitudes, and behavioral intentions, and looked into the differences between first and second language responses. The third essay took a neuroscience approach to look into advertising involvement. This essay took three different strategies to analyze EEG brain signals and explained how the differences between advertisements viewed in the first and/or second languages can be explained. Advertising involvement as explained in the marketing literature and neuroscience do not always converge. This third essay worked to find a common ground in this regard.

**Résumé**

La thèse veut comprendre le changement ethnique montré par les bilingues canadiens et expliquer les réponses aux questionnaires et aux annonces publicitaires dans les deux langues. Trois essais sont développés à cet égard. Dans le premier essai, les changements ethniques des Canadiens anglais et français ont été étudiés. Une analyse factorielle a révélé trois facteurs: «utilisation des médias anglais/français», «interaction sociale anglaise/française» et «attachement culturel anglais /français». Les effets de l'origine ethnique et de la langue du questionnaire sur ces facteurs ont ensuite été analysés. Le deuxième essai a analysé «l'implication globale de la publicité» avec des annonces informatives et émotionnelles. Une structure commune à trois facteurs a été proposée pour les quatre conditions relatives à l'origine ethnique et à la langue du questionnaire. Les participants ont montré une faible implication dans les annonces avec des réponses et des publicités en langue deuxième. Cet essai a également utilisé des analyses de causalité pour la participation à la publicité, les attitudes de la marque et les intentions comportementales. Le troisième essai a utilisé deux méthodes pour analyser les signaux cérébraux EEG et a expliqué les différences entre les publicités affichées dans la première et/ou la deuxième langue.

# Acknowledgement

# Contribution of Authors

This thesis project received inspiration from a research proposal to SSHRC by Dr. Michel Laroche and Dr. Marie-Odile Richard. Their original proposal wanted to study bilingual responses to questionnaires and find the role of acculturation with a functional magnetic imaging (fMRI) based neuroscience technology. Some of the paragraphs in the conceptual foundation, as presented in the common literature section, are based on their proposal. Dr. Richard also translated the entire survey for this study. Both Dr. Laroche and Dr. Richard made suggestions at various points in time and are expected to contribute to and be co-authors once the essays are prepared for academic conferences and journals.

Other details of the thesis and the three essays are the work of Golam M. M. Aurup as part of his doctoral thesis project. This includes work on theoretical background development, essay planning, literature review specific to the essays, selection of measurement tools, survey platform selection and setup, survey agency selection and data collection; selection, purchase, and setup for the EEG data collection scheme;  EEG participant recruitment and data collection, participant interviews, data analysis, thesis writing, etc. Also, application and receipt of ethics approval for the thesis proposal and the doctoral thesis grant are part of this work. Communication with vendors, participants, technical support teams and client service of vendors; procurement of laptop, accessories, and different software were also within the work scope.

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# List of Equipment and Software Used

| Developer/ Manufacturer | Name and Model/Version | Purpose |
|---|---|---|
| **Software** | | |
| IBM | SPSS Statistics 25 | Exploratory factor analysis, analysis of variance, multivariate analysis of variance, reliability analysis. |
| Multivariate Software Inc. | EQS Version 6.1 | Confirmatory factor analysis, structural equation modeling, path analysis. |
| Microsoft Corporation | Microsoft Office 2010- Excel | Run T-tests, F-tests, spreadsheet analysis; import data from CSV files, build trend charts etc. |
| Emotiv | Emotiv Pro | Software to record raw EEG signals, process data, and provide with user interface to manage recording. |
| HHD Software | Free Virtual Serial Ports | Create virtual ports to connect Emotiv Pro and OpenSesame Experiment Builder. |
| Open-source | OpenSesame 3.2.4 Kafkaesque Koffka | Build the experiment and show stimuli on screen, send triggers or event markers to Emotiv Pro. |
| **Equipment** | | |
| Emotiv | Emotiv Epoc 14+ | Hardware to collect EEG brain signal. |
| Lenovo | Ideapad 320 | Laptop to run software, analysis, and to write thesis. |
| IBM | ThinkVision | Additional monitor to show stimulus. |

# List of Hypotheses

**Essay 1**

$H_1$: First language response by EC and FC bilinguals on the factors of ethnic change for each of the cultures will be significantly different.

$H_2$: Second language response of English bilinguals (EC-French response) will be significantly different than their first language responses (EC-English response); and the mean values for second language response will shift towards the response by the French bilinguals.

$H_3$: Second language response of French bilinguals (FC-English response) will be significantly different than their first language responses (FC-French response); and the mean values will move towards the response by the English bilinguals.

**Essay 2**

$H_1$: EC bilinguals responding in English shall show higher involvement with an informative advertisement than FC bilinguals responding in French.

$H_2$: FC bilinguals responding in French shall show higher involvement with an emotional advertisement than EC bilinguals responding in English.

$H_3$: EC bilinguals would show acculturation in their responses in the second language

$H_4$: FC bilinguals would show acculturation in their responses in the second language

$H_{3a}$: EC bilinguals would show lower involvement with second languages advertisements

$H_{4a}$: FC bilinguals would show lower involvement with second languages advertisements

**Essay 3**

$H_1$: English and French Canadians would show lower frontal alpha activation (greater emotional involvement) with the first language version of an advertisement than the second language version.

$H_2$: English and French Canadians would show more approach tendencies (higher frontal EEG asymmetry index values) towards advertisements in first languages than second languages.

$H_3$: English and French Canadian bilinguals will show more 'valence' with the first language advertisements.

$H_4$: English and French Canadian bilinguals will show more 'arousal' towards an emotional advertisement in first language.

# Foreword

This thesis has four sections. The first section describes the background of the study, a brief overview of bilinguals in Canada and in the Province of Quebec, and the common literature review that lays the groundwork for this study on bilingualism. Then, there are three related essays on the topic of the effects of bilingualism on the responses in the two languages.

The central theme of the essays is to understand differences between the bilingual responses in the two languages and to find the role of acculturation (adoption of cultural traits and values) while responding in the second language. Bilingual people from English Canadian and French Canadian heritage are considered for this study. The first essay selected an issue that would show obvious differences between the English and French populations, and then would show how second language responses may vary from the first language ones. For example, English Canadians are expected to respond to questions regarding English language/media use (in English) more preferably than French Canadians responding to the same question in their native language (in French). Their second language responses are expected to move closer to the responses of the other group. This seems adequate to confirm acculturation when people responded in the second language.

The second essay wants to extend the concept in a more relevant marketing context. The topic of advertising involvement was selected in this regard. The second essay explains how Canadian bilinguals show involvement with informative and emotional advertisements, and how their responses to advertisements in the two languages vary. It is realized that, theoretically, there exists two streams of conceptualization of involvement with advertisements. One is addressed from within marketing/consumer behavior and the other in linguistics/neuroscience.

The third essay wants to bridge the two streams of conceptualization of involvement with advertisements. It used neuroscience techniques to understand bilingual's involvement with advertisements presented in the first and the second languages. It proposes that both streams may consider modifications in the way they use the term 'advertising involvement'.

## Background of the Study

Canadian bilingualism is different than the bilingualism in most parts of the world where European countries have set colonies. For example, here in Canada, native speakers of both English and French interact with each other and belong to a very similar socio-economic background. That is not the case when we talk about Chinese bilinguals living in China or Hong Kong, or Indian bilinguals living in India. In fact bilinguals in those places rarely get the opportunity to interact with native English speakers on a daily basis. So, people speak English without being involved with all the aspects of the English culture. Also, it is almost always the fact that people of Chinese and Indian origin become bilinguals by learning English as English has become a global language in the fields of technology, education, and business. We rarely see the opposite, that is English people speak Mandarin or Cantonese or Hindi. Socio-economic conditions in China and India, when compared to that of England, are very different. Although immigrant children living and growing up in England may have the exposure to English culture and have the same socio-economic background as the English families, finding bilinguals of English origin who are capable to communicate in the Chinese or Indian languages is rare. In Canada, this is not the case as a lot of people with English heritage speak fluent French, and both groups have the opportunity to socially interact with each other. Both groups belong to the culture more commonly known as the 'western culture'. This bilingualism is also different than the bilingual Hispanic population living in the USA. The dominant culture in the USA is English with some cities and provinces with a strong Hispanic population. But, the bilinguals are mostly Hispanic people who have learned English as a second language. Not often we do see native English speakers who have learned Spanish and live within a dominant Hispanic culture. Bilingual literature involving the USA generally report of the first type of bilinguals.

Another interesting thing about Canadian bilingualism is the presence of different dominant cultures in different parts of Canada, and sometimes a blurred presence of a dominant culture. English is the dominant culture in Canada given that all the provinces except Quebec have a

majority of English speaking people. Quebec is a province with the majority of its people speaking French. So, French speaking people live within a dominant English culture in the rest of Canada and within a dominant French culture in Quebec. French Quebecers, sometimes, may find themselves under an indirect influence of the strong English culture of the rest of Canada and the USA. Quebec has borders with two English provinces in Canada (Ontario and Newfoundland and Labrador), and bilingual New Brunswick; and with four states in the USA (New York, Vermont, Maine, and New Hampshire). It is very close to major cities in the USA like New York and Boston and has a lot of cross-border communication with major cities in those places. It also has the presence of major American brands and outlets, major American companies doing business in the province, access to popular English media in the USA, popular sports teams participating in the North American leagues, and major cities like Montreal and Gatineau with significant English speaking minority populations. Most Quebecers are said to have "come from a French culture, but live in an English society and have an American lifestyle". French Quebecers are said to be North Americans who speak French, not French people who live in North America (Leger, Nantel, & Duhamel, 2016, page 24). This is truer for bilingual people who happen to communicate in their second language frequently. This makes the presence of a dominant culture blurred at times. On contrary, English bilinguals in the province of Quebec live within the dominant French culture of Quebec and within close proximity of the English culture of North America. They have strong English institutions in the province. Previous studies have found that English Quebecers are often in-between the English people living in the rest of Canada and the French Quebecers, and have a distinct identity (Leger, Nantel, & Duhamel, 2016, page 21). It is felt that a study that includes English and French Canadian bilinguals in Quebec, who live within a blurred presence of a dominant culture or within two dominant cultures, would be a worthy endeavor.

Research studies on understanding the differences between the English and French Canadians are abundant, yet there are not many studies that mention bilinguals who compose a significant proportion of the population. Probable effects of bilingualism on responses are ignored. This study is an attempt to fill this void and build a strong knowledge base to rely on in future studies involving bilingual respondents. Given that bilingualism is on the rise in the bilingual belt of Canada, it is time to include this increasing population and run appropriate cultural analyses.

**Canadian Bilinguals**

Canada is officially a bilingual country with English and French being the two official languages. Historically, European settlers from France and England were the first and most prominent groups to settle in the region which is now today's Canada. Present day Quebec has been with a French majority since the beginning, but provinces towards the west or in the Atlantic region are with an English majority. Although officially a bilingual Country, New Brunswick is the only bilingual province in Canada, Quebec is the only French province, and all the other provinces have English as the official language at the provincial level. Federal services are normally provided in both languages throughout Canada. According to the 2011 Census, around 17.5% of the population or 5.8 million people in Canada identify themselves to be bilingual, or have the capability to hold a conversation in both English and French. Most bilinguals live in the province of Quebec (3.3 million or 42.6% of the population of the province), Ontario (1.4 million or 11% of provincial population), and New Brunswick (33.2% of provincial population). It is reported that English-French bilingualism in Canada is concentrated in these three regions, where a significant degree of interaction between Francophones and Anglophones exists.

Different studies have reported on three different types of bilinguals. They are compound, coordinate, and sub-coordinate bilinguals (D'Acierno, 1990). A *compound* bilingual is a person who learns both languages in the same environment, like learning both of them at home. A *coordinate* bilingual learns the two languages in different environments like learning the mother tongue at home and the second language at school. In a *sub-coordinate* scenario, one language dominates the other, like the bilingual uses one language as a reference. In the Canadian context, bilinguals with good proficiency fall mostly in the coordinate category. During the data collection and analysis, it was realized that there is a very small group of bilinguals who identify themselves as both French and English or consider their linguistic ethnicity to be 'Canadian bilingual'. Census data supports that view as a small percentage of people identify both English and French as their mother tongue. Often, they achieve such mastery in the two languages and enjoy such access to both cultures that they feel at ease with both groups and live in both cultures. Many of the people in this category have one parent from each of the two groups.

Another group of bilinguals, who speak a third language at home along with English and French, are mostly from immigrant families from other parts of the world than England and France. These two groups of bilinguals were deliberately left out of this research.

In Canada, there is significant interaction between Anglophones (English speaking people) and Francophones (French speaking people) in major bilingual metropolitan areas namely Montreal, Ottawa-Gatineau, Quebec city, and Winnipeg. There are families with bilingual parents, neighborhoods with a lot of bilinguals or balanced representation of the two groups, and preschools, daycares, and schools that communicate in both languages. Also, bilingual people may choose their spouse from the other group, work in either of the two language environments (or in a completely bilinguals setting), and consume media in the two languages. So, on a daily basis, bilinguals use their languages with varying levels. For example, a bilingual may speak French with parents but English with the spouse (depending on family composition), interact with other family members following different language preferences, and communicate with other bilingual friends by switching frequently between the two languages. Also, this person may study at an English University and work in a French office, follow local news in French but global news and entertainment in English (because of the dominant American media and culture), and so on. There are no fixed patterns in this regard. So, looking into the language acculturation or usage of both languages and trying to relate that to behavioral intentions and attitudes seemed to be a logical approach in this study. For this reason, understanding language acculturation and ethnic identification as shown by bilinguals is within the scope of the study.

Although there are interactions between the two groups, there is also significant tension between them. There are regulations (Charter of the French language or Bill-101) in Quebec that requires use of French in all walks of life and dictates language rights of the two groups. English people are mostly concerned regarding diminishing access to services in English, while French people have differing views regarding the preservation of their culture and access to education in English. A recent poll conducted by Leger Marketing shows that only 16.7% English speakers think that English is properly protected in the province of Quebec, where 72% French speakers think that English is preserved. On the other hand, 87.5% English speakers think that French is well protected in the province of Quebec, while 40% French speakers think that way ("Is English well protected in Quebec?", 2017). While a big majority of Canadian bilinguals speak French as

the first language and live in the province of Quebec, the rate of bilingualism among the minority English Quebecers is very high. According to the 2016 Census, 71% of English speaking Quebecers are bilinguals while 40% of the French speaking people are bilinguals. 51% of the allophones (a French term for people who speak another language as a mother tongue) are also bilingual speakers of English and French (Scott, 2017). English speaking children growing up in Quebec sometimes have more opportunity to grow up as bilinguals, as they have more support to learn French in schools (English medium) and may take admission into French schools which is not mandatory for them by law. The opportunity to attend English schools and colleges is mostly restricted for French Quebecer children in Quebec. Yet, in the bilingual atmosphere of Montreal, there are more scopes for French children to grow up as bilinguals than in the rest of the province. Also, the numerous private or subsidized schools (who have more resources to teach both languages) help this cause, although access to these schools is often beyond the means of many low income families.

Normally, for federal services in Canada, people are given the possibility to choose a language to respond to questionnaires. It is true for any behavioral data collection. So, people are expected to respond in the language they are better at or the language they feel is their native language in case they are equally good at both languages. It makes complete sense as it is not useful to get information based on a questionnaire not understood perfectly in the second language. For this reason, behavioral data from bilinguals in the second language is not so common, although they may have high proficiency in the second language and may use it at work or school on a daily basis. Many studies looking into the differences between the English and the French Canadians followed proper rigor and deliberately left out the bilingual population (Laroche, Pons, and Turmel, 2002). In some other studies involving French & English Canadians, it was not explicitly mentioned if the bilingualism of participants were checked. This study wanted to collect data from bilinguals in both languages, given that they are comfortable with the second language, and look into the differences bilingualism may have on the responses. Findings from this study should guide how bilingual responses can be included in studies and analyzed. This will be an important contribution of this study.

**Conceptual Foundation**

*Cultural Affirmation and Accommodation*

Bond and Yang (1980) administered several studies on Chinese bilinguals in Hong Kong to understand the language effects on bilinguals. They used questionnaires in both Chinese and English and explained the mechanism behind differential responses obtained with the two versions of the questionnaire. They observed two different mechanisms behind their results. According to cultural affirmation, Chinese bilinguals responded in a more Chinese way when tested in their second language. This finding was later attributed to specific cases and not universal. On the contrary, Chinese bilinguals responded in a manner to match cultural norms associated with the second language. This was referred to as cultural accommodation (Bond and Yang, 1982). The results are attributed to the fact that bilinguals respond in a manner to accommodate the language of the questionnaire. So, they show bias towards the English culture while responding to English questionnaire, and bias towards the Chinese culture while responding in Chinese language.

*Language Priming and Frame Switching*

Hong et al. (2000) argued that bilinguals have two cultural frames that are formed over the years from different cultural experiences and knowledge. These frames can be activated by elements like language, icons, and settings, and may affect phenomena like personality, values, self-beliefs, emotional responses, etc. It is also suggested that bilinguals may shift between the two frames easily under the effect of language priming on the self-construals of bilinguals (Dixon, 2007; Kemmelmeier and Cheng, 2004). The findings are very relevant to the proposed study. As bilinguals will be exposed to either of the languages, they are expected to be primed to the cultural frame of the language of the questionnaire. This should lead them to provide differential responses consistent with the frame they are in.

*The Whorfian Hypothesis*

The Whorfian hypothesis of linguistic relativity states that language influences thought. In its stronger form, it mentions that language controls perceptions and thoughts. In the weaker form, it

mentions that language influences thoughts. Though the stronger form was never proven, the second form later gained empirical support from researchers (Hunt and Agnoli, 1991). Hull (1996) investigated if bilinguals showed different thought patterns while responding in the two different languages. He found that coordinate bilinguals showed different responses when alternately tested in the two languages. As Canadian bilinguals are mostly coordinate bilinguals, significant differences are expected from their responses in the two languages.

*Individualism and Collectivism*

Hofstede (1983, 1984) studied the influence of culture on workplace behavior and identified four dimensions that can show differential results for various national cultures. Individualism vs Collectivism is one of the dimensions that emerged from his research. In a broad sense, individualism refers to the state where people prefer a loosely-knit social structure and expect to take care of their own selves and immediate family members. On contrary, in collectivism, people prefer a tightly-knit social framework and expect relatives and other members in the community to look after each other. A society is positioned high in the individualistic dimension when people define their self-images in terms of 'I'. Most western cultures are considered individualistic. On the other hand, most Asian cultures define their self-images in terms of 'we'. They are called collectivistic societies. Triandis (1988) further studied factors in the individualism-collectivism dimension. Since then, a lot of studies in consumer research used this dimension to explain differences in marketing attitudes and behavior between individualistic and collectivistic groups. Han and Shavitt (1994) reported that advertisements in the USA used more appeals of individual benefits and preferences, personal success, and independence than in Korea. Korean ads emphasized ingroup benefits, harmony, and family integrity. Ads emphasizing individual benefits were found to be more persuasive, and ads emphasizing ingroup or family benefits were found to be less persuasive in the USA than in Korea. They also reported that cultural differences were stronger in products used and purchased with others. Though both the English and French are part of the western culture, it is observed that French Canadians are more susceptible to normative influence and they scored significantly lower in the individualistic dimension than the English Canadians (Mourali, Laroche, and Pons, 2005). So, the expectations are that French bilinguals may exhibit behavior similar to that of other collectivistic societies when responding to advertisements on products of individual or social benefits.

*Cross-Cultural Differences in the Canadian Context*

French and English Canadians are often stereotyped to act in certain ways. Traditionally, French Canadians were said to be more religious, more inclined to rural life, more submissive in relationships, present oriented, self-indulgent, means oriented, and risk-averse. On contrary, English Canadians were said to be less influenced by religion, more urban, individualistic, competitive in relationships, future oriented, and goal oriented (Mallen 1978). Later, studies found French Canadians to be more liberal than earlier reports while English Canadians to be more conservative than previous generations (Schaninger, Bourgeois, and Buss, 1985). There are notable studies regarding their differences in the marketing context also. It is reported that French people tend to be more loyal to brands, receptive of advertising, responsive to coupons and premiums, attracted to premium products, and home oriented. They form more favorable attitudes towards national brands than store brands (Calantone, Morris, and Johar, 1985). French Canadians are found to be willing to postpone a purchase for some time than buying on credit. They are cautious towards new products and prefer to wait for the product to prove its worth. It is also reported that French Canadians exhibit more hedonistic attitudes and behavior than English Canadians, and they are more likely to buy a product regardless of price if they liked it (Vary, 1992). Despite reports regarding the differences between these two groups, it appears that cross cultural studies involving French and English Canadians intentionally left out bilinguals as participants. Given the rise of bilingualism in Canada and its prominence in the bilingual belt, I believe that it is time to analyze and understand bilingualism and its effects. A more recent report by Léger, Nantel, and Duhamel (2016) provided a very succinct description of the French Quebecers and their differences from their English counterparts in the province or rest of Canada. According to them, "most Quebecers come from a French culture, live in an English society and have an American lifestyle." It is noteworthy that most researchers ignored the fact that most French Quebecers and Anglo Quebecers living in Quebec have some sort of bilingualism with a significant percentage (43% and 70% respectively) of them having the ability to hold a conversation in any of the two languages. The understanding from the linguistic literature that bilinguals may show differential results when tested in the two languages or with stimuli in two languages is largely overlooked. The main focus of this thesis is to shed new light on this phenomenon.

*Consumer Neuroscience Research with EEG*

In recent years, there has been an explosion of scientific research in the field of neuroscience and closely related fields like medicine, neuro economics, psychology, psychophysiology, linguistics, computer science, signal processing, etc. Many of the studies are interdisciplinary in nature and include domain experts and neuroscientists collaborating. The basic idea is to use neuroscience techniques to understand the functioning of the human brain and link it to topics of area specific interests. Consumer neuroscience or the more popular term neuromarketing is a recent inclusion to the research domains. Companies are working to provide manufacturers or retailers with marketing insights that they consider cannot be reached with traditional consumer research methodologies. Although there are controversies surrounding the claims made by many of the neuromarketing companies, marketing researchers are trying to use this methodology to complement traditional consumer research methods. Renowned journals are publishing articles and dedicating special issues to embrace this field. Still, acceptance of consumer neuroscience as a mainstream method for consumer research is yet to be achieved. Because of this and the collaborative nature of such research, a vast majority of the articles relevant to this field are found in related domains mentioned earlier.

Among the popular neuroscience methods, there is functional magnetic resonance imaging (fMRI), electroencephalography (EEG), magnetoencephalography (MEG), positron emission topography (PET), etc. While EEG and MEG are direct measures to capture electrical activity of the neurons or brain cells, fMRI and PET are an indirect measure related to blood flow through the brain. This study wanted to utilize the EEG method mostly because of the possibility to collect data in a natural setting to view stimuli and the ease of acquiring such equipment for research. This gives the researcher adequate scope to control all aspects of data collection. MRI data collection, on contrary, requires collaboration with specialized medical/research facilities and the data collection from the participant viewpoint is often imposing.

Electroencephalography (EEG) signal captures combined electrical activity of neurons in different brain regions. This helps to locate task specific activity in the brain in real-time. For non-invasive data collection schemes, as used in all non-medical purpose EEG, data is collected from above the skull with easily detachable electrodes. It has very high temporal resolution but inferior spatial resolution compared to fMRI. Also, its capacity to look at deep regions of the

brain is a bit limited. Still it can provide enough information about people's emotional valence, attention, excitement, and cognition among other responses to stimuli (Vecchiato et al. 2011). It can be easily used in tandem with other equipment like eye tracker and face muscle movement monitoring equipment which can be very useful. This is a very popular method used by neuromarketing companies. The biggest advantage of this method is the ease of data collection. With non-invasive headsets to collect data from above the skull, participants can simply sit on a chair during data collection while visual stimuli or instructions can be showed on a screen in front of them. This natural data collection method allows researchers to collect reasonable amount of data in a short period and with minimum hassle and risk to participants. This method can be used to look into differences in the preference and attention of participants while presenting two language versions of the same stimuli. Another reason to use EEG is that, it is not a new method when analysis of involvement with advertisements, use of language, or bilingualism is of concern. There are reports of use of EEG in these fields from the early seventies (Krugman, 1971).

**Essay 1: Ethnic Change of the English and French Canadian Bilinguals in Quebec and the Role of Acculturation on Second Language Responses**

**Abstract**

This essay looked into the ethnic change of the English Canadian (EC) and the French Canadian (FC) bilinguals in terms of language acculturation (adoption of cultural traits and values) and ethnic identification (adherence to the culture of origin). A correlated three factor common structure involving media use, social interaction, and cultural attachment emerged in this regard. A multivariate analysis of variance then showed the effects of ethnicity and language of questionnaire on the factors. Also, the comparison between the first and the second language responses explained the role acculturation plays on the responses from bilinguals.

*Key words:* Ethnic change; language acculturation; ethnic identification; Canadian bilingualism; English Quebecer acculturation.

**Introduction**

Canadian bilingualism is very different as many English Canadians and French Canadians have embraced the language and culture of the other group. It is not so common to find an English speaking population learning a different language and living within another dominant culture than English as seen in the province of Quebec. Here, many people with English heritage speak fluent French and socially interact with French speaking people. French Quebecers are the majority in this province and many of them are bilinguals. One interesting aspect of this bilingualism in Quebec is the blurred presence of the dominant culture. English is the indirect dominant culture given that the province is surrounded by the very strong English culture present in the USA and the rest of Canada. French Quebecers are said to live in an English society and have a very American lifestyle (Leger, Nantel, and Duhamel, 2016, page 24). Previous studies have reported that French bilinguals show acculturation to English language and culture (Laroche et al. 1996). On contrary, French is the only official language and the dominant culture in the province of Quebec which made English Canadians wanting to acculturate to the French

culture. Previous studies have found that English Quebecers' responses to some behavioral questionnaires fall between the English people living in the rest of Canada and the French Quebecers, and they have a distinct identity (Laroche, Pons, and Turmel, 2002; Leger, Nantel, and Duhamel, 2016, page 21). This study wanted to capture the language acculturation of both the English and the French Canadian bilinguals to both cultures in this blurred presence of a dominant culture. It is observed that studies on understanding the differences between the English and French Canadians are abundant, yet there are not many studies that include bilinguals or explain the effects of bilingualism that may be present in the responses from bilinguals. This study will be one of the few attempts to fill this void and build a knowledge base to refer to in future studies involving bilingual respondents.

There are studies to understand bilingual language acculturation and ethnic identification. This stream of research normally collects data from bilinguals in the language of the dominant culture and in their native language. In a Canadian context, Laroche et al. (1996) reported on the multidimensional structure of ethnic change of French Canadians. They reported that ethnic affiliation and acculturative tendency are the key dimensions of ethnic change. Kim, Laroche, and Tomiuk (2001) studied the language acculturation and ethnic identification of Italian Canadians and reported on a four factor structure for language acculturation and ethnic identification and attachment. Three factors are related to language acculturation and the other factor measures ethnic identification and attachment. Also, Laroche, Pons, and Richard (2009) reported a similar structure while investigating role of language on measurement of ethnic identity of English Canadians. This study adds to this stream by analyzing both English and French Canadians living in the province of Quebec and their responses in both languages. Getting responses from two ethnic groups in two languages is not very common in the cross-cultural or social science literature. This study would make a significant contribution from that perspective.

The study of language acculturation and ethnic identification among the English and French Canadians is an interesting one. English bilinguals living in this French province are the minority people living within the dominant French culture. But, often they have the choice to attend English institutions for education, receive services from the strong English institutions or the bilingual service providers in the province, and live in English majority neighborhoods mostly

located on the west part of the Island of Montreal and in a few other major cities in the province. On the other hand, French Quebecers live in a province surrounded by English provinces/states in Canada and the USA (except for bilingual New Brunswick), and are under the influence of the strong English/American culture of the USA. Many French Quebecers are bilingual and they consume English media produced mostly in the USA or in the rest of Canada. As later found from interviews, bilinguals mostly prefer to consume entertainment in the original languages. So, French bilinguals' consumption of a lot of English media makes the presence of the dominant culture blurred at times.

## Conceptual Framework

### Ethnic Change

Ethnic change is the process showed by immigrants adapting to the new culture. Bilingualism requires a person to go through ethnic change while acquiring the second language. Literature on ethnic change fall under two dominant streams (Kim, Laroche, and Tomiuk, 2001). The assimilationist view argues that immigrants gradually lose their original identity as they pick up the dominant culture of the land. This is often called the melting pot theory where traits from different cultures come together to make a distinct culture (Park, 1950). There have been numerous studies to support this view as it very well explained the ethnic change of people coming into the USA from different European countries. The influence of culture under this view is considered unidirectional that flowed from 'Anglo-American' to different ethnic groups. English-Canadian culture as described under this view also shows very similar tendencies (Kim, Laroche, and Tomiuk, 2001). The underlying tenet is that ethnic change is a unidirectional process that shows loss of the original identity and gain in the new (dominant) identity. 'Americanization' and 'Anglo-conformity' are some of the other terms used in this regard (Keefe and Padilla 1987). Later, it was argued that only white Protestant people from Western and Northern Europe showed true assimilation as explained under this view. The acculturation view proposed that people may retain their original identity and at the same time live in the host society. People need not lose their original identity to adapt to the dominant culture. Ethnic change showed by Hispanics and Asian people in the USA is better explained by this stream of thought (Keefe and Padilla 1987; Wooden, Leon, and Toshima, 1988). In the context of the

present study, we will focus only on the later stream. The main reason is that both English and French are the dominant cultures in Canada and the linguistic rights of each group are respected at the federal government level. Also, bilinguals from these two groups do not show complete loss of one`s identity or assimilation tendencies to merge into the other one. French Canadians preserved their language and culture for centuries despite being under the British rule. Also, English Canadians living in the province of Quebec as a minority are not assimilating into the French culture despite their numbers decreased dramatically over the last few decades. Both groups significantly retained their original identity and captured traits of the second culture. 'A very American lifestyle' as used to describe French Canadians (Leger et al., 2016), and the differences showed by English Quebecers from the 'rest of Canada' support this view.

*Ethnic Identification and Language Acculturation*

Ethnic identity was explained as the retention of the culture of origin of a person (Keefe and Padilla, 1987, Laroche, Kim, and Tomiuk, 1998). Ethnic identity can be observed through values, attitudes and behaviors and is multi-dimensional in nature (Lee and Yoo, 2004). Phinney (1990) proposed that ethnic involvement includes language, network of friends, food, religion, etc. Acculturation, on the other hand, is learning the language and culture of the host society or the dominant culture by the minority group (Keefe, 1980). Laroche, Kim, Hui, and Joy (1996) reported on the multidimensional structure of ethnic change for French Canadians in Quebec. Kim, Laroche, and Tomiuk (2001) proposed a four dimensional scale to measure ethnic change that includes factors for language acculturation and ethnic identification. The three factors for language acculturation are language use, media use, and social interaction. The other factor is ethnic identification and attachment. Though language acculturation and ethnic identification are only two facets of ethnic identity, they explain much of the variance of the concept (Kim, Laroche, and Tomiuk, 2001) and can be considered an appropriate measure for ethnic change.

*Role of Acculturation on Second Language Responses*

Bond and Yang (1982) analyzed the responses of Chinese bilinguals in Hong Kong and found that participants responded in a way to match cultural norms associated with the language of questionnaire (Cantonese vs. English). This was referred to as cultural accommodation. This stream of thought inspired many studies and documented responses of bilinguals to show cultural accommodation. Hong et al. (2000) reported that bilinguals develop two cultural frames based on

their cultural experiences and knowledge. These frames can be activated by cultural elements like language and bilinguals can switch between the frames under language priming (Dixon, 2007; Kemmelmeier and Cheng, 2004). This confirms that bilinguals responding to a questionnaire in a particular language would be primed to that language and follow the cultural norms of that culture while responding to the questionnaire. This is also supported by the Whorfian hypothesis of linguistic relativity arguing that language can influence thoughts (Hunt and Agnoli, 1991). Later, Hull (1996) showed that coordinate bilinguals show different thought patterns and differences in responses while responding in the two languages. Coordinate bilinguals are people who learn the two languages in two different contexts, like learning one at home and the other at school (D'Acierno, 1990). It is expected that responses from Canadian bilinguals in the second language would show acculturation of bilinguals to the second culture.

*Hypotheses*

There are four groups/conditions for data collection in this study. They are English Canadian (EC) bilinguals responding in English, EC bilinguals responding in French, French Canadian (FC) bilinguals responding in French, and FC bilinguals responding in English. These are termed as EC-English, EC-French, FC-French, and FC-English. English Canadians are expected to show more English language use, English media use, English social interaction, and English ethnic identification compared to the French Canadians. For the French Canadians, similar results are expected for the factors related to French acculturation and ethnic identification. The following hypothesis argues that first language responses by these two groups would show expected differences between the two groups as showed by monolinguals.

**H₁**: First language responses by EC and FC bilinguals on the factors of ethnic change for each of the cultures will be significantly different.

Also, following literature relating to acculturation and second language responses, the groups are expected to show acculturation while responding to the questions in their second languages. Hypothesis 2 and 3 are proposed to explain acculturation showed by the English and French bilinguals respectively.

**H₂**: Second language responses of English bilinguals (EC-French response) will be significantly different than their first language responses (EC-English response); and the mean

values for second language responses will shift towards the responses by the French bilinguals.

**H₃**: Second language responses of French bilinguals (FC-English response) will be significantly different than their first language responses (FC-French response); and the mean values will move towards the responses by the English bilinguals.


**Methodology**

*Measurement Scales:*

This study used the work of Kim, Laroche, and Tomiuk (2001) as the basis for the measurement scales regarding language acculturation and ethnic identification. They integrated and purified various measurements while developing a scale to measure acculturation and ethnic identification of Italian Canadians. They reported on the three dimensions of language acculturation (English language use, English Canadian mass media exposure, and English Canadian social interaction), and one dimension for ethnic identification and attachment to the English culture. From that study, 16 items for the language acculturation dimensions and 9 items for the factor identification and attachment to the English culture are adopted for this study. Modifications were made to measure attachment to English culture than Italian. Table 1.1 provides with the items used in this study to measure English language acculturation and ethnic identification. The items are numbered from Q4.1_1 to Q4.1_24. A similar scale was developed and used to measure French language acculturation and ethnic identification and attachment to French culture. The items are numbered from Q5.1_1 to Q5.1_24.

**Table 1.1** English Language Acculturation and Ethnic Identification Scale Items

| Factor | Item No | Item description |
|--------|---------|------------------|
| English | Q4.1_1 | I always speak English to my spouse |
| Language | Q4.1_2 | I always use English with my friends |
| Use | Q4.1_3 | I mostly think in English |
| | Q4.1_4 | In general, I speak in English |
| | Q4.1_5 | I mostly speak in English at family gatherings |
| | Q4.1_6 | I mostly carry on conversations in English every day |

| | | |
|---|---|---|
| English Media Use | Q4.1_7 | The TV programs that I watch are always in the English language |
| | Q4.1_8 | The radio programs that I listen to are always in the English language |
| | Q4.1_9 | The newspapers and magazines that I read are always in the English language |
| | Q4.1_10 | The movies and DVDs that I watch are always in the English language |
| English Social Interaction | Q4.1_11 | Most of my friends are English speaking |
| | Q4.1_12 | Most of the people at the places I go to have fun and relax are English speaking |
| | Q4.1_13 | Most of the people I go to parties with are English speaking |
| | Q4.1_14 | I get together with English speaking people very often |
| | Q4.1_15 | I have many English speaking friends with whom I am very close |
| English Ethnic Identification and Attachment | Q4.1_16 | The English culture has the most positive impact on my life. |
| | Q4.1_17 | I feel very proud of the English culture. |
| | Q4.1_18 | I feel most comfortable in the English culture. |
| | Q4.1_19 | I feel a strong attachment to the English culture. |
| | Q4.1_20 | I feel very proud to identify with the English. |
| | Q4.1_21 | I consider the English culture rich and precious. |
| | Q4.1_22 | I have the sentiment of being ''English speaking''. |
| | Q4.1_23 | I consider myself to be "English speaking" |
| | Q4.1_24 | I would like to be known as ''English speaking'' by people of English descent. |

*Survey Development*

The survey questionnaire was uploaded in the Qualtrics online platform. The first page contained the qualifying and demographic questions. The qualifying questions were that participants must identify to speak English or French as a mother tongue, have good second language proficiency, be resident of the province of Quebec, and be between the ages of 18-40. The qualifying question regarding mother tongue helped to exclude multilingual people who may speak both English and French but grew up speaking another language at home. Also bilingual people who consider both

English and French as their native languages were excluded. The age groups selected are important because people in these two groups of adults are the people who were born after the Bill 101 or Charter of the French language came in effect. So, they grew up in a French dominant atmosphere. Also, the two groups closely match the age brackets for the generations Y and the generations Z. Though the study wanted to understand Canadian bilinguals in general, this section limited the scope to bilinguals living in the province of Quebec. This is mostly due to the fact that English Quebecers have shown differences from the rest-of-Canada English speakers in different studies (Laroche, Pons, and Turmel, 2002).

Following the first page, the two advertisements and questions were presented that are part of related studies. Questions for English and French language acculturation and attachment were presented in separate pages after this section. Language learning questions (language proficiency, medium of school, etc.) were at the end of the survey. Participants needed to answer each question in order to proceed to the next page. Scrolling up and down a page allowed viewing that particular section and related questions.

The survey was translated into French by two bilingual professors in marketing who have years of experience in cross-cultural research involving English and French Canadians. As all participants are from the province of Quebec, the French version was carefully reviewed for its relevance to the language and culture in Quebec. Also, a few items were updated to reflect present technology use by participants. For example, use of the word 'video cassette' was replaced with 'DVD'.

*Data Collection and Demographics*
Qualtrics Experience Management was appointed to help with data collection. They formed panels and sent the questionnaire to prospective participants. The target was to get data from 600 participants and around 150 people in each of the four conditions. Participants responded to both measurement scales: Acculturation to English Language and identification with the English culture; and acculturation to French language and identification with the French culture.

Participants could access only one language version of the questionnaire. People not comfortable with the second language questionnaire had the option of not completing the survey. One reason for this was to collect second language responses from bilinguals who are at ease with

responding in their second languages. Also language proficiency was asked to screen out candidates with weak first/second language skills.

A total of 619 participants completed the data. Among them 300 participants identified English as their first language and 319 participants identified French as their first language. All participants completed either the English version or the French version of the survey. So, the responses include both first language and second language responses. 145 EC bilinguals completed the survey in English and 155 EC bilinguals completed the survey in French. 164 FC bilinguals completed the survey in French and 155 FC bilinguals completed the English version. Sample size was decided on a reasonable estimate to build structural equation models and availability of resources to collect data. Around 150 responses were expected in each group.

189 participants were between the age of 18-25, and 430 participants were in the group between the ages of 26-40. 217 participants were male and 402 participants were female. 9 participants (2% of the total) mentioned their highest level of education as primary, and the other options for education were reasonably represented. Annual household income of '$80,000 and up' was the biggest contributor (26%) while the other four options varied between 14% and 21% of the participants. The demographic compositions of the participants regarding gender, age, income, and education are shown in figure 1.1, 1.2, 1.3, and 1.4. Table 1.2 shows demographic composition of the participants across the four groups. The English Canadian groups have a few more people aged between 18-25 years, and there are a few more female participants among the French Canadians. Also, the English Canadian groups include a few more people with college degrees. The demographic composition across the four groups is very similar and considered suitable for the use of between group comparisons for this study.

**Figure: 1.1** Demographic Details: Frequency Pie Chart for Gender
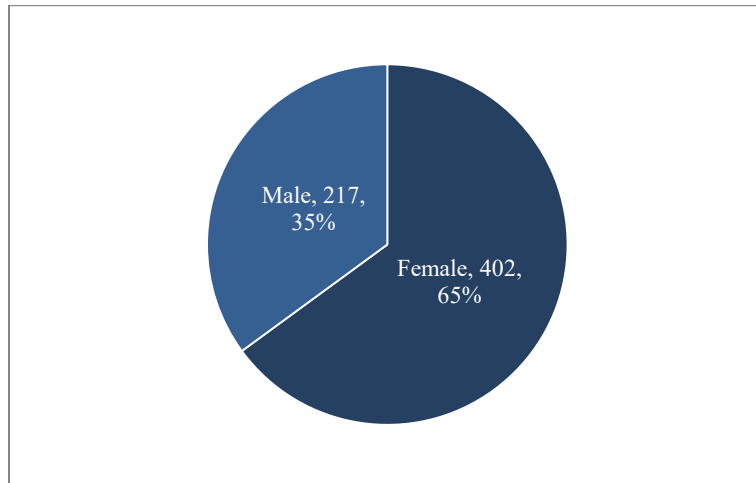


**Figure 1.2** Demographic Details: Frequency Pie Chart for Age
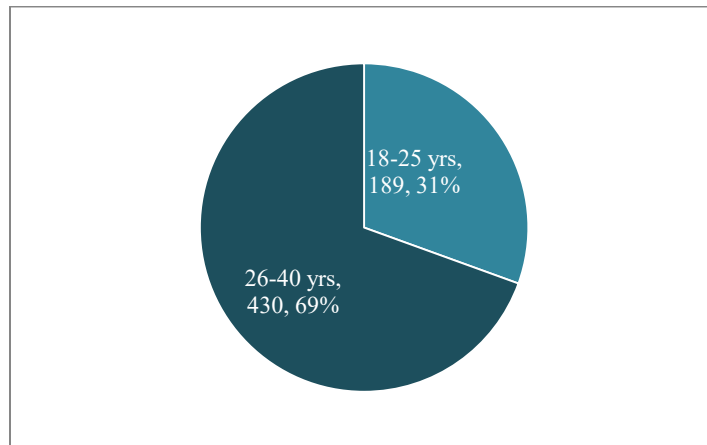


**Figure 1.3** Demographic Details: Frequency Pie Chart for Education
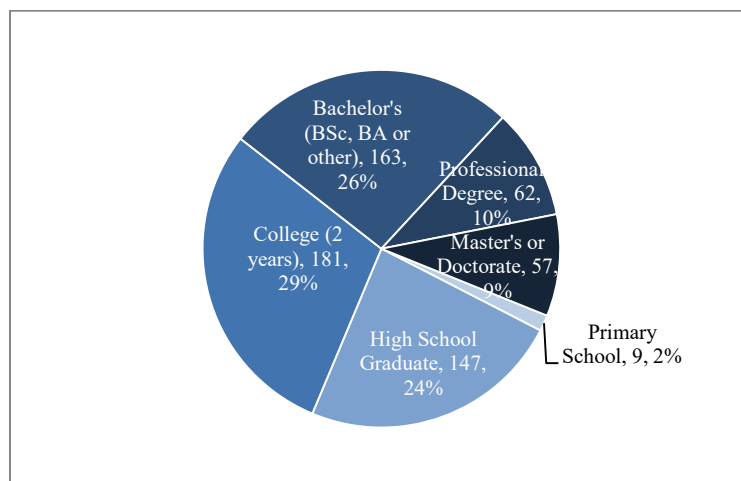
**Figure 1.4** Demographic Details: Frequency Pie Chart for Annual Household Income
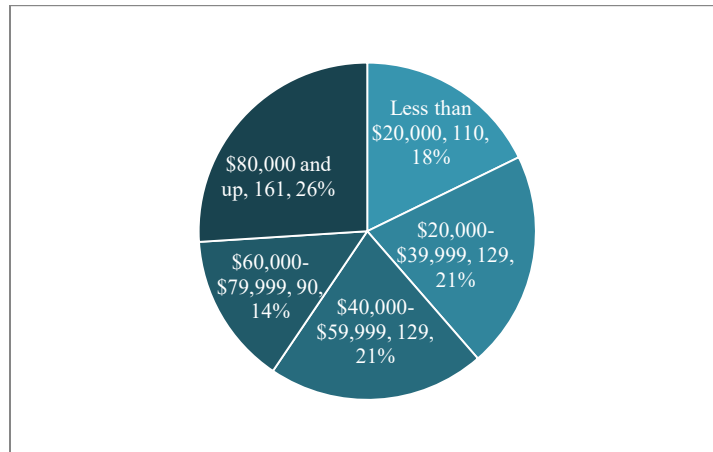


**Table 1.2** Demographic Compositions across Groups

|  |  | EC-English | | EC-French | | FC-English | | FC-French | |
|---|---|---|---|---|---|---|---|---|---|
|  |  | Freq. | % of Total | Freq. | % of Total | Freq. | % of Total | Freq. | % of Total |
| Age | 18-25 | 54 | 37.20% | 57 | 36.80% | 43 | 27.70% | 35 | 21.30% |
|  | 26-40 | 91 | 62.80% | 98 | 63.20% | 112 | 72.30% | 129 | 78.70% |
| Gender | Female | 90 | 62.10% | 96 | 61.90% | 102 | 65.80% | 114 | 69.50% |
|  | Male | 55 | 37.90% | 59 | 38.10% | 53 | 34.20% | 50 | 30.50% |
| Income | Less than $20,000 | 25 | 17.20% | 34 | 21.90% | 28 | 18.10% | 23 | 14% |
|  | $20,000- $39,999 | 26 | 17.90% | 31 | 20% | 32 | 20.60% | 40 | 24.40% |
|  | $40,000- $59,999 | 30 | 20.70% | 30 | 19.40% | 32 | 20.60% | 37 | 22.60% |
|  | $60,000- $79,999 | 21 | 14.50% | 24 | 15.50% | 22 | 14.20% | 23 | 14% |
|  | $80,000 and up | 43 | 29.70% | 36 | 23.20% | 41 | 26.50% | 41 | 25% |
| Education | Primary School | 1 | 0.70% | 2 | 1.30% | 5 | 3.20% | 1 | 0.60% |
|  | High School | 24 | 16.60% | 39 | 25.20% | 39 | 25.20% | 45 | 27.40% |
|  | College (2 years) | 43 | 29.70% | 39 | 25.20% | 49 | 31.60% | 50 | 30.50% |
|  | Bachelor's | 43 | 29.70% | 43 | 27.70% | 36 | 23.20% | 41 | 25% |
|  | Professional Deg. | 13 | 9% | 18 | 11.60% | 9 | 5.80% | 22 | 13.40% |
|  | Master's or PhD | 21 | 14.50% | 14 | 9% | 17 | 11% | 5 | 3% |

*Overview of Analysis*

There are two sections in the analysis. The first section is for measure purification. In this section, participant data for language acculturation and ethnic identification and attachment were analyzed to find a comparable structure across the four conditions (EC-English, EC-French, FC-

French, and FC-English). Also, a probable same structure for both cultures was preferred for simplicity. Exploratory factor analysis and confirmatory factor analysis were used to purify the items. The second section ran a multivariate analysis of variance with ethnicity and language of questionnaire as the independent variables and the factors of English/French language acculturation and ethnic identification as the dependent variables.

**Measure Purification**

*Exploratory Factor Analysis*

As a translated version of the questionnaire was developed and two different ethnic groups were used in the study, the factorial structures of the measurement scales were looked into in the first analysis. A series of exploratory factor analyses were run separately on the 4 groups. The questionnaire includes measurements scales for both English language acculturation and identification and French language acculturation and identification. Principal axis factoring and direct oblimin rotation were used in IBM SPSS software for the EFA. An iterative purification process was used in each of the four groups to get rid of the cross-loaded items and the items with low factor loadings (Churchill, 1979). A cutoff value of 0.65 was used in this regard. The purpose was to have an initial idea of the factorial structure of the concepts involving 'language acculturation' and 'ethnic identification and attachment' to both cultures. It was difficult to find a comparable structure across all the groups for both English and French language acculturation and identification when Eigen value>1 was used as a means of choosing number of factors to retain. The analysis also failed to obtain a common 4 factor structure in almost all cases as was expected from previous studies. Instead, a correlated three factor structure emerged across all conditions. The factors 'English/French Language Use' and 'English/French Social Interaction' merged at one point during the EFA and most items of the first factor (language use) moved out of the factor. The items in factors in the EFA are presented in tables 1.3 and 1.4.

During the EFA analysis, it appeared that the factor 'Ethnic identification and attachment' gets rid of the core identity questions (22-24) in almost all the groups. Also, the factors 'language use' and 'social interaction' merged to form one factor. For English acculturation, only one item from the factor 'language use' survived for the EC respondents. FC responses got rid of all the items in that factor. All the items in the factor 'English media use' stayed for EC respondents while items related to radio and newspaper did not make the cut for FC responses. Items 16 and

18 ('English culture is most important in my life', and 'I am most comfortable in English culture') moved out for English language acculturation while item 18 mostly stayed for French acculturation ('I am most comfortable in French culture'). An interesting finding from the EFA was that only the FC-French responses for French acculturation hold all the original items (French language use, French media use, French social interaction, and French ethnic identification and attachment). This is in line with the previous reports regarding ethnic change of French Canadians (Laroche et al., 1996). But their response regarding English acculturation has the new 3 factor structure. Omission of the 'language use' factor in the other conditions and for the English language acculturation may be more of a phenomenon related to inclusion of English bilinguals and second language response of French Canadians.

**Table 1.3** EFA on **English** Language Acculturation, Ethnic Identification and Attachment

| Group | Items retained in EFA | | |
| --- | --- | --- | --- |
| | Factor 1<br>**English** Social<br>Interaction | Factor 2<br>**English** Media<br>Exposure | Factor 3<br>**English** Cultural<br>Attachment |
| EC-English | Q4. (2, 11, 13, 14, 15) | Q4. (7, 8, 9, 10) | Q4. (17, 19, 20, 21, 24) |
| EC-French | Same as above | Same as above | Same as above |
| FC- French | Q4. (11, 12, 13, 14, 15) | Q4. (7,10) | Q4. (17, 19, 20, 21) |
| FC-English | Same as above | Same as above | Same as above |

**Table 1.4** EFA on **French** Language Acculturation, Ethnic Identification and Attachment

| Group | Items Retained in EFA | | |
| --- | --- | --- | --- |
| | Factor 1<br>**French** Social<br>Interaction | Factor 2<br>**French** Media<br>Exposure | Factor 3<br>**French** Cultural<br>Attachment |
| EC-English | Q5. (11, 12, 13, 14, 15) | Q5. (7, 8, 9, 10) | Q5. (17, 18, 19, 20, 21) |
| EC-French | Q5. (1, 2, 4, 5, 6) | Q5. (7, 8, 10) | Q5. (16, 17, 18, 19, 20, 21) |
| FC- French | Q5. (2, 3, 4, 5, 6) +<br>(11, 13, 14, 15) | Q5. (7, 8, 9, 10) | Q5. (17, 19, 20, 21) |
| FC-English | Q5. (11, 12, 13, 14, 15) | Q5. (7, 8, 10) | Q5. (17, 18, 19, 20, 21) |

*A Common Item Structure Based on EFA:* From tables 1.3 and 1.4, based on the items in each factor, a common item factorial structure across all the conditions is proposed. This common item model included the minimum items common to most conditions. The common item model is needed to derive meaningful comparisons of means across conditions. Table 1.5 presents the proposed common item 3 factor structure with explanations why some additions or omissions were made to each of the factors. In brief, the factor 'media use' retained 3 items, 'social interaction' retained 4 items, and 'cultural attachment' retained 4 items.

**Table 1.5** Proposed Common-Item Factorial Structure across Groups

| Factor No. | Factor Name | Item Numbers | Explanatory note |
|---|---|---|---|
| Factor F1 | English/French Media Use | Q (7,8,10) Note: Q9 is not included | Item Q8 was not present in EFA for English acculturation for FC-French and FC-English responses (present in 6 other groups). It is added to have a minimum 3 items in the factor. This item (listening to radio programs) is very similar to the included item 'watching TV programs'. |
| F2 | English/French Social Interaction | Q (11, 13, 14, 15) Note: Q12 is removed | These items from 'Social Interaction' factor are common in all conditions except for EC-French response for French acculturation. There, the items for the factor 'French language use' survived in the EFA. These two factors 'language use' and 'social interaction' are highly correlated (>0.85) in all conditions. So, items from 'social interaction' can be an alternate measure for French acculturation responses for EC-French condition. |
| F3 | English/French Cultural Attachment | Q (17, 19, 20, 21) Note: Q16 and Q18 are removed | Items Q16 and Q18 were present in the conditions inconsistently. The other items appeared in all conditions consistently. |

*Confirmatory Factor Analysis*

Different models on the four conditions were tested with the confirmatory factor analysis. EQS software with maximum likelihood (ML) estimator was used in this regard. A 3 factor model based on the EFA results was run at first. Then the common item three-factor model was run. A four factor model with all original items and a 5 factor model splitting ethnic identification into two factors were then tested to check the fit of the original models from previous studies. Fit indices for the various models for the four conditions are presented in tables 1.6, 1.7, 1.8, and 1.9 respectively.

**Figure 1.5** FC-English Common Structure CFA Model: English Acculturation; $\chi2$=48.45, df=41, P=0.20, CFI=0.99, RMSEA=0.03, SRMR=0.046 (ML estimator)
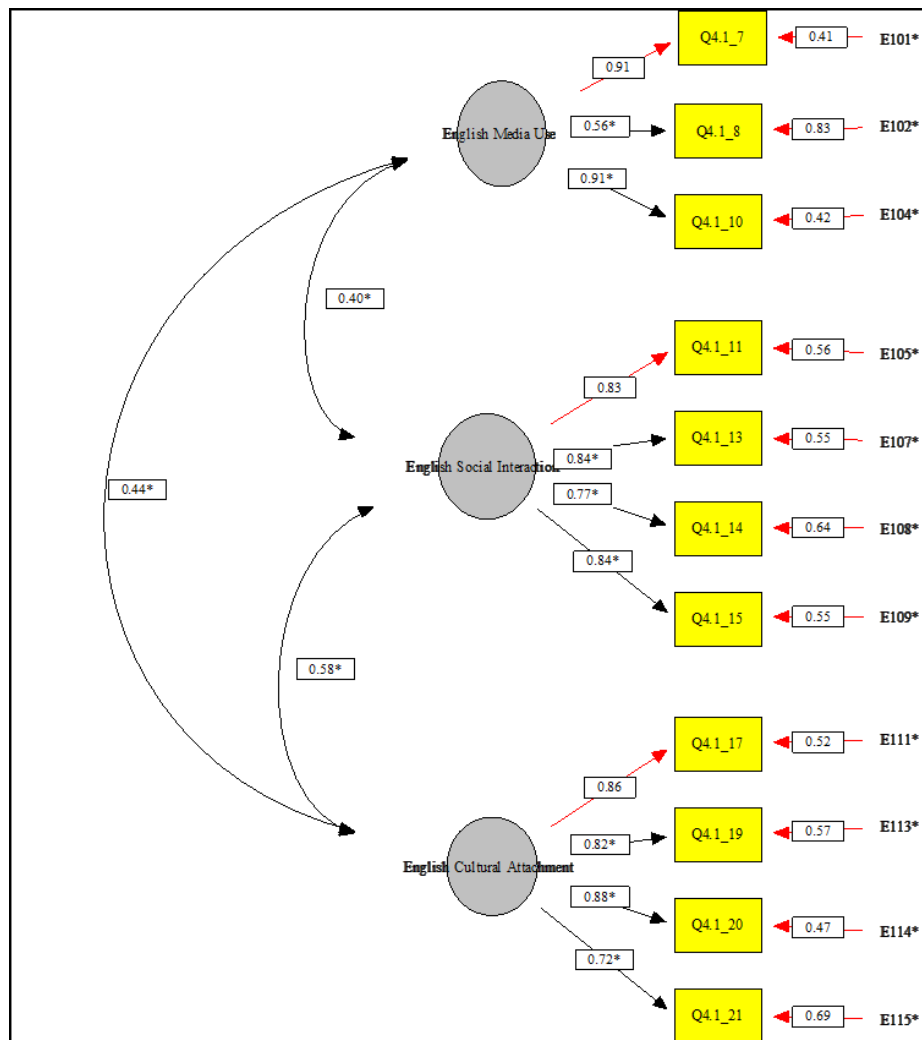
*A 3 Factor Model Based on the EFA:* Based on the EFA results, confirmatory factor analyses were run for both English and French language acculturation and ethnic identification for all the four conditions (EC-English, EC-French, FC-French, and FC-English). The fit indices showed that the χ2 test of model fit was significant, good to marginally okay RMSEA values were present in some conditions, CFI values had reasonably good fit (>0.9 or >0.95), and standardized RMR had very good values across all conditions.

*A 3 Factor Common Item Structure:* A series of CFA were run on the common item factorial structure as proposed earlier. The CFA fit indices for the common items structure showed some improvement in model fit indices in most cases than the EFA based model. FC-French response to English acculturation had almost identical fit indices while EC-French response to French acculturation showed a poorer model fit. Figure 1.5 shows the common item structure for the FC-English responses for English acculturation and cultural attachment.

*4 and 5 Factor Models:* As the language acculturation and ethnic identification factors were selected from previous studies, a series of different models were run on the previously 'fit' structures with all the items as reported before. The expectations were to get some insight on the three factor structure that emerged. Two models were considered in this regard. A four factor model with all the factors and items from previous studies, and a five factor model by separating items (Q4.1_22-24 and Q5.1_22-24) related to the factor 'ethnic identification and attachment'. This separation of this factor also made sense as seemed to have distinct meaning than the rest of the items in the factor and showed some improvements in fit indices. But, overall these models did not provide with very good model fit indices.

**Table 1.6** CFA Model Fit Indices for **EC-English** Responses, ML Estimate

| EC-English | χ2 | df | p | χ2/df | CFI | SRMR | RMSEA | 90% CI |
|---|---|---|---|---|---|---|---|---|
| *English Language Acculturation & Cultural Attachment* | | | | | | | | |
| 4 Factors (all items) | 632.33 | 246 | 0.0 | 2.57 | 0.88 | 0.074 | 0.104 | .094, .114 |
| 5 Factors (all items) | 590.60 | 242 | 0.0 | 2.43 | 0.89 | 0.068 | 0.10 | .089, .11 |
| 3 Factors (EFA Based) | 139.71 | 74 | 0.0 | 1.88 | 0.96 | 0.052 | 0.08 | .058, .098 |
| 3 Factors (Common Item) | 70.58 | 41 | 0.0 | 1.72 | 0.98 | 0.045 | 0.07 | .041, .098 |
| *French Language Acculturation & Cultural Attachment* | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 Factors (all items) | 630.86 | 246 | 0.0 | 2.56 | 0.88 | 0.066 | 0.104 | .094, .114 |
| 5 Factors (all items) | 558.92 | 242 | 0.0 | 2.30 | 0.90 | 0.055 | 0.95 | .085, .105 |
| 3 Factors (EFA Based | 150.56 | 74 | 0.0 | 2.03 | 0.96 | 0.047 | 0.085 | .065, .104 |
| 3 Factors (Common Item) | 81.65 | 41 | 0.0 | 1.99 | 0.97 | 0.036 | 0.08 | .056, .108 |

**Table 1.7** CFA Model Fit Indices for **EC-French** Responses, ML Estimate

| EC-French | $\chi^2$ | df | p | $\chi^2$/df | CFI | SRMR | RMSEA | 90% CI |
|---|---|---|---|---|---|---|---|---|
| *English Language Acculturation & Cultural Attachment* | | | | | | | | |
| 4 Factors (all items) | 456.98 | 246 | 0.0 | 1.85 | 0.93 | 0.046 | 0.075 | .064, .085 |
| 5 Factors (all items) | 431.87 | 242 | 0.0 | 1.78 | 0.94 | 0.043 | 0.071 | .06, .082 |
| 3 Factors (EFA Based) | 184.41 | 74 | 0.0 | 2.49 | 0.94 | 0.047 | 0.098 | .08, .116 |
| 3 Factors (Common Item) | 79.78 | 41 | 0.0 | 1.94 | 0.97 | 0.035 | 0.078 | .052, .108 |
| *French Language Acculturation & Cultural Attachment* | | | | | | | | |
| 4 Factors (all items) | 627.71 | 246 | 0.0 | 2.55 | 0.90 | 0.063 | 0.10 | .09, .11 |
| 5 Factors (all items) | 523.2 | 242 | 0.0 | 2.16 | 0.92 | 0.053 | 0.087 | .076, .097 |
| 3 Factors (EFA Based) | 167.20 | 74 | 0.0 | 2.25 | 0.95 | 0.04 | 0.09 | .072, .108 |
| 3 Factors (Common Item) | 117.23 | 41 | 0.0 | 2.85 | 0.95 | 0.058 | 0.11 | .086, .133 |

**Table 1.8** CFA Model Fit Indices for **FC-French** Responses, ML Estimate

| FC-French | $\chi^2$ | df | p | $\chi^2$/df | CFI | SRMR | RMSEA | 90% CI |
|---|---|---|---|---|---|---|---|---|
| *English Language Acculturation & Cultural Attachment* | | | | | | | | |
| 4 Factors (all items) | 825.79 | 246 | 0.0 | 3.35 | 0.82 | 0.102 | 0.12 | .111 .129 |
| 5 Factors (all items) | 592 | 242 | 0.0 | 2.44 | 0.89 | 0.09 | 0.094 | .084, .103 |
| 3 Factors (EFA Based) | 119.44 | 74 | 0.0 | 1.61 | 0.94 | 0.045 | 0.108 | .086, .131 |
| 3 Factors (Common Item) | 117.57 | 41 | 0.0 | 2.86 | 0.94 | 0.073 | 0.107 | .084, .129 |
| *French Language Acculturation & Cultural Attachment* | | | | | | | | |
| 4 Factors (all items) | 834.31 | 246 | 0.0 | 3.39 | 0.84 | 0.075 | 0.12 | .112, .130 |
| 5 Factors (all items) | 712.47 | 242 | 0.0 | 2.94 | 0.87 | 0.073 | 0.109 | .1, .118 |
| 3 Factors (EFA Based) | 331.09 | 116 | 0.0 | 2.85 | 0.91 | 0.066 | 0.107 | .093, .12 |
| 3 Factors (Common Item) | 100.91 | 41 | 0.0 | 2.46 | 0.96 | 0.063 | 0.09 | .071, .118 |

**Table 1.9** CFA Model Fit Indices for **FC-English** Responses, ML Estimate

| FC-English | χ2 | df | p | χ2/df | CFI | SRMR | RMSEA | 90% CI |
|---|---|---|---|---|---|---|---|---|
| *English Language Acculturation & Cultural Attachment* | | | | | | | | |
| 4 Factors (all items) | 526.73 | 246 | 0.0 | 2.14 | 0.90 | .069 | .086 | .076, .096 |
| 5 Factors (all items) | 439.97 | 242 | 0.0 | 1.81 | 0.93 | .065 | .073 | .062, .083 |
| 3 Factors (EFA Based) | 61.96 | 41 | .02 | 1.51 | 0.98 | .035 | .058 | .024, .085 |
| 3 Factors (Common Item) | 48.45 | 41 | .20 | 1.18 | 0.99 | .046 | .034 | .00, .086 |
| *French Language Acculturation & Cultural Attachment* | | | | | | | | |
| 4 Factors (all items) | 690.86 | 246 | 0.0 | 2.80 | 0.86 | .089 | .108 | .099, .108 |
| 5 Factors (all items) | 556.72 | 242 | 0.0 | 2.30 | 0.90 | .077 | .092 | .082, .102 |
| 3 Factors (EFA Based) | 173.97 | 62 | 0.0 | 2.80 | 0.94 | .064 | .108 | .089, .127 |
| 3 Factors (Common Item) | 79.89 | 41 | 0.0 | 1.94 | 0.97 | .06 | .078 | .052, .103 |

*Comparative Analysis of CFA Model Fit Indices*

The common item three factor models showed improvements over the other models. The χ2 test was significant (which is not okay) for all groups except for FC-English responses for English acculturation. The comparative fit index (CFI) was very good will all values above 0.95 except for FC-English responses for English acculturation. RMSEA value was from very good (0.03 for FC-English response for English acculturation) to mostly acceptable and marginally on the cut off region for FC-French responses for English acculturation and EC-French responses to French acculturation. Standardized RMR values were also all very good (<0.06) except for FC-French responses for English acculturation. Overall this common structure model showed better fit that the EFA based model and the 4/5 factor models.

The 4 and 5 factor models showed very high correlations (>0.85) between the factors 'language use' and 'media use' in most conditions. This indicates a probable cause the factors tended to merge in the EFA. CFI and RMSEA indicated more of a mediocre/poor fit. It is reported that models with small degrees of freedom and low N may have artificially large values of the RMSEA, and models with more variables tend to have comparatively poorer fit. Also, models with high correlation among factors show poorer Chi squared fit (David Kenny, 2015). For these reasons, and for the fact that these models were theoretically supported in previous literature, it is tough to discard them completely. For this study, these models did not provide with a good fit.

*Robust ML Estimator for CFA*

Because of the issues with significant χ2 test and RMSEA values, normality of the data was checked and high values of multivariate Kurtosis were found in all groups. As the better model from the previous analysis, only the common item model was continued at this point. The values for multivariate Kurtosis for the models are presented in table 1.10. It was deemed appropriate to use a robust maximum likelihood estimator and have Satorra-Bentler correction for χ2 test to tackle this issue with Kurtosis. The model fit indices for the common item model showed significant improvement with the ML robust estimator. Most of the χ2 tests became not significant except for EC-French responses to both English and French acculturation, and FC-French responses to French acculturation. RMSEA values showed significant improvement with only FC-French responses to English acculturation having a marginally high value. CFI values also showed improvement with the lowest being .956 for FC-French responses to English acculturation. All fit indices for the common item 3 factor model with a robust maximum likelihood estimator are presented in table 1.11. Standardized factor loadings of the items for all conditions are presented in table 1.12 and 1.13 for English and French acculturation respectively. Only FC responses (both English and French version) to the item relating to 'always listen to English/French radio programs' had a moderate factor loadings for the media use factor. Factor loadings for all other items were very good. Factor correlations for all the conditions are presented in table 1.14 and 1.15 for the English and French acculturation responses respectively. Correlations among the three factors for all conditions were moderate to strong. EC-French responses showed particularly stronger correlations between factors.

**Table 1.10** Multivariate Kurtosis Values for Common Item Factorial Structure

|  | English Acculturation | | French Acculturation | |
|---|---|---|---|---|
|  | Mardia's Coefficient | Normalized Estimate | Mardia's Coefficient | Normalized Estimate |
| EC-English | 67.5309 | 24.0422 | 59.48 | 21.1759 |
| EC-French | 58.4049 | 21.4982 | 38.31 | 14.1025 |
| FC-French | 34.8392 | 13.1910 | 62.798 | 23.7769 |
| FC-English | 29.8055 | 10.9711 | 74.964 | 27.5934 |

**Table 1.11** Common Item Model Fit Indices All Groups, **Robust** ML Estimate

| Robust ML | Satorra-Bentler Scaled χ2 | df | p | χ2/df | CFI | RMSEA | 90% CI |
|---|---|---|---|---|---|---|---|
| *English Acculturation* | | | | | | | |
| EC-English | 37.23 | 38 | .51 | .98 | 1 | .00 | .00, .057 |
| EC-French | 45.35 | 38 | .19 | 1.19 | .991 | .035 | .00, .069 |
| FC-French | 85.53 | 38 | .00 | 2.25 | .956 | .088 | .063, .11 |
| FC-English | 31.76 | 38 | .75 | .83 | 1 | .00 | .00, .041 |
| *French Acculturation* | | | | | | | |
| EC-English | 51.96 | 38 | .07 | 1.37 | .989 | .051 | .00, .082 |
| EC-French | 69.19 | 38 | .00 | 1.82 | .978 | .073 | .045, .1 |
| FC-French | 56.33 | 38 | .03 | 1.48 | .985 | .054 | .018, .08 |
| FC-English | 43.88 | 38 | .23 | 1.15 | .995 | .032 | .00, .067 |

**Table 1.12** Standardized Parameter Estimates **English Acculturation** (All Groups)

| Latent Factors & Items | Standardized coefficients | | | |
|---|---|---|---|---|
| | EC-English | EC-French | FC-French | FC-English |
| **F1  *English Media Use*** | | | | |
| Q4.1_7 The TV programs that I watch are always in the English language | 0.89 | 0.84 | 0.87 | 0.91 |
| Q4.1_8 The radio programs that I listen to are always in the English language | 0.78 | 0.84 | 0.47 | 0.56 |
| Q4.1_10 The movies and DVDs that I watch are always in the English language | 0.79 | 0.83 | 0.91 | 0.91 |
| **F2  *English Social Interaction*** | | | | |
| Q4.1_11 Most of my friends are English speaking | 0.87 | 0.81 | 0.90 | 0.83 |
| Q4.1_13 Most of the people I go to parties with are English speaking | 0.94 | 0.89 | 0.86 | 0.84 |
| Q4.1_14 I get together with English speaking | 0.89 | 0.80 | 0.73 | 0.77 |

| | people very often | | | | |
|---|---|---|---|---|---|
| | Q4.1_15 I have many English speaking friends with whom I am very close | 0.80 | 0.85 | 0.86 | 0.84 |
| F3 | *English Ethnic Identification and Attachment* | | | | |
| | Q4.1_17 I feel very proud of the English culture. | 0.82 | 0.87 | 0.88 | 0.86 |
| | Q4.1_19 I feel a strong attachment to the English culture. | 0.87 | 0.87 | 0.90 | 0.82 |
| | Q4.1_20 I feel very proud to identify with the English. | 0.96 | 0.88 | 0.88 | 0.88 |
| | Q4.1_21 I consider the English culture rich and precious. | 0.88 | 0.75 | 0.74 | 0.72 |

**Table 1.13** Standardized Parameter Estimates for **French Acculturation** (All Groups)

| | | Standardized Coefficients | | | |
|---|---|---|---|---|---|
| | Latent Factors & Items | EC- English | EC- French | FC- French | FC- English |
| F1 | *French Media Use* | | | | |
| | Q5.1_7 The TV programs that I watch are always in the French language | 0.96 | 0.90 | 0.93 | 0.94 |
| | Q5.1_8 The radio programs that I listen to are always in the French language | 0.89 | 0.92 | 0.60 | 0.68 |
| | Q5.1_10 The movies and DVDs that I watch are always in the French language | 0.88 | 0.87 | 0.81 | 0.92 |
| F2 | *French Social Interaction* | | | | |
| | Q5.1_11 Most of my friends are French speaking | 0.85 | 0.83 | 0.84 | 0.83 |
| | Q5.1_13 Most of the people I go to parties with are French speaking | 0.89 | 0.86 | 0.78 | 0.88 |
| | Q5.1_14 I get together with French speaking people very often | 0.91 | 0.66 | 0.90 | 0.84 |
| | Q5.1_15 I have many French speaking friends | 0.83 | 0.80 | 0.93 | 0.76 |

| | | | | | |
|---|---|---|---|---|---|
| | with whom I am very close | | | | |
| F3 | *French Ethnic Identification and Attachment* | | | | |
| | Q5.1_17 I feel very proud of the French culture | 0.88 | 0.81 | 0.86 | 0.90 |
| | Q5.1_19 I feel a strong attachment to the French culture. | 0.90 | 0.96 | 0.90 | 0.91 |
| | Q5.1_20 I feel very proud to identify with the French. | 0.86 | 0.92 | 0.94 | 0.94 |
| | Q5.1_21 I consider the French culture rich and precious. | 0.80 | 0.80 | 0.85 | 0.80 |

**Table 1.14** Factor Correlations for **English** Acculturation (All Groups)

| English Acculturation | Eng. Media Use * Eng. Social Int. | Eng. Social Int. * Eng. Cultural Attachment | Eng. Media Use * Eng. Cultural Att |
|---|---|---|---|
| EC-English | .61 | .65 | .55 |
| EC-French | .8 | .78 | .72 |
| FC-French | .41 | .64 | .44 |
| FC-English | .4 | .58 | .44 |

**Table 1.15** Factor Correlations for **French** Acculturation (All Groups)

| French Acculturation | French Media Use * French. Social Int. | French Social Int. * French Cultural Attach. | French Media Use * French Cultural Attach. |
|---|---|---|---|
| EC-English | .59 | .61 | .55 |
| EC-French | .76 | .71 | .57 |
| FC-French | .25 | .59 | .34 |
| FC-English | .39 | .5 | .47 |

The presence of moderate to strong correlations between factors led to a discriminant validity analysis. The CFA models for all the conditions for both English and French acculturation were constrained by placing the correlation value between two factors to unity. Then the $\chi^2$ difference tests found the original CFA models to show better statistical fits. This confirmed discriminant validity of the factors (Anderson and Gerbing, 1988).

As the study includes two ethnic groups and translated version of a questionnaire, measurement invariance across the four conditions were looked into. The guidelines compiled by Steencamp and Baumgartner (1998) were consulted in this regard. It is realized that configural invariance and scalar invariance are already achieved across the four conditions. The proposal of the common item factorial structure across the four conditions with the same observed variables for each latent variable largely helped to achieve invariance. The criterions for the configural invariance are that the factorial structures across the conditions are the same, the factor loadings are substantial and significantly different than zero, the factor correlations are significantly under unity, and the factors show discriminant validity. These are all supported in the proposed structure across the conditions. This measurement also has scalar invariance as the factor loadings for each item across the conditions are very similar with only a couple of items showing slightly low factor loadings for certain conditions. The requirement is to have at least two items in each factor that have very similar loadings. Also, the fit indices for the measurement models in the four conditions are very similar. The other forms of measurement invariances were not checked as these two forms of invariance are considered sufficient to compare means across the conditions.

*CFA Results Discussion*

The results suggest that English and French Canadian bilinguals living in the province in Quebec show a different factorial structure for language acculturation and ethnic identification than was observed among bilingual French Canadians or other bilinguals in Canada in previous studies. The factors 'language use' and 'social interaction' became highly correlated and formed a single factor once an exploratory factor analysis was run. In the CFA, it was possible to find two similar 3 factor common item structures to explain English acculturation and cultural attachment and French acculturation and cultural attachment. Both concepts have three factors namely 'media use', 'social interaction,' and 'cultural attachment'. There were multivariate Kurtosis in the data and robust maximum likelihood estimate provided with better model fit indices for the models.

**Multivariate Analysis of Variance**

This section used the purified measurement scale regarding language acculturation and cultural attachment and looked into the differences across the groups. English acculturation and French

acculturation are the two distinct (and correlated) cultural frames that the bilinguals exhibit in this regard. The dependent variables in this analysis are the factors of ethnic change: English/French media use, English/French Social interaction, and English/French cultural attachment. Ethnicity (EC vs. FC) and language of questionnaire (English vs. French) are the two independent variables used in the analysis. There are two elements of this task. First, finding the differences related to first language responses from these two groups; and second, finding differences between the first and the second language response of each of the two groups. The first element would confirm if the two groups differ on a particular factor as different ethnic groups, and the second element would confirm if the groups show acculturation to the other group while responding in second language.

The choice of a multivariate analysis of variance starts with the findings that the dependent variables are moderately to strongly correlated as found during measure purification. From the previous section, a comparable structure of the measurement scale (factors of ethnic change) was developed across the four conditions (EC-English, EC-French, FC-English, and FC-French). Also, the analysis of the demographic variables in each of the groups did not find any major differences in composition in terms of age, gender, education, and income. So, consideration of the data from the four conditions as data from a continuous group seemed appropriate. Using ethnicity and language of questionnaire as categorical independent variables and the factors of ethnic change as dependent variables allowed us to run between-group analysis. The analysis and details for both the English and French acculturation are presented in the following sections.

*English Language Acculturation and Ethnic Identification*

From the common item factorial structure proposed in the earlier section, mean values for the factors English media use, English social interaction, and English cultural attachment for each participant were calculated for this analysis. As MANOVA was selected as the method of analysis, the different assumptions for MANOVA were looked into. The data was collected from Likert type scales and it was considered suitable to be used in parametric procedures (Norman, 2010). The independent variables were categorical and dependent variables explained a meaningful concept and were correlated from moderately to strongly as we had found in the first section. The observations were independent of each other and no participant was present in more than one group. Sample size was adequate with about 150 cases in each cell where having more

cases than number of DVs is considered a sufficient condition. As Likert type scale data was used in this study, outliers were not deemed a major concern. Looking in to the data, it was found that the assumption of normality was violated as normality tests were significant in most conditions. Only FC-English responses adhered to normality assumptions (Kolmogorov-Smirnov test $P$=0.2, df= 155, Shapiro-Wilk test $p$=0.1, df=155). Q-Q plots showed that the deviations from the normal curves were rather modest. So, a multivariate analysis of variance (MANOVA) was deemed appropriate as an analysis tool as it is considered robust to modest violations of normality when sample sizes are equal and degrees of freedom are at least 20 in the univariate analyses (Tabachnick and Fidell, 2007). Also, equality of covariance matrix was violated as Box's M test was significant ($p$=.00). It is reported that for groups with more than 30 cases, MANOVA is robust against the violation of this assumption. Assumption of equality of error variance was also violated as Levene's test came significant for all the dependent variables. A stricter $p$ value ($p$=0.01) was used in the univariate tests as a measure against this violation of equality of error variance. Descriptive statistics for the MANOVA for English acculturation are presented in table 1.16.

**Table 1.16** Descriptive Statistics for MANOVA: English Acculturation

|  | Ethnicity | Questionnaire language | Mean | Std. Deviation | N |
|---|---|---|---|---|---|
| English Media Use | EC | English | 5.6184 | 1.34485 | 145 |
|  |  | French | 5.4280 | 1.54805 | 155 |
|  | FC | English | 4.8043 | 1.59987 | 155 |
|  |  | French | 4.3659 | 1.54471 | 164 |
| English Social Interaction | EC | English | 5.3879 | 1.50662 | 145 |
|  |  | French | 5.1323 | 1.46255 | 155 |
|  | FC | English | 3.4823 | 1.52125 | 155 |
|  |  | French | 3.1814 | 1.49188 | 164 |
| English Cultural Attachment | EC | English | 5.3644 | 1.29904 | 145 |
|  |  | French | 5.3258 | 1.30687 | 155 |
|  | FC | English | 4.0452 | 1.40735 | 155 |
|  |  | French | 4.0152 | 1.34654 | 164 |

A multivariate analysis with ethnicity and language of questionnaire as independent variables (IVs) and the three factors of English language acculturation and cultural attachment as dependent variables (DVs) showed a significant effect of ethnicity (F $(3,613)$ = 88.28, $p<0.005$; Wilk's $\Lambda$ = 0.698) and language of questionnaire (F $(3,613)$ = 4.171, $p$ = 0.006; Wilk's $\Lambda$ = 0.980), and no significant effect of the interaction term ethnicity*questionnaire language (F $(3,613)$ = 0.511, $p=0.68$; Wilk's $\Lambda$= 0.998). Table 1.17 shows the between subject effects for this test. All the effects for ethnicity and language of questionnaire are statistically significant except for effect of questionnaire language on 'English cultural attachment'.

**Table: 1.17** Tests of Between-Subjects Effects: English Acculturation

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Ethnicity | English Media Use | 135.925 | 1 | 135.925 | 59.177 | .000 |
| | English Social Interaction | 574.299 | 1 | 574.299 | 256.782 | .000 |
| | English Cultural Attachment | 267.042 | 1 | 267.042 | 148.413 | .000 |
| Questionnaire language | English Media Use | 15.272 | 1 | 15.272 | 6.649 | .010 |
| | English Social Interaction | 11.960 | 1 | 11.960 | 5.347 | .021 |
| | English Cultural Attachment | .181 | 1 | .181 | .101 | .751 |
| Ethnicity * Questionnaire language | English Media Use | 2.375 | 1 | 2.375 | 1.034 | .310 |
| | English Social Interaction | .079 | 1 | .079 | .035 | .851 |
| | English Cultural Attachment | .003 | 1 | .003 | .002 | .968 |

Univariate effects of ethnicity and questionnaire language for the significant main effects are shown in table 1.18 and 1.19.

**Table 1.18** Univariate Effects of Ethnicity**:** English Acculturation

| Dependent Variable | Ethnicity | Mean | Std. Error | 95% Confidence Interval Lower Bound | 95% Confidence Interval Upper Bound |
|---|---|---|---|---|---|
| English Media Use | EC | 5.523 | .088 | 5.351 | 5.695 |
| | FC | 4.585 | .085 | 4.418 | 4.752 |
| English Social Interaction | EC | 5.260 | .086 | 5.090 | 5.430 |

| | | | | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | | |
| | FC | 3.332 | .084 | 3.167 | 3.496 |
| English Cultural Attachment | EC | 5.345 | .077 | 5.193 | 5.497 |
| | FC | 4.030 | .075 | 3.883 | 4.178 |

**Table 1.19** Univariate Effects of Questionnaire Language: English Acculturation

| | | | | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Dependent Variable | Questionnaire language | Mean | Std. Error | Lower Bound | Upper Bound |
| English Media Use | English | 5.211 | .088 | 5.039 | 5.383 |
| | French | 4.897 | .085 | 4.730 | 5.064 |
| English Social Interaction | English | 4.435 | .086 | 4.265 | 4.605 |
| | French | 4.157 | .084 | 3.992 | 4.321 |
| English Cultural Attachment[N.S.] | English [N.S] | 4.705 | .077 | 4.553 | 4.857 |
| | French [N.S] | 4.671 | .075 | 4.523 | 4.818 |

Figure 1.6, 1.7 and 1.8 show that the marginal mean values for English language acculturation and cultural attachment for the EC bilinguals are always higher than that of the FC bilinguals. This supports hypothesis $H_1$. Also, it confirms that second language responses tend to be different from first language response and it shifts towards the responses of the other ethnic group. This appears to be the result of acculturation; that EC bilingual's responses in French move closer to FC bilingual responses to the questions, and vice versa. These findings indicate that hypotheses $H_2$ and $H_3$ have the right direction of mean differences. An interesting finding from the marginal means is that the second language responses always stayed close to the first language responses and did not cross the grand mean. This suggests that the magnitude of acculturation during second language responses is not too strong (or statistically significant) to be compared with the response from the other ethnic group. So, both the groups are strongly rooted to their ethnic identity and show moderate acculturation. As there is no significant effect of questionnaire language on English cultural attachment, the marginal means plot does not show a significant deviation in the plot. Yet, the mean differences show they are in the right direction.

**Figure 1.6** Estimated Marginal Means for English Media Use



**Figure 1.7** Estimated Marginal Means for English Social Interaction



**Figure 1.8** Estimated Marginal Means for English Cultural Attachment
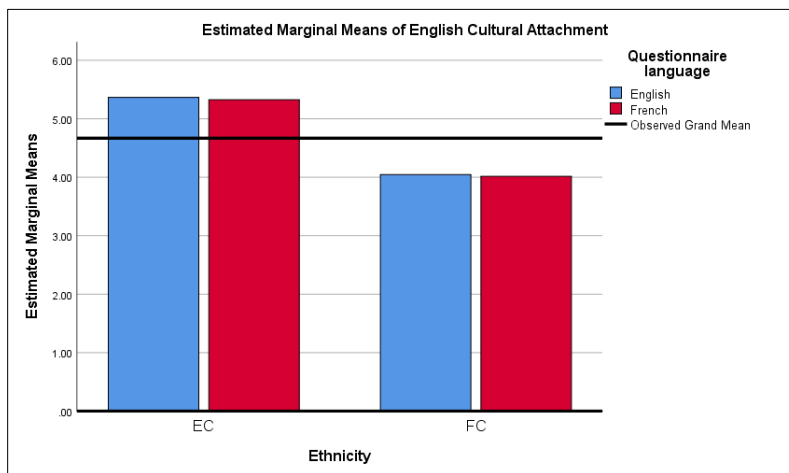
*Hypothesis Testing: English Language Acculturation and Cultural Attachment*

The MANOVA was followed up with a series of T-tests to confirm the between group differences and the hypotheses. The results are presented in table 1.20. Hypothesis $H_1$ (EC-English vs FC-French responses for English Acculturation and cultural attachment) was statistically significant for all the dependent variables. $H_2$ (EC acculturation to French) was not statistically significant for any of the variables, though the direction of mean differences was correct for all the factors. $H_3$ was statistically significant for only 'English Media Use', and had a noteworthy *p* value (.07) for 'English Social Interaction'. This suggests that although native language responses by the two ethnic groups are significantly separate for the factors of English acculturation, second language responses of EC bilinguals do not show statistically significant effects of acculturation. Second language responses of FC bilinguals show acculturation in only one factor. Having a closer look at the *p* values suggests that the factor 'cultural attachment' does not show any sign of acculturation for second language responses, while 'media use' and 'social interaction' show signs of acculturation despite not having statistical significance for all variables for both the ethnic groups.

**Table 1.20** Hypothesis Testing: English Language Acculturation

| Dependent Variable | Comparison | Hypothesis | P value | Hypothesis Supported? | Direction of Mean Diff. |
|---|---|---|---|---|---|
| English Media Use | EC-English vs FC-French | $H_1$ | **<.0001** | **Yes** | **Correct** |
| | EC-English vs. EC-French | $H_2$ | 0.23 | No | Correct |
| | FC-French vs. FC-English | $H_3$ | **.01** | **Yes** | **Correct** |
| English Social Interaction | EC-English vs FC-French | $H_1$ | **<.0001** | **Yes** | **Correct** |
| | EC-English vs. EC-French | $H_2$ | .13 | No | Correct |
| | FC-French vs. FC-English | $H_3$ | .07 | **No** | **Correct** |
| English Cultural Attachment | EC-English vs FC-French | $H_1$ | **<.0001** | **Yes** | **Correct** |
| | EC-English vs. EC-French | $H_2$ | .76 | No | Correct |
| | FC-French vs. FC-English | $H_3$ | .84 | No | Correct |

*Effects of Demographic variables*

A series of MANOVAs were conducted to understand the effects of the demographic variables of age, gender, income, and education. A statistically significant effect of age (F (3, 615) = 2.947, $p$ = 0.032; Wilk's $\Lambda$ = 0.986) was found. There were no significant effects for gender (F (3,615) = 0.113, $p$ = 0.95; Wilk's $\Lambda$ = 0.999), income (F (12, 1619.491) = 0.870, $p$ = 0.577; Wilk's $\Lambda$ = 0.983), and education level (F (15, 1687.103) = 1.347, $p$ = 0.166; Wilk's $\Lambda$= 0.968). Test of between-subjects effects showed that age has an effect on English social interaction (F (1, 21.565) = 6.856, $p$=0.009). Table 1.21 shows descriptive statistics for the two age groups and gives an idea of the direction of the mean values.

**Table 1.21** Descriptive Statistics for Age as an Independent Variable: English Acculturation

|  | Age | Mean | Std. Deviation | N |
|---|---|---|---|---|
| English Media Use | 18-25 | 5.0829 | 1.58138 | 189 |
|  | 26-40 | 5.0140 | 1.59895 | 430 |
| English Social Interaction | 18-25 | 4.5437 | 1.72563 | 189 |
|  | 26-40 | 4.1384 | 1.79420 | 430 |
| English Cultural Attachment | 18-25 | 4.7751 | 1.41625 | 189 |
|  | 26-40 | 4.6194 | 1.52195 | 430 |

*French Language Acculturation and Cultural Attachment*

All participants responded to both the English and French language acculturation and cultural attachment factors. A similar common item factorial structure was obtained for responses to both scales. So the data is expected to have similar characteristics regarding suitability for parametric tests and MANOVA. The independent variables were the same and the dependent variables explained a meaningful concept and were correlated as we had found in the CFA in the previous section. The observations were independent of each other as usual. Sample size was adequate with about 150 cases in each cell. Outliers, again, were not considered a major concern for this study. Looking into the data, it was found that the assumption of normality was violated as normality tests were significant in all conditions ($p$=.00). Q-Q plot for the dependent variables though did not show major deviations from normality. Equality of covariance matrix was violated as Box's M test was significant (Box's M= 67.293, F=3.705, df1=18, $p$=.00). Equality

of error variance was also violated as Levene's test came significant for all the dependent variables.

**Table 1.22** Levene's Test of Equality of Error Variances: French Acculturation

|  |  | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| French Media Use | Based on Mean | 4.154 | 3 | 615 | .006 |
| French Social Interaction | Based on Mean | 9.765 | 3 | 615 | .000 |
| French Cultural Attachment | Based on Mean | 4.994 | 3 | 615 | .002 |

Although some of the assumptions are violated, a robust MANOVA was run for the analysis as a significant number of cases were available in each cell (more than 30 in each) and there are almost equal numbers of cases across all conditions (Tabachnick and Fidell, 2007). Having adequate cases in each cell is a sufficient condition for a robust MANOVA with modest violations with normality and equality of the covariance matrix. A stricter $p$ value ($p$=0.01) for the univariate tests was proposed as a measure against the violation of equality of error variance following the Levene's test. Descriptive statistics for the test are presented in table 1.23.

**Table 1.23** Descriptive Statistics for MANOVA: French Acculturation

|  | Ethnicity | Questionnaire language | Mean | Std. Deviation | N |
|---|---|---|---|---|---|
| French Media Use | EC | English | 2.7402 | 1.52523 | 145 |
|  |  | French | 3.0495 | 1.74276 | 155 |
|  | FC | English | 3.8215 | 1.87151 | 155 |
|  |  | French | 4.5285 | 1.59451 | 164 |
| French Social Interaction | EC | English | 3.4241 | 1.60520 | 145 |
|  |  | French | 3.5742 | 1.52633 | 155 |
|  | FC | English | 5.4516 | 1.30063 | 155 |
|  |  | French | 5.8049 | 1.12999 | 164 |
| French Cultural Attachment | EC | English | 3.7138 | 1.52695 | 145 |
|  |  | French | 3.8516 | 1.64768 | 155 |
|  | FC | English | 5.2903 | 1.31008 | 155 |
|  |  | French | 5.6357 | 1.24319 | 164 |

A multivariate analysis with ethnicity and language of questionnaire as independent variables (IVs) and the three factors of French language acculturation and cultural attachment as dependent variables (DVs) showed a significant effect of ethnicity (F (3,613) = 125.516, $p<0.001$; Wilk's $\Lambda$ = 0.619) and language of questionnaire (F (3,613) = 4.747, $p = 0.003$; Wilk's $\Lambda$ = 0.977), and no significant effect of the interaction term ethnicity*questionnaire language (F (3, 613) =.740, $p$ = .529; Wilk's $\Lambda$ = 0.996). Table 1.24 shows between subject effects for this test. All the effects for ethnicity and questionnaire language were statistically significant at $p$ = 0.05 level. If a stricter value for $p$ = 0.01 is applied following violation of homogeneity of variance, all effects of ethnicity on all the DVs come statistically significant ($p<0.001$) and only the effect of questionnaire language on French media use is statistically significant ($p<0.001$). This is consistent with the results for English acculturation.

**Table 1.24** Tests of Between-Subjects Effects: French Acculturation

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Ethnicity | French Media Use | 253.114 | 1 | 253.114 | 88.620 | .000 |
| | French Social Interaction | 700.146 | 1 | 700.146 | 359.287 | .000 |
| | French Cultural Attachment | 436.089 | 1 | 436.089 | 211.166 | .000 |
| Questionnaire language | French Media Use | 39.874 | 1 | 39.874 | 13.961 | .000 |
| | French Social Interaction | 9.782 | 1 | 9.782 | 5.020 | .025 |
| | French Cultural Attachment | 9.014 | 1 | 9.014 | 4.365 | .037 |
| Ethnicity * Questionnaire language | French Media Use | 6.108 | 1 | 6.108 | 2.139 | .144 |
| | French Social Interaction | 1.595 | 1 | 1.595 | .818 | .366 |
| | French Cultural Attachment | 1.663 | 1 | 1.663 | .805 | .370 |

The univariate tests for the effects of ethnicity and questionnaire language on the dependent variable are presented in table 1.25 and table 1.26.

**Table 1.25** Univariate Effects of Ethnicity: French Acculturation

| Dependent Variable | Ethnicity | Mean | Std. Error | 95% Confidence Interval | |
| | | | | Lower Bound | Upper Bound |
| --- | --- | --- | --- | --- | --- |
| French Media Use | EC | 2.895 | .098 | 2.703 | 3.087 |
| | FC | 4.175 | .095 | 3.989 | 4.361 |
| French Social Interaction | EC | 3.499 | .081 | 3.341 | 3.658 |
| | FC | 5.628 | .078 | 5.475 | 5.782 |
| French Cultural | EC | 3.783 | .083 | 3.620 | 3.946 |
| Attachment | FC | 5.463 | .080 | 5.305 | 5.621 |

**Table 1.26** Univariate Effects of Questionnaire Language: French Acculturation

| Dependent Variable | Questionnaire language | Mean | Std. Error | 95% Confidence Interval | |
| | | | | Lower Bound | Upper Bound |
| --- | --- | --- | --- | --- | --- |
| French Media Use | English | 3.281 | .098 | 3.089 | 3.473 |
| | French | 3.789 | .095 | 3.603 | 3.975 |
| French Social Interaction [N.S.] | English | 4.438 | .081 | 4.280 | 4.596 |
| | French | 4.690 | .078 | 4.536 | 4.843 |
| French Cultural Attachment [N.S.] | English | 4.502 | .083 | 4.339 | 4.665 |
| | French | 4.744 | .080 | 4.586 | 4.902 |

Plots for the estimated marginal means for 'French media use', 'French social interaction', and 'French cultural attachment' are shown in figures 1.9, 1.10, and 1.11. The plots show similar trends as were found with English acculturation. First language responses have significantly different mean values which supports $H_1$. Second language responses also show mean differences from first language responses in the right direction for 'French media use' and 'French social interaction'. Mean values for second language did not cross the grand mean or get too close to responses by the other ethnic group. FC responses to French cultural attachment also showed differences between the first and second language responses.

**Figure 1.9** Estimated Marginal Means for French Media Use
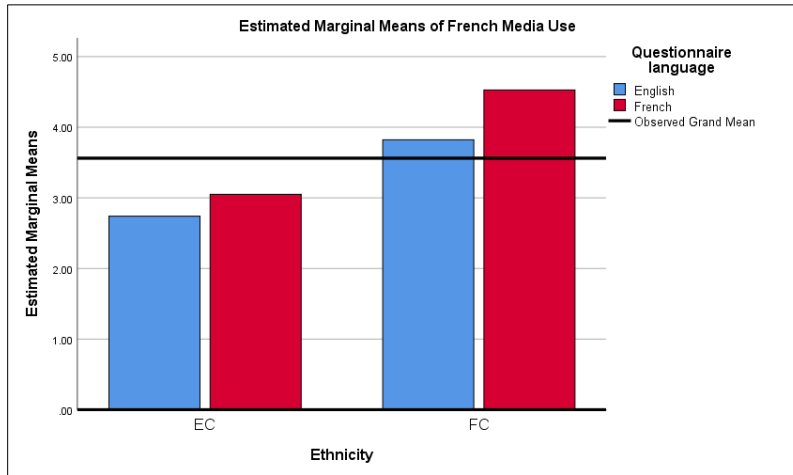


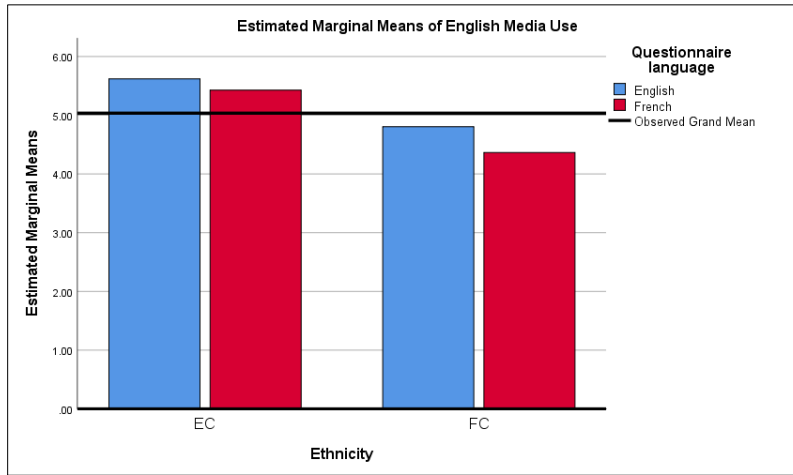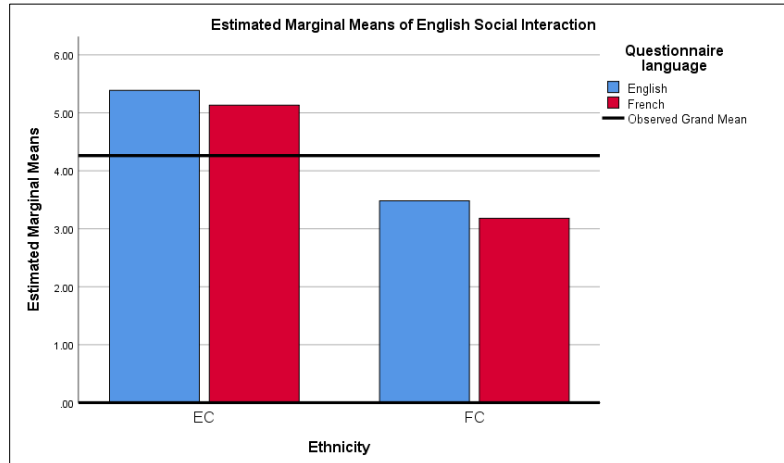**Figure 1.10** Estimated Marginal Means for French Social Interaction
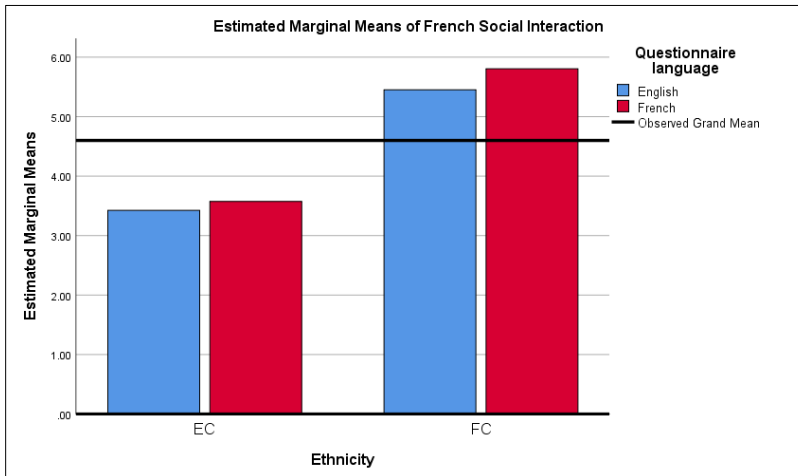


**Figure 1.11** Estimated Marginal Means for French Cultural Attachment
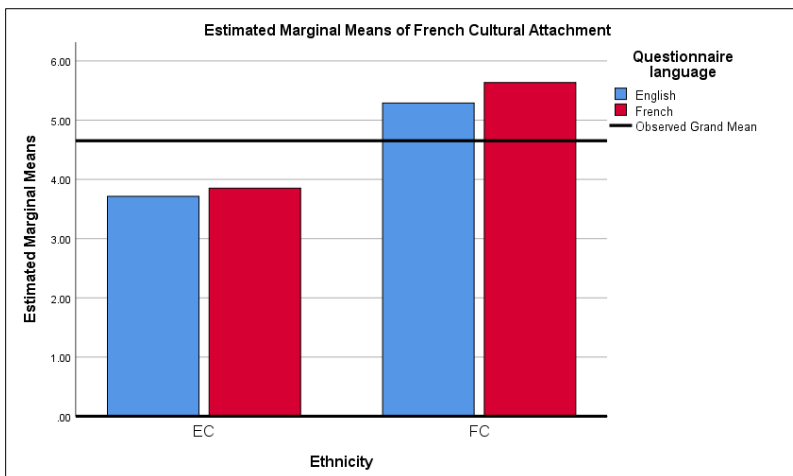
*Hypothesis Testing: English Language Acculturation and Cultural Attachment*

Based on the results from the graphical marginal means, the MANOVA was followed up with a series of T-tests to confirm the statistical significance of between group differences related to the hypotheses. The results are presented in table 1.27. The results suggest that $H_1$ (EC-English vs FC-French responses for French Acculturation and cultural attachment) was statistically significant for all the dependent variables. $H_2$ (EC acculturation to French) was not statistically significant for any of the variables, but had a notable *p* value of 0.1 for 'French Media Use'. Although not statistically significant, the direction of the mean differences was always correct for $H_2$. This means that EC responses in French moved closer to FC responses to the factors. $H_3$ (FC acculturation to English) was statistically significant for all the dependent variables. So, acculturation of FC bilinguals while responding in English was supported.

**Table 1.27:** Hypothesis Testing: French Language Acculturation

| Dependent Variable | Comparison | Hypothesis | *P* value | Hypothesis Supported? | Direction of Mean Diff. |
|---|---|---|---|---|---|
| French Media Use | EC-English vs FC-French | $H_1$ | <.001 | **Yes** | **Correct** |
| | EC-English vs. EC-French | $H_2$ | .1 | No | Correct |
| | FC-French vs. FC-English | $H_3$ | .0003 | **Yes** | **Correct** |
| French Social Interaction | EC-English vs FC-French | $H_1$ | <.0001 | **Yes** | **Correct** |
| | EC-English vs. EC-French | $H_2$ | .4 | No | Correct |
| | FC-French vs. FC-English | $H_3$ | <.001 | **Yes** | **Correct** |
| French Cultural Attachment | EC-English vs FC-French | $H_1$ | <.0001 | **Yes** | **Correct** |
| | EC-English vs. EC-French | $H_2$ | .45 | No | Correct |
| | FC-French vs. FC-English | $H_3$ | .01 | **Yes** | **Correct** |

*Effects of demographic factors:* A series of one-way MANOVAs were conducted to find the effects of demographic variables on French language acculturation. A significant multivariate main effect of age on the French language acculturation factors was observed (Wilk's $\Lambda$= 0.981, $F_{(3, 615)} = 3.953$, $p$= 0.008). Tests of between subjects effects showed significant main effect of age on French social interaction ($p = 0.005$), and French cultural attachment ($p = 0.001$). Effect on French media use ($p = 0.052$) was not statistically significant as more stringent $p = .01$ was

used. Results of univariate tests are presented in table 1.28. It is evident that participants in the 26-40 year age group showed significantly more French media use, French social interaction, and French cultural attachment than participants in the 18-25 year age group. The findings make sense as the public education system in Quebec normally does not allow younger people to get high proficiency in the second language or give the opportunity to interact with people from the other group in the academic context. People working in the industry often have more exposure in the second language and have more chances to meet people from the other group.

**Table 1.28** Effect of Age on French Language Acculturation Factors

| Dependent Variable | Age | Mean | Std. Error | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| French Media Use | 18-25 | 3.347 | .132 | 3.087 | 3.608 |
| | 26-40 | 3.657 | .088 | 3.484 | 3.829 |
| French Social Interaction | 18-25 | 4.304 | .127 | 4.054 | 4.554 |
| | 26-40 | 4.730 | .084 | 4.565 | 4.896 |
| French Cultural Attachment | 18-25 | 4.311 | .120 | 4.075 | 4.547 |
| | 26-40 | 4.802 | .080 | 4.646 | 4.959 |

No significant main effects were observed in the other one-way MANOVA tests for income ($F_{(12, 1619.491)} = 1.097$, $p = 0.358$; Wilk's $\Lambda = 0.979$), and education ($F_{(15, 1687.103}} = 0.898$, $p = 0.566$; Wilk's $\Lambda = 0.978$). Gender had a significant main effect ($F_{(3,615)} = 2.796$, $p = 0.04$; Wilk's $\Lambda = 0.987$) in the between subjects test, but no statistically significant effect was observed in the univariate test.

**General Discussion**

This study looked into ethnic change of both English and French Canadian bilinguals in the province of Quebec. The factorial structure of English and French language acculturation and ethnic identification was looked into in this regard. A common factorial structure was proposed to measure acculturation and attachment to both the cultures. The factors that emerged in the analysis are 'English/French media use', 'English/French social interaction', and

'English/French cultural attachment'. The proposed structure is different from previous reports as the factor 'language use' could not be obtained in the analysis. This common structure helped running a MANOVA to see the effects of ethnicity and language of questionnaire on responses on these factors from bilinguals. Also, acculturation to second language was observed from the responses in the two languages. The role of acculturation on the responses in the second language was more prominent for the factors on language acculturation, but subtle or non-existent on the cultural attachment factor.

The missing factor 'language use' can be a source of future research. It appeared that the items in 'language use' and 'social interaction' had very subtle differences. It was not clear if low proficiency in second languages could be an issue. Another explanation might be superior acculturation and high proficiency in second language where bilinguals are so fluent in both the languages that 'language use' is not an issue to them, social interaction with the two groups is. As participants in our survey showed high proficiency, this may also be the cause for the missing factor.

This study was challenging as it looked to find a common measure across four conditions regarding ethnicity and language of questionnaire. Also, acculturation to two different cultures were measured which added to this issue. Most other studies, in comparison, normally consider two conditions only. Some adjustments had to be made in the measures in this regard. For example, the item 'listening to radio programs' did not have a very high factor loading (although it was reasonably good in most conditions) compared to the other two items in the factor. It was retained to have a minimum of three items in the factor. Logically, it made sense to keep the item for its relevance to another item in the factor (watching television programs) and popularity of radio stations to listen to music (both languages) while driving or at work. Another adjustment in the factorial structure was the use of a very strongly correlated alternate measure for 'French social interaction' for the EC-French condition, and the exclusion of the items for the same factor for the FC-French condition. The fit indices for the models showed that these practices did not have any visible impact on the following analysis. The biggest reveal from this analysis is that French Canadians show significant acculturation while responding in second language.

One limitation in this study was the choice of data collection through an external agency. Quebec is not exactly a homogeneous society with people from different regions showing subtle differences among them (Leger, Nantel, and Duhamel, 2016). This study missed an opportunity to add a discussion as the locations of panel members were not known. Another issue is that this study considered linguistic ethnicity and ignored the 'race' factor of participants. Bilingual people who did not learn any other language than English and French at home were eligible to take part in this study. This was expected to provide with a relatively homogeneous sample of bilingual participants from both groups. Future studies can avoid this limitation and provide with a discussion in this regard.

The three factor structure of ethnic change, as emerged in this study, is thought provoking. Disappearance of the factor 'language use' suggests that bilinguals with high proficiency may not need that factor as a measure for ethnic change. Also, it emerged that the reduced factor 'cultural attachment' would be a better way to measure 'ethnic identification and attachment' when second language responses or acculturation to the second culture is considered. In the Quebec context with the two distinct ethnic groups, coordinate bilinguals are not expected to identify themselves with the second culture. So, the reduced version of the factor seems more appropriate. There is a small group of people who consider themselves 'Canadian bilinguals' and do not want to associate themselves with any of the two ethnic groups. Also, there are the people who speak a third language other than English and French. This factorial structure of ethnic change may also be useful to study language acculturation and cultural attachment of these people particularly.

**Essay 2: Bilingual Involvement with Informative and Emotional Advertisements: A Comparative Study of English and French Canadian Bilinguals**

**Abstract**

This study looked into bilingual involvement with informative and emotional advertisements. The first section measured overall advertisement involvement of English Canadian (EC) and French Canadian (FC) bilinguals in the two languages, and proposed a common item factorial structure across the four conditions related to ethnicity and language of questionnaire. The three correlated factors are media involvement, message involvement, and creative involvement. Then, a multivariate analysis of variance showed mean differences among the groups and the effects of ethnicity and language of questionnaire on the responses. This found French Canadians to be more involved with the informative advertisements and having a lower involvement with the second language version of the advertisements. English Canadians showed higher involvement with the second language version of the informative advertisement and lower involvement with the second language version of the emotional advertisement. Later, the path models for the causal relationship of overall advertising involvement, brand attitudes, and behavioral intentions for the first and the second language responses were developed and compared.

*Keywords:* Advertising involvement; Canadian bilinguals; emotional advertisement; informative advertisement.

**Introduction**

Different advertising appeals are used by marketers to attract the attention of consumers and influence their attitudes and behavior towards products, services, or causes. Because of the cultural differences around the world, often, different appeals are used by the advertisers to effectively reach a certain group. Emotional and informative appeals are two distinct advertising execution strategies used in this regard (Yoo and MacInnis, 2005). There is a significant body of knowledge regarding the use of emotional versus informative advertising appeals in different countries (Hong et al., 1986, Biswas et al., 1992, Chan 1995, Janssens and De Pelsmacker,

2005). There are studies reporting varying responses between the first and the second language responses from an ethnic group (Laroche and Tofolli, 2002). Although there are many research studies investigating the differences between English and French Canadians, there is a scarcity of literature regarding English and French Canadians' responses to advertisement appeals. Also, studies on the differences between the first and the second language responses from bilinguals in these two groups are rare. In this regard, this study would like to know how the bilingual French Canadians and English Canadians would respond to these two seemingly contrasting appeals, and how their responses in the two languages would vary. Given the significant bilingual population from the groups in the province of Quebec in Canada and their acculturation (adapting to traits of a second culture) to both the cultures, this study wanted to include a bilingual element in the study rather than working with unilingual English and French Canadians. The assumption was that the first language responses by these two groups would resemble the responses of unilingual English/French Canadians and then second language responses would provide with insights on the effects of bilingualism or acculturation.

This essay has three sections. The first section purified the measurement scale for overall advertising involvement with the emotional and informative advertisements across the four conditions: EC responding in English, EC responding in French, FC responding in French, and FC responding in English. The conditions are written as EC-English, EC-French, FC-English, and FC-French throughout the text. Then, with a MANOVA in the second section, the between group differences are reported and the effects of language of questionnaire and ethnicity on the factors are looked into. In the third section, the path model for the causal relationship involving advertisement involvement, brand attitude, and behavioral intentions was analyzed to compare responses in the two languages.

**Conceptual Framework**

*Informative vs. Emotional Advertisements*
Different articles have reported that the types of advertising messages vary by countries. The understanding is that people from different cultures may prefer certain types of messages over others. Informational advertisements and emotional advertisements are two of the major

approaches that are used in this regard. Hong, Muderrisoglu, and Zinkhan (1986) analyzed print advertisements in the USA and Japan and reported that the Japanese ads were more emotional and less comparative than the US ads, but had similar amounts of information cues. Biswas, Olsen, and Carlet (1992) analyzed print advertisements in the USA and France and reported that advertisements in the USA use more information cues, while advertisements in France use emotional, humor and sensual cues. Chan (1995) investigated views of Chinese participants towards informative and emotional advertisements and found significant differences as participants termed informative advertisements as 'dull', 'uninteresting,' and 'informative'; and emotional advertisements as 'appealing', interesting', and 'original'. Janssens and De Pelsmacker (2005) analyzed radio advertisements in Belgium and reported that 'information dominant and emotional/creative' spots fared better than 'image dominant and emotional/creative spots' and 'information dominant non creative/non emotional' spots.

*Overall Advertising Involvement*

Advertising involvement has been a very important concept in marketing literature since Krugman (1965) first made the distinction between high involvement and low involvement states. Over the years, numerous researchers worked on the concept, and measurement scales have been developed to capture the different aspects of involvement. The product involvement scale by Zaikhkowsky (1994), the message involvement scale form Baker and Lutz (2000), the ad message involvement scale from Lee (2000), and the ad involvement scale from Laczniak, Muehling, and Grossbert (1989) are some of the notable works in this regard. In a recent study, Spielmann and Richard (2013) proposed the overall advertising involvement concept to bring together related concepts around involvement with ads. It is described as a multidimensional structure that includes message involvement, media involvement, and creative involvement as three correlated factors. The message involvement factor combined the product involvement scale (Zaikhkowsky, 1994) and the advertisement message involvement scale (Baker and Lutz, 2000). The media involvement factor included the ad message involvement scale (Lee 2000) and the ad preference index from Brunel and Nelson (2001). The creative involvement factor included motivation to process items (Petty and Cacioppo, 1986) and the ad involvement scale (Laczniak, Muehling, and Grossbert, 1989).

*Bilingual Advertising Involvement*

There are many reports on the choice of language to reach bilingual consumers. Most studies based in the USA identified two options the advertisers normally have, namely using native language of the bilinguals (often Spanish) to reach them out, or using the language of the dominant culture (English). Noriega and Blair (2008) investigated if the choice of language can generate certain types of association to help persuasion. They reported that native language advertisements may bring out thoughts regarding family, friends, home, and homeland; and then more positive attitude measures and behavioral intentions. It appears that involvement with advertisements in the first language should bring out more favorable outcomes in certain contexts. Luna and Perrachio (1999) explained the advertisement information processing framework for bilinguals. They reported that second language advertisements are more cognitively demanding for bilinguals than first language ads. In another study Luna and Perrachio (2001) reported that second language messages result in inferior memory, and higher level of congruity helps second language processing and eventually memory. It is realized that the word 'involvement' as investigated from the linguistics perspective is very different than seen in advertising/marketing research. In the advertising context, it is more of a perception of an advertisement, not exactly a discussion of cognitive work load/involvement. Bringing the 'bilingual involvement' description from linguistics into 'advertising involvement', it can be suggested that the ease of association with advertisements in the first language, or the difficulty with cognitive processing and memory with advertisements in the second language should make bilinguals get more involved with (or have a more positive perception about) first language advertisements than second language advertisements.

*Second Language Responses and Acculturation*

There has been a rich stream of research that studies the differences when bilinguals respond to questionnaires in two languages. Bond and Yang (1982) studied Hong Kong Chinese people and collected responses in Cantonese and English. They reported that participants acted more like Chinese while responding in Cantonese and acted more English while responding in English. This is called cultural accommodation or acculturation. Acculturation means taking up cultural traits and values from a second culture. Bilinguals show acculturation to the second language they speak. Hong et al. (2000) reported that bilinguals develop two cultural frames and they can activate any of them with cues like language, signs, etc. It is also reported that bilinguals can

easily switch frames upon language priming (Dixon, 2007; Kemmelmeier and Cheng, 2004). Hull (1996) studied if bilinguals used different thought patterns while responding in the two languages and found that coordinate bilinguals (who learn one language at home and the other in a separate context) show differences while responding in the two languages. From these reports, it can be expected that Canadian bilinguals would be in different cultural frames while responding to questionnaire in the two languages, show differences in their responses in the two languages, and show acculturation to the other culture while responding in the second language.

There are similar studies in this stream of thought. Laroche and Toffoli (2002) tested English Canadian and Hong Kong Chinese bilingual participants with an informational print advertisement. They reported that English Canadians had perception of greater source honesty and less forcefulness of this informative advertisement than the Hong Kong Chinese counterparts when both the groups responded in their native languages. While comparing the differential responses of Chinese bilinguals in English and Cantonese, it was revealed that English language responses by the Chinese bilingual participants showed acculturation to English culture and was closer to that of English Canadian respondents (and significantly different than their native language responses).

*Hypothesis*

Obermiller et al. (2005) reported about consumer skepticism toward advertising, that 'skeptic consumers like advertising less, rely on it less, and respond more positively to emotional appeals than to informational appeals.' As French consumers are reported to have a more cautious approach about decision making (Vary, 1992; Leger, Nantel, and Duhamel, 2016), it is expected that they may respond more positively to emotional advertisements than English Canadians. Although, from a different point of view, it may be expected that French Canadians prefer to process information to come to decisions, and will have a more positive perception towards an informative advertisement. For this discrepancy between the two streams of thought, similar comparative studies between individualistic and collectivistic populations (Hong et al, 1986; Biswas et al., 1992; Laroche et Toffoli, 2002) are considered to build the hypotheses that English Canadians may prefer informative advertisements more that French Canadians and the French Canadians will be more involved with an emotional advertisement.

**H<sub>1</sub>**: EC bilinguals responding in English shall show higher involvement with an informative advertisement than FC bilinguals responding in French.

**H<sub>2</sub>**: FC bilinguals responding in French shall show higher involvement with an emotional advertisement than EC bilinguals responding in English.

From the literature regarding language acculturation, it is expected that attitudinal measures in second language responses would show acculturation towards that culture. A related study with the same sample found some proof of acculturation in second language responses. The following hypotheses are proposed in this light:

**H<sub>3</sub>:** EC bilinguals would show acculturation in their responses in the second language.

**H<sub>4</sub>:** FC bilinguals would show acculturation in their responses in the second language.

These hypotheses ($H_1$-$H_4$) are applicable to both the informative and the emotional advertisements, and for all the dependent variables emerging from the factorial structure of overall advertising involvement. This relates six analyses to each hypothesis.

Luna and Peracchio (1999, 2001) reported that responses in second language would require more cognitive processing. So, it can be hypothesized that because of this apparent discomfort, involvement with an advertisement in the second language would be less than that in the first language. So, hypothesis $H_{3a}$ and $H_{4a}$ are proposed for this alternate hypothesis.

**H<sub>3a</sub>:** EC bilinguals would show lower involvement with second languages advertisements.

**H<sub>4a</sub>:** FC bilinguals would show lower involvement with second languages advertisements.


**Methodology**

*Stimuli Selection*

This study wanted to use informative and emotional print advertisements and questionnaires in the two languages and compare results from English and French Canadian bilinguals. The basic understanding is that French Canadians would be more involved with an emotional advertisement while English Canadians would be more involved with an informative advertisement, and second language responses would show lower involvement across the formats or follow acculturation. There are reports that French Canadians prefer hedonic products and

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premium brands, show more loyalty to a brand, and ignore price information when they really like a product (Vary, 1992). So, choosing a non-premier brand and a non-hedonic product category was a goal to choose ads. Also, as an advertisement can be both informative and emotional, it was needed to select advertisements that were significantly more informative in nature or more emotional in nature. A few ads were collected and screened from different sources for this purpose. Categories like smartphones, pens, beverages, social media services, and environmental and social messages were used. Based on a discussion with two graduate students in business, four advertisements were selected for a pretest. The main objective was to understand how emotional or informative the ads were, if the brand was a premium brand, and how important was the product to the consumer. A short survey questionnaire was developed in this regard. 20 English speakers (half of them bilinguals) and 10 French speakers (all bilinguals) participated in this survey in English. The questions were: How informative is the advertisement? How emotional is the advertisement? How familiar you are with the advertised product? How important is the product to you? How likely you are to buy the product? And, for non-product categories, how likely you are to support the cause? All the questions were single items measured with a 5 point Likert type scale (i.e. Not informative at all - Absolutely informative). The advertisements informative in nature were products ('Blackberry DTEK60' cellular phone and 'Oasis NutriSolution' meal supplement drink), and the emotional advertisements were on messages ('Green Peace' message to save the earth, and 'Mothers against Drunk Drivers' message to raise awareness against drunk driving). Two-sample t-Test assuming unequal variance were run on the data in MS Excel in this regard. Both EC and FC participants found all the advertisements significantly different on the two dimensions. The results are presented in table 2.1.

**Table 2.1** Perception of EC and FC about the Ad Being Informative versus Emotional

| | English Canadian (EC) | | | French Canadian (FC) | | |
|---|---|---|---|---|---|---|
| | How informative is the Ad? (mean) | How emotional is the Ad? (mean) | $p$ value | How informative is the Ad (mean) | How emotional is the Ad (mean) | $p$ value |
| Blackberry | 3.1 | 1.50 | 0.00 | 3.8 | 1.4 | 0.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Oasis | 3.45 | 2.75 | 0.004 | 3.4 | 1.8 | 0.001 |
| Green Peace | 1.85 | 3.20 | 0.00 | 2.2 | 3.2 | 0.02 |
| MADD | 2.95 | 4.30 | .0002 | 2.8 | 4.2 | 0.0004 |

Then we checked if English Canadians and French Canadians held different perceptions about an advertisement being informative or emotional. Results are presented in table 2.2. Only the Blackberry advertisement was significant in this regard in the expected dimension (informative). Oasis was perceived to be significantly different on the emotional dimension. One probable cause may be that advertisements with low emotional appeal may differ between English and French Canadians, while strong emotional appeals are perceived similar by both groups. As the Oasis advertisement had stronger informative appeal than emotional, it was not used in the main study. The main study used the Blackberry and the MADD Canada advertisements. It is to be mentioned that French Canadian participants responded to this short survey in English. French Canadian sample size was of concern to find significant differences. French Canadians perceived the Blackberry ad to be more informative and English Canadians perceived the MADD ad to be more emotional (although not significant).

**Table 2.2** EC versus FC perceptions about the Ad Being Informative or Emotional

| | How informative is the Ad? | | | How emotional is the Ad? | | |
|---|---|---|---|---|---|---|
| EC vs. FC | EC mean | FC mean | $p$ Value | EC mean | FC mean | $p$ value |
| Blackberry | 3.1 | 3.8 | 0.001 | 1.5 | 1.4 | 0.37 |
| Oasis | 3.45 | 3.4 | 0.41 | 2.75 | 1.8 | 0.02 |
| Green Peace | 1.85 | 2.2 | 0.14 | 3.2 | 3.2 | 0.50 |
| MADD | 2.95 | 2.8 | 0.35 | 4.3 | 4.2 | 0.37 |

Table 2.3 summarizes other issues that may affect involvement with advertisements like brand familiarity, product familiarity, product category importance, product purchase intention, and perception of brand as a premium brand. The questions for the non-product category were on intentions to support the cause, message importance, and familiarity with the organization. Two-sample t-Test assuming unequal variance were run on the data. No significant differences were found between English and French Canadians except for that French Canadians perceived Oasis

as a premium brand. Based on the findings it was deemed appropriate to use the Blackberry (informative) and the MADD Canada (emotional) advertisements in the study.

**Table 2.3** EC versus FC Perceptions about Brand Familiarity, Product Familiarity, Product Importance, Behavior Intentions, and Brand Perception

| Advertisements | Questions | EC (mean) | FC (mean) | $p$ value |
|---|---|---|---|---|
| **Blackberry** | How familiar you are with the brand Blackberry? | 3.1 | 2.8 | 0.27 |
| | How familiar you are with the model DTEK60? | 1.1 | 1.8 | 0.11 |
| | How important is a cellular phone in your life? | 4.3 | 4 | 0.23 |
| | How likely you will buy a BB DTEK60? | 1.5 | 1.4 | 0.35 |
| | Do you consider Blackberry a premium brand? | 2.95 | 2.8 | 0.32 |
| **Oasis** | How familiar you are with the brand Oasis? | 3.47 | 3.8 | 0.21 |
| | How familiar you are with the drink Nutri Solution? | 1.35 | 1.2 | 0.28 |
| | How important are Nutrition drinks to you? | 1.95 | 2.4 | 0.19 |
| | How likely it is that you will use Oasis Nutri Solution? | 1.85 | 1.6 | 0.21 |
| | Do you consider Oasis a premium brand? | 3.15 | 2.4 | 0.04* |
| **Green Peace** | How familiar you are with the organization Green Peace? | 3.3 | 3 | 0.25 |
| | How important is the message from Green Peace to you? | 3.7 | 2.3 | 0.40 |
| | How likely it is for you to support Green Peace? | 3.25 | 3.2 | 0.45 |

| MADD Canada | How familiar you are with the organization MADD Canada? | 2.65 | 2.8 | 0.38 |
|---|---|---|---|---|
| | How important is the message from MADD Canada to you? | 4.1 | 3.8 | 0.21 |
| | How likely it is for you to support MADD Canada? | 3.15 | 2.8 | 0.20 |

*Survey Development*

The survey questionnaire was developed using the Qualtrics platform. The first page contained the qualifying and demographic questions. The qualifying questions asked participants to identify as a native speaker of English or French, have good second language proficiency, be resident of the province of Quebec, and be between the ages of 18-40. The qualifying question regarding mother tongue helped to exclude multilingual people who may speak both English and French but grew up speaking another language at home. Also bilingual people who consider both English and French as first languages were excluded. The age groups selected are important because people in these two groups are the people who were born after the Bill 101 or Charter of the French language came in effect. Also, the two groups closely match the age brackets for the generation Y and the generation Z. Though the study wanted to understand Canadian bilinguals in general, this section limited the scope to bilinguals living in the province of Quebec. This is mostly due to the fact that English Quebecers have shown differences from the rest-of-Canada English speakers in different studies.

Following the first page, the two advertisements were displayed in separate pages, and questions pertaining to the advertisements followed the image on each page. Scrolling up and down a page allowed viewing only one advertisement and related questions. Questions for English and French language acculturation and attachment were presented in separate pages after the advertisements. Language learning questions (language proficiency, medium of school, etc.) followed this section. Also, there were questions regarding language acculturation and ethnic identification that were part of a separate study. They survey requested forced response to each question in order to proceed to the next page. Also, the language choice option from the top of the page was intentionally removed with programming scripts. The survey was translated into French with the help of two bilingual Professors in Marketing who have years of experience in cross-cultural

research especially involving English and French Canadians. As all participants are from the province of Quebec, the French version was carefully reviewed for its relevance to the language and culture in Quebec.

*Data Collection*

One thing different in this study was not to provide participants a language option. Bilinguals received either of the two versions (English or French) and had to respond to that version. One reason for this was to collect second language responses from bilinguals who are at ease with responding in their second languages. So, there were four groups of responses: English bilinguals responding in English, English bilinguals responding in French, French bilinguals responding in French, and French bilinguals responding in English. It was planned to have around 150 participants in each of the four groups. Data were collected from panels created by Qualtrics Experience Management.

A total of 619 participants from the Qualtrics panels completed the surveys. Among them, 300 participants identified English as their first language, and 319 participants identified French as their first language. All participants completed either the English version or the French version of the survey. So, the responses include both first language and second language responses. 145 English Bilinguals completed the survey in English and 155 English Bilinguals completed the survey in French. 164 French bilinguals completed the survey in French and 155 French bilinguals completed the English version. The 4 groups are termed EC-English, EC-French, FC-French, and FC-English throughout this essay where EC and FC correspond to English Canadian and French Canadian respectively.

The sample size was decided on a reasonable requirement to build structural equation models to purify measures in all the conditions and the availability of resources to collect data. So, a moderate goal of having 150 responses in each group was set. 35% of participants were male and 65% were female. 31% were between the age of 18-25, and 69% of participants were in the group between the ages of 26-40. For level of education, 2% of the participants mentioned primary school, 24% mentioned high school, 29% mentioned college, 26% mentioned bachelor's degree, 10% mentioned professional degree, and 9% mentioned graduate school education. So, 45% of participants had university level education. For annual household incomes, 26% mentioned an income of over $80k, 14% mentioned $60-80k, 21% mentioned $40-60k, 21%

mentioned $20-40k, and 18% mentioned less than $20k as income. An analysis of the demographics in each group revealed that the compositions of participants were not significantly different across the groups.

*Measurement Scales*

The three factor scale for overall advertising involvement (Spielmann and Richard, 2013) is used in this study. Attitude toward the Brand is measured using the scale developed by Sengupta and Johar (2002). Five single item measures proposed by Bergkvist and Rossiter (2007) were modified to match product type and used to measure behavioral intentions. The single items are willingness to buy the product, seek more information, participate in word of mouth, contact the company, visit the website, and direct someone to the website. All scales and single items used 7 point Likert-type questions.

## Measure Purification

Data on overall advertisement involvement (Spielmann and Richard, 2013) for the two advertisements (one mostly informative in nature and the other mostly emotional) were analyzed to purify the items. A comparable common item factorial structure across the four groups was sought in this process. Exploratory factor analysis and confirmatory factor analysis were used in this regard. The following sections explain the processes for the two advertisements separately. The items of the overall advertising involvement scale for the informative advertisement are presented in table 2.4. The items numbers for the factor media involvement starts with 1.1, message involvement with 1.2, and creative involvement with 1.3. The same scale was used for the emotional advertisement. The item numbers for the emotional advertisement starts with the prefix 2.1 (media involvement), 2.2 (message involvement), and 2.3 (creative involvement) respectively.

**Table 2.4** Items for Overall Advertising Involvement Factors

| Factor | Items |
| --- | --- |
| Media Involvement | 1.1 When looking at the Advertisement, you find what is advertised to be: |

|  | 1.1_1 Important |
|  | 1.1_2 Of concern to you |
|  | 1.1_3 Relevant |
|  | 1.1_4 Meaning a lot to you |
|  | 1.1_5 Valuable |
|  | 1.1_6 Beneficial |
|  | 1.1_7 Mattering to you |
|  | 1.1_8 Essential |
|  | 1.1_9 Significant to you |
|  | 1.1_10 Motivating |
| Message Involvement | 1.2 When thinking of the Advertisement, did you find yourself doing any of the following? |
|  | 1.2_1 Paying attention to the content |
|  | 1.2_2 Concentrating on the content |
|  | 1.2_3 Thinking about the content |
|  | 1.2_4 Focusing on the content |
|  | 1.2_5 Spending effort looking at the content |
|  | 1.2_6 Carefully reading the content |
| Creative Involvement | 1.3 When thinking of the advertisement, did you find yourself doing any of the following? |
|  | 1.3_1 Taking notice of the visual aspects of the advertisement |
|  | 1.3_2 Focusing on the colors and/or the images of the advertisement |
|  | 1.3_3 Noting some specific colors or images in the advertisement |
|  | 1.3_4 Paying close attention to the advertisement as a piece of art |

***Informative Advertisements***

*Exploratory factor analysis:* There are four conditions based on ethnicity and language of questionnaire (EC-English, EC-French, FC-English, and FC-French). Exploratory factor analyses

were run to understand the underlying structure in the fours conditions. Principal axis factoring as an extraction method and direct oblimin rotation were used in this regard. IBM SPSS Statistics 25 was used for this purpose. An iterative purification process was used in each of the conditions to get rid of items with low factor loadings and cross-loadings. A cutoff for factor loading was set to 0.6. The factors showed strong correlations. The EFA obtained slightly different items for each factor in the four groups. The items retained in the EFA are presented in table 2.5.

**Table 2.5** EFA Results for Overall Advertising Involvement: Informative Advertisements

| Group | Items retained in EFA | | |
| --- | --- | --- | --- |
| | Factor 1 | Factor 2 | Factor 3 |
| | Media Involvement | Message Involvement | Creative Involvement |
| EC-English | 1.1_1-10 | 1.2_1-4, 6 | 1.3_ 1, 2, 3 |
| EC-French | 1.1_4- 10 | 1.2_1-4, 6 | 1.3_1, 2, 3 |
| FC- French | 1.1_1, 3, 4, 6- 10 | 1.2_1, 2, 3, 5, 6 | 1.3_1, 2, 3 |
| FC-English | 1.1_1, 2, 4- 10 | 1.2_1- 6 | 1.3_2, 3 |

*Common Item Factorial Structure:* After observing the items retained, a common item 3-factor structure was proposed across the conditions. Media involvement was developed using items 1.1_1 and 8 items from 1.1_4 to 1.1_10. Items 1.1_1 and 1.1_5 were kept in the common model despite missing out the EFA in one condition each. Message involvement retained all items but 1.2_5 as it was missing twice in the conditions. Creative involvement contained the items 1.3_1, 2, and 3.

*Confirmatory Factor Analysis:* A series of confirmatory factor analyses were run on the proposed common factor model in each of the four conditions. Figure 2.1 shows the measurement model for the EC-English condition. EQS software and maximum likelihood estimator was used in this regard. The model fit indices are presented in table 2.6. A look into the model fit indices showed that the $\chi^2$ test values were significant, RMSEA values were a bit near to the cut off region, and fit indices like $\chi^2/df$, CFI, and SRMR values were very good.

**Figure 2.1** EC-English CFA Model for Informative Advertisements
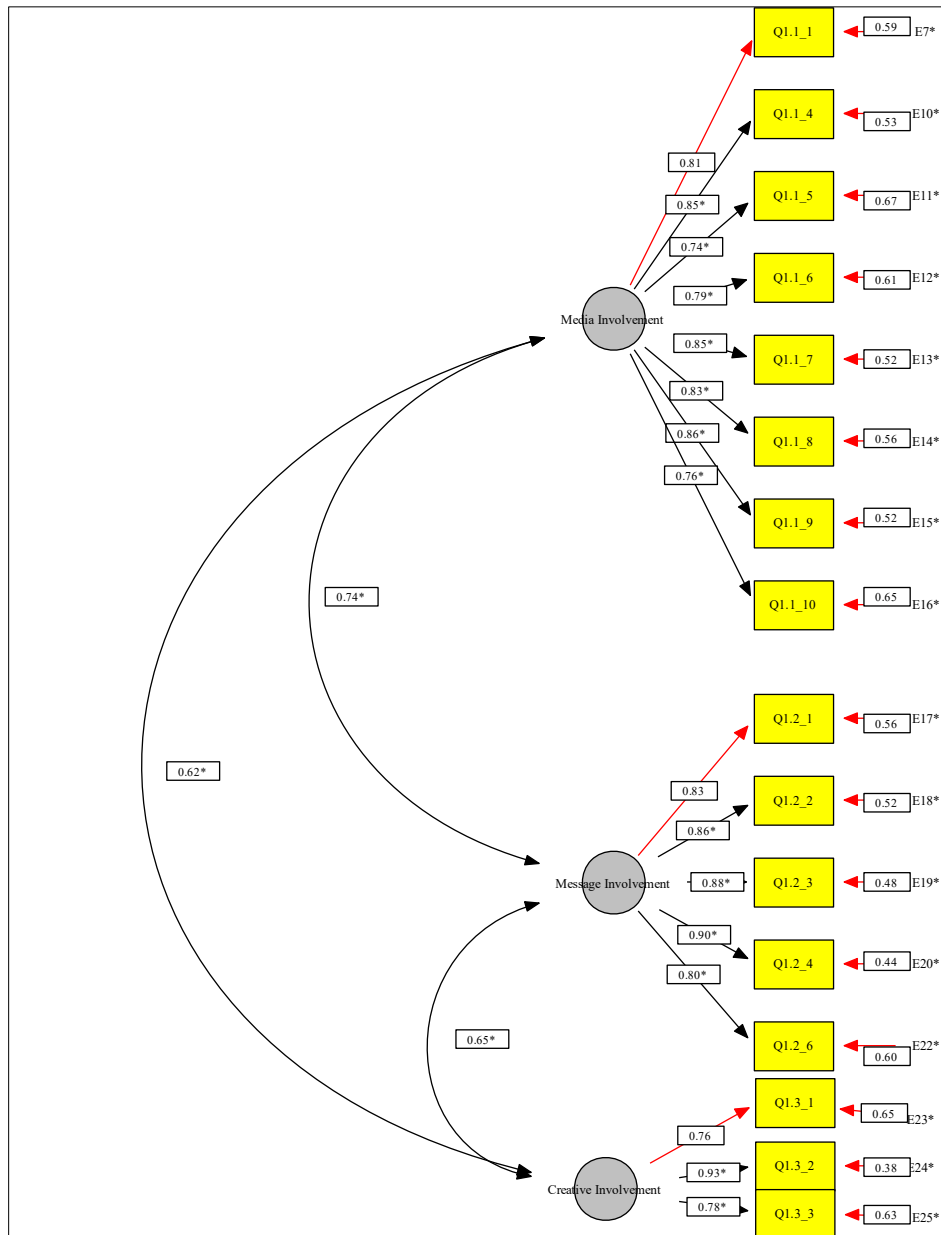


**Table 2.6** CFA Model Fit Indices with ML Estimator: Informative Ad

| Informative Ad | $\chi^2$ | df | $p$ | $\chi^2$/df | CFI | SRMR | RMSEA | 95% CI |
|---|---|---|---|---|---|---|---|---|
| EC-English | 196.47 | 101 | 0.0 | 1.94 | 0.95 | 0.05 | 0.08 | 0.064, 0.097 |
| EC-French | 224.22 | 101 | 0.0 | 2.22 | 0.94 | 0.04 | 0.09 | 0.073, 0.104 |
| FC-French | 230.21 | 101 | 0.0 | 2.27 | 0.94 | 0.05 | 0.09 | 0.073, 0.103 |
| FC-English | 200.49 | 101 | 0.0 | 1.98 | 0.96 | 0.05 | 0.08 | 0.063, 0.096 |

Probable reasons for a significant χ2 value and a high RMSEA are often attributed to small sample sizes and the presence of strongly correlated factors (Kenny, 2016). Also, the CFA outputs showed that there was significant multivariate Kurtosis in data which may have impacted both fit indices. Normalized estimate of multivariate Kurtosis ranged from 18 to 22 which were significantly high (EC-English= 19.35, EC-French= 18.17, FC-French= 20.99, FC-English= 21.91). The CFA models were then re-run with robust maximum likelihood estimator which is expected to tackle non-normality issues in data. Satorra-Bentler scaled χ2 was calculated in this regard. This resulted in marked improvement in the fit indices RMSEA, CFI, and χ2/df. Also, the χ2 test became non-significant in two occasions which is a definite improvement. The fit indices with the robust ML estimator are presented in table 2.7. The CFA model fit indices in the four conditions can be considered excellent.

**Table 2.7** CFA Fit Model Indices with Robust ML Estimator: Informative Ad

| Informative Ad Robust | Satorra–Bentler Scaled χ2 | df | p | χ2/ df | CFI | RMSEA | 90% CI for RMSEA |
|---|---|---|---|---|---|---|---|
| EC-English | 117.034 | 98 | .08 | 1.19 | .988 | .038 | .00, .06 |
| EC-French | 128.206 | 98 | .02 | 1.30 | .982 | .045 | .018, .065 |
| FC-French | 133.012 | 98 | .01 | 1.35 | .982 | .047 | .023, .066 |
| FC-English | 116.13 | 98 | .1 | 1.18 | .992 | .035 | .00, .057 |

The factor correlations for the four conditions and the standardized factor loadings are presented in table 2.8 and table 2.9. Very strong correlations are observed between media involvement and message involvement. The other correlations are also strong. The factor loadings are large enough and support inclusion of the items in each factor.

**Table 2.8** Common Item Model Factor Correlations: Informative Ad

| Emotional Ad | Media Inv * Message Inv. | Message Inv. * Creative Inv | Media Inv. * Creative Inv. |
|---|---|---|---|
| EC-English | 0.88 | 0.53 | 0.47 |
| EC-French | 0.90 | 0.75 | 0.63 |
| FC-French | 0.89 | 0.66 | 0.65 |
| FC-English | 0.79 | 0.56 | 0.47 |

**Table 2.9** CFA Common Item Model Factor Loadings: Informative Ad

| Latent Factors & Items | Standardized coefficients | | | |
|---|---|---|---|---|
| | EC-English | EC-French | FC-French | FC-English |
| *F1*  *Media Involvement:* | | | | |
| When looking at the Ad, you find what is advertised to be | | | | |
| 1.1_1 Important | .81 | .65 | .77 | .74 |
| 1.1_4 Meaning a lot to you | .85 | .81 | .88 | .89 |
| 1.1_5 Valuable | .74 | .75 | .73 | .79 |
| 1.1_6 Beneficial | .79 | .81 | .82 | .82 |
| 1.1_7 Mattering to you | .85 | .84 | .89 | .88 |
| 1.1_8 Essential | .83 | .79 | .78 | .90 |
| 1.1_9 Significant to you | .86 | .84 | .79 | .92 |
| 1.1_10 Motivating | .76 | .82 | .80 | .84 |
| *F2*  *Message Involvement:* | | | | |
| When thinking of the Advertisement, did you find yourself doing any of the following? | | | | |
| 1.2_1 Paying attention to the content | .83 | .81 | .87 | .86 |
| 1.2_2 Concentrating on the content | .86 | .88 | .90 | .91 |
| 1.2_3 Thinking about the content | .88 | .87 | .88 | .86 |
| 1.2_4 Focusing on the content | .90 | .88 | .85 | .94 |
| 1.2_6 Carefully reading the content | .80 | .80 | .81 | .76 |
| *F3*  *Creative Involvement* | | | | |
| When thinking of the advertisement, did you find yourself doing any of the following? | | | | |
| 1.3_1 Taking notice of the visual aspects of the Advertisement | .76 | .78 | .88 | .72 |
| 1.3_2 Focusing on the colors and/or the images of the advertisement | .93 | .84 | .91 | .82 |
| 1.3_3 Noting some specific colors or images in the advertisement | .78 | .85 | .81 | .85 |

*Emotional Advertisements*

*Exploratory Factor Analysis:* We ran exploratory factor analyses to understand the underlying structure in the four conditions. Principal axis factoring as an extraction method and direct oblimin rotation were used in IBM SPSS Statistics 25 software. An iterative purification process was used to get rid of the items with low factor loadings and cross-loadings. A cutoff for factor loading was set to 0.6. The EFA results suggest that a very similar factor structure can be obtained like informative advertisements. The differences are due to a couple of items which appears to be related to the advertisements. For the creative involvement factor, item 4 (Paying close attention to the advertisement as a piece of art) was retained for this emotional advertisement. Item 1 (Taking notice of the visual aspects of the advertisement) was, in comparison, retained with the informative advertisement. It appeared that a stricter cut-off tends to merge factor 1 and 2 for EC responses and eventually get rid of one of them. The items retained in the EFA are presented in the table 2.10.

**Table 2.10** EFA Results for Overall Advertising Involvement: Emotional Advertisement

| Group | Items retained in EFA | | |
| --- | --- | --- | --- |
| | Factor 1 Media Involvement | Factor 2 Message Involvement | Factor 3 Creative Involvement |
| EC-English | 2.1 1-10 | 2.2 1-4 | 2.3_2, 3, 4 |
| EC-French | 2.1 1-10 | 2.2 1-4, 6 | 2.3_2, 3, 4 |
| FC- French | 2.1 3 -9 | 2.2 1-6 | 2.3_2, 3, 4 |
| FC-English | 2.1 1-9 | 2.2 1-4, 6 | 2.3_1, 2, 3, 4 |

*Common Item Factorial Structure:* A common item factorial structure is proposed following the EFA. There are nine items (Q2.1_1 – 2.1_9) for media involvement, 5 items (Q2.2_1-4, Q2.2_6) for message involvement, and 3 items for the factor creative involvement (Q2.3_2-4). Q2.1_10 was left out as it was missing in the EFA run in 2 conditions, Q2.2_5 was left out as it was missing 3 times, and Q2.3_1 was left out of the factor as it was missing 3 times in the groups.

*Confirmatory Factor Analysis:* A series of confirmatory factor analyses were run for advertising involvement with an emotional advertisement. The common-item factor structure for overall advertising involvement with an emotional advertisement was used in the four conditions. EQS

software and Maximum likelihood (ML) estimator was used in this regard. The model is shown in figure 2.2. The Model Fit indices using ML estimator are presented in table 2.11.

**Figure 2.2** FC-French CFA Model for Emotional Ad
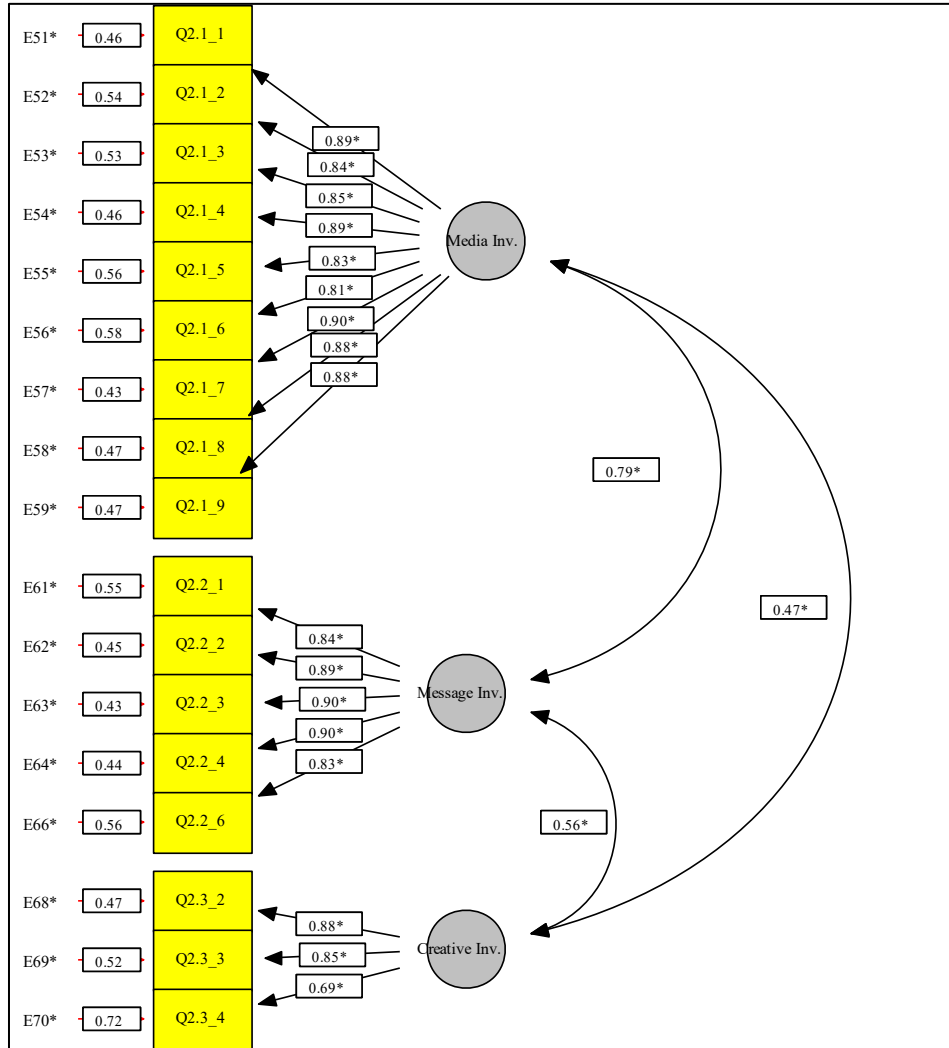


**Table 2.11** CFA Model Fit Indices, ML Estimate: Emotional Advertisement

| Emotional Ad | χ2 | df | p | χ2/df | CFI | SRMR | RMSEA | 95% CI |
|---|---|---|---|---|---|---|---|---|
| EC-English | 336.08 | 116 | 0.0 | 2.89 | 0.90 | 0.05 | 0.115 | 0.1, 0.13 |
| EC-French | 261.40 | 116 | 0.0 | 2.25 | 0.94 | 0.04 | 0.09 | 0.075, 0.10 |
| FC-French | 353.88 | 116 | 0.0 | 3.05 | 0.92 | 0.04 | 0.11 | 0.1, 0.125 |
| FC-English | 381.95 | 116 | 0.0 | 3.29 | 0.90 | 0.04 | 0.12 | 0.108, 0.135 |

It appears that $\chi^2$ test was significant in all conditions which is not a satisfactory result. Comparative fit index values were acceptable and Standardized RMR values were very good in all conditions. The fit index $\chi^2$/df was not very good (usually between 1 and 2 are very good and between 2 and 3 are okay). Also, RMSEA values were right outside the cutoff region and not deemed acceptable. A look into the CFA outputs showed significant multivariate Kurtosis in all the models. Normalized estimate of multivariate Kurtosis ranged from 25 to 40 which are significantly high (EC-English= 33.93, EC-French= 25.5, FC-French= 40.50, FC-English= 31.06). As non-normality of data may have major impact on $\chi^2$ test and RMSEA values, robust ML estimator was used to re-run the CFA models. The results are presented in table 2.12. This improved the $\chi^2$/df, CFI, and RMSEA values significantly and indicated very good model fit. $\chi^2$ test was significant in all conditions but EC-French.

**Table 2.12** CFA Model Fit, **Robust** ML Estimate: Emotional Advertisement

| Emotional Ad | $\chi^2$ | df | $p$ | $\chi^2$/df | CFI | RMSEA | 95% CI |
|---|---|---|---|---|---|---|---|
| EC-English | 177.616 | 113 | .0 | 1.57 | .96 | .063 | .044, .08 |
| EC-French | 183.13 | 113 | .0 | 1.62 | .96 | .061 | .04, .077 |
| FC-French | 172.84 | 113 | .0 | 1.53 | .97 | .057 | .04, .073 |
| FC-English | 207.619 | 113 | .0 | 1.83 | .95 | .074 | .058, .09 |

The parameter estimates for the models are presented in table 2.13 and 2.14. Factor correlations showed very strong correlation between the factors media involvement and message involvement. Factor loadings were very good (high) and consistent across all conditions. Only item 2.3_4 showed a modest factor loading compared to the rest. This is acceptable and was deemed necessary to keep a minimum of 3 items in the factor.

**Table 2.13** Factor Correlations, All Groups: Emotional Advertisement

| Emotional Ad | Media Inv * Message Inv. | Message Inv. * Creative Inv | Media Inv. * Creative Inv. |
|---|---|---|---|
| EC-English | 0.88 | 0.53 | 0.47 |
| EC-French | 0.90 | 0.75 | 0.63 |
| FC-French | 0.89 | 0.66 | 0.65 |
| FC-English | 0.79 | 0.56 | 0.47 |

**Table 2.14** CFA Standardized Factor Loadings: Emotional Advertisement

| Latent Factors & Items | Standardized Coefficients | | | |
|---|---|---|---|---|
| | EC-English | EC-French | FC-French | FC-English |
| *F1*    *Media Involvement:* | | | | |
| When looking at the Ad, you find what is advertised to be | | | | |
| 1.1_1 Important | .85 | .83 | .87 | .89 |
| 1.1_2 Of concern to you | .77 | .79 | .85 | .84 |
| 1.1_3 Relevant | .79 | .86 | .90 | .85 |
| 1.1_4 Meaning a lot to you | .80 | .89 | .90 | .89 |
| 1.1_5 Valuable | .87 | .83 | .86 | .83 |
| 1.1_6 Beneficial | .82 | .80 | .87 | .81 |
| 1.1_7 Mattering to you | .83 | .89 | .86 | .90 |
| 1.1_8 Essential | .84 | .82 | .87 | .88 |
| 1.1_9 Significant to you | .71 | .86 | .90 | .88 |
| *F2*    *Message Involvement:* | | | | |
| When thinking of the Advertisement, did you find yourself doing any of the following? | | | | |
| 1.2_1 Paying attention to the content | .87 | .90 | .88 | .84 |
| 1.2_2 Concentrating on the content | .88 | .90 | .9 | .89 |
| 1.2_3 Thinking about the content | .91 | .88 | .93 | .9 |
| 1.2_4 Focusing on the content | .87 | .84 | .89 | .9 |
| 1.2_6 Carefully reading the content | .77 | .83 | .88 | .83 |
| *F3*    *Creative Involvement* | | | | |
| When thinking of the advertisement, did you find yourself doing any of the following? | | | | |
| 1.3_2 Focusing on the colors and/or the images of the advertisement | .86 | .83 | .9 | .88 |
| 1.3_3 Noting some specific colors or images in the advertisement | .86 | .87 | .89 | .85 |
| 1.3_4 Paying close attention to the advertisement as a piece of art | .67 | .65 | .59 | .69 |

The presence of very strong correlations between media involvement and message involvement and from moderate to strong values for the other two correlations indicated if the factors really measure different concepts or the same concept. Discriminant validity analysis was run on the factors of overall advertising involvement with both the informative and the emotional advertisement in this regard. The CFA models for all the conditions for both the advertisements were constrained by setting the correlations to 1. Then the $\chi^2$ difference tests were conducted between the original models and the constrained model in each condition. The original CFA models showed better statistical fit. This confirmed discriminant validity of the factors (Anderson and Gerbing, 1988). So, the factors of overall advertising involvement are distinct despite being very strongly correlated.

This study uses two ethnic groups and questionnaires in two languages. So it is important to look into measurement invariance across the four conditions. The guidelines compiled by Steencamp and Baumgartner (1998) were consulted in this regard. It is realized that configural invariance, and scalar invariance are already achieved across the four conditions. The use of the common item factorial structure for all the four conditions largely helped to achieve configural invariance. The requirements for the configural invariance are that the factorial structures across the conditions are the same, the factor loadings are substantial and significantly different than zero, the factor correlations are significantly under unity, and the factors show discriminant validity. This measurement also has scalar invariance as the factor loadings for each item across the conditions are very similar with only a couple of items showing a slightly lower factor loadings for certain conditions. The requirement is to have at least two items in each factor that have invariance across the conditions. As found in the demographic data for the participants, the in-group demographics for the conditions are very similar. This suggests that it is acceptable to use the measurements across the four conditions.

*Discussion on Measure Purification*

The findings suggest that a common factor structure involving all the factors can be established with a pair of strongly correlated factors and a third factor with an item with a lower factor loading. The model fit indices and parameter estimates suggest suitability of the models to be used as a measurement scale. Also, models for the informative and emotional advertisements showed some differences. For an emotional advertisement, item 4 appeared in the EFA (view the

advertisement as a piece of art), where item 1 appeared in the informative advertisement (taking notice of the visual aspects). This may be related to the visuals used in the advertisements.

## Multivariate Analysis of Variance

The purified measures are provided with the items to be included in the factors. So, the mean values of the items in respective factors were calculated to use in further analysis. The multivariate analysis of variance (MANOVA) was planned to look into the effects of ethnicity and language of questionnaire and the mean differences across conditions regarding the factors of overall advertising involvement. Ethnicity and language of questionnaire are the two independent variables, and the factors of overall advertising involvement are the dependent variables. Two MANOVAs were run for the informative and the emotional advertisements. As a multivariate analysis of variance was chosen, it became possible to check the effects of ethnicity and language of questionnaire (IVs) on the responses. The following section runs the analyses on the informative and emotional advertisement separately.

### *Informative Advertisements*

A MANOVA was adopted for analysis as the dependent variables are part of a general theme (advertising involvement) and are correlated. It is preferred over separate analysis of variances (ANOVAs) run on each of the DVs. The assumptions to run a MANOVA were checked in this regard. The two independent variables ethnicity and language of questionnaire are categorical in nature which is required. The dependent variables were values obtained from Likert-type scales which are widely accepted to act like interval data and acceptable for use in a MANOVA. The observations were independent of each other as they were collected from different participants and no participant was placed in multiple cells. There were adequate cases in each cell (approximately 150) where a rule of thumb is to have at least 10 times more cases in each group than the number of dependent variables. Data was collected from a Likert type scale and numeric values between 1 and 7 represented each option. So, mean values calculated from such data was expected to be free of very large outliers.

The assumption of normality was violated as Shapiro-Wilk test of normality returned significant *p* values in all conditions. A look into the Normal Q-Q plots suggests that the deviations across

the conditions for all the DVs were modest. It is reported that a MANOVA is robust to modest violations of normality when sample sizes are close to equal and the degrees of freedom are at least 20 in the univariate analyses (Tabachnick and Fidell, 2007). So the test was fine in that regard. Homogeneity of the variance-covariance matrix as checked in a Box's M test of equality of covariance matrix did not return a significant $p$ value. Homogeneity of error variance was tested and no DVs showed a significant $p$ value in a Levene's test. The results suggested that the assumptions were not violated and the use of a MANOVA was justified. Test results are shown in table 2.15 and 2.16.

**Table 2.15** Box's Test of Equality of Covariance Matrices: Informative Ad

| Box's M | 20.659 |
|---|---|
| F | 1.138 |
| df1 | 18 |
| df2 | 1316607.723 |
| Sig. | .307 |

**Table 2.16** Levene's Test of Equality of Error Variances: Informative Ad

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| Ad1_Media Involvement | Based on Mean | .704 | 3 | 615 | .550 |
| Ad1_Message Involvement | Based on Mean | 1.803 | 3 | 615 | .145 |
| Ad1_Creative Involvement | Based on Mean | .510 | 3 | 615 | .676 |

A multivariate analysis with ethnicity and language of questionnaire as independent variables (IVs) and the three factors of overall advertising involvement as dependent variables (DVs) showed a significant effect of language of questionnaire (F (3,613)=12.955, $p< 0.001$; Wilk's $\Lambda$ = 0.940), and the interaction term ethnicity*questionnaire language (F (3,613) = 3.146, $p=0.025$; Wilk's $\Lambda= 0.985$). There was no significant effect of ethnicity (F (3,613) = 0.289, $p=0.833$; Wilk's $\Lambda = 0.999$).

Descriptive statistics for the test are shown in table 2.17. It shows that the mean for all the factors for the FC-French condition is higher than that in the EC-English condition. This suggests that

$H_1$ is not supported and the English Canadians are not more involved with an informative advertisement than French Canadians. Second language responses from EC bilinguals show higher involvement for two factors (media and creative involvement) and lower involvement with message involvement. Second language responses of FC bilinguals show lower involvement for all the dependent variables.

**Table 2.17** Descriptive Statistics for MANOVA: Informative Advertisement

| Dependent variable | Ethnicity | Questionnaire language | Mean | Std. Deviation | N |
|---|---|---|---|---|---|
| Ad1_Media Involvement | EC | English | 2.5502 | .94202 | 145 |
| | | French | 2.8079 | .94868 | 155 |
| | FC | English | 2.5269 | 1.01043 | 155 |
| | | French | 2.8415 | .94000 | 164 |
| Ad1_Message Involvement | EC | English | 2.7945 | 1.03547 | 145 |
| | | French | 2.7587 | 1.00614 | 155 |
| | FC | English | 2.7832 | 1.11866 | 155 |
| | | French | 2.8549 | .98984 | 164 |
| Ad1_Creative Involvement | EC | English | 2.9931 | 1.01795 | 145 |
| | | French | 3.0946 | 1.01629 | 155 |
| | FC | English | 2.7419 | 1.05173 | 155 |
| | | French | 3.2947 | 1.03411 | 164 |

Table 2.18 shows between subject effects for this test. There is no significant effect of ethnicity found in the test. It appeared that the effect of questionnaire language is significant only on media involvement and creative involvement, and the effect of the interaction term was significant only on creative involvement.

**Table 2.18** Tests of Between-Subjects Effects: Informative Advertisement

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Ethnicity | Ad1_Media Involvement | .004 | 1 | .004 | .004 | .947 |
| | Ad1_Message Involvement | .278 | 1 | .278 | .258 | .611 |
| | Ad1_Creative Involvement | .101 | 1 | .101 | .095 | .758 |
| Questionnaire language | Ad1_Media Involvement | 12.646 | 1 | 12.646 | 13.701 | .000 |
| | Ad1_Message Involvement | .050 | 1 | .050 | .046 | .830 |
| | Ad1_Creative Involvement | 16.531 | 1 | 16.531 | 15.571 | .000 |
| Ethnicity * Questionnaire language | Ad1_Media Involvement | .125 | 1 | .125 | .135 | .713 |
| | Ad1_Message Involvement | .446 | 1 | .446 | .414 | .520 |
| | Ad1_Creative Involvement | 7.863 | 1 | 7.863 | 7.406 | .007 |

The results for the univariate tests for the significant effects are shown in table 2.19 (questionnaire language) and table 2.20 (interaction term). This shows the significantly different mean values for the English and the French versions of the questionnaire for media involvement and creative involvement. Univariate effects of the interaction term shows mean values for the message involvement.

**Table 2.19** Univariate Effects of Questionnaire Language: Informative Advertisement

| Dependent Variable | Questionnaire language | Mean | Std. Error | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| Ad1_Media Involvement | English | 2.539 | .055 | 2.430 | 2.648 |
| | French | 2.825 | .054 | 2.719 | 2.930 |
| Ad1_Message Involvement [N.S.] | English | 2.789 | .060 | 2.671 | 2.907 |
| | French | 2.807 | .058 | 2.693 | 2.921 |
| Ad1_Creative Involvement | English | 2.868 | .060 | 2.751 | 2.984 |
| | French | 3.195 | .058 | 3.081 | 3.308 |

**Table 2.20** Univariate Effects of Ethnicity * Questionnaire Language: Informative Ad

| Dependent Variable | Ethnicity | Questionnaire language | Mean | Std. Error | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Ad1_Media Involvement [N.S.] | EC | English | 2.550 | .080 | 2.394 | 2.707 |
| | | French | 2.808 | .077 | 2.656 | 2.959 |
| | FC | English | 2.527 | .077 | 2.375 | 2.678 |
| | | French | 2.841 | .075 | 2.694 | 2.989 |
| Ad1_Message Involvement | EC | English | 2.794 | .086 | 2.625 | 2.964 |
| | | French | 2.759 | .083 | 2.595 | 2.922 |
| | FC | English | 2.783 | .083 | 2.619 | 2.947 |
| | | French | 2.855 | .081 | 2.696 | 3.014 |
| Ad1_Creative Involvement [N.S.] | EC | English | 2.993 | .086 | 2.825 | 3.161 |
| | | French | 3.095 | .083 | 2.932 | 3.257 |
| | FC | English | 2.742 | .083 | 2.579 | 2.904 |
| | | French | 3.295 | .080 | 3.137 | 3.453 |

Figures 2.3, 2.4, and 2.5 show the bar charts for the marginal means for the three factors. Ethnicity is in the horizontal axis and the estimated marginal means are plotted along the vertical axis with bars. The visual presentation explains the differences in means for the three factors. The charts show that the effect of questionnaire language on media and creative involvement are present. The mean values for the French language responses were higher irrespective of the ethnicity of the participants. It was surprising to find that there were no significant effects of ethnicity on any of the factors of involvement with an informative advertisement. As later found in interviews, many EC participants mentioned their preferences for emotional advertisements. This may be a result of acculturated English Canadians in the province of Quebec. The significant effect of the interaction term on creative involvement suggests that EC and FC bilinguals may respond to creative elements differently while responding in the two languages.

**Figure 2.3** Marginal Means for Media Involvement: Informative Advertisement
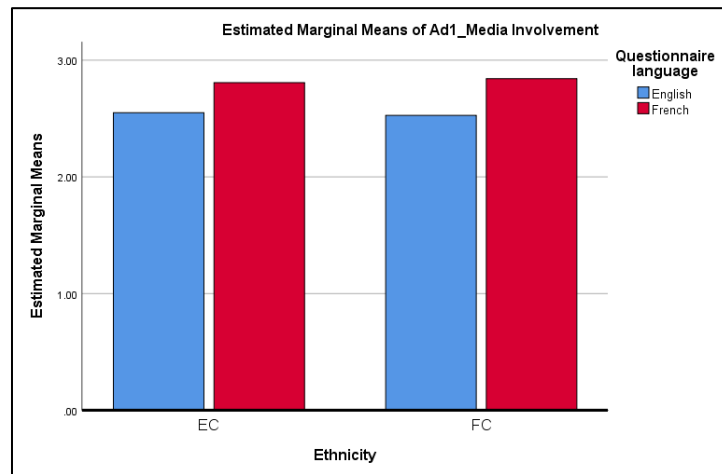


**Figure 2.4** Marginal Means for Message Involvement: Informative Advertisement
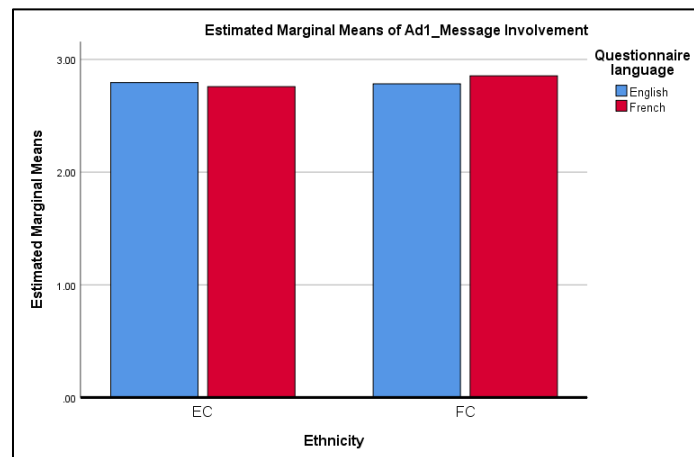


**Figure 2.5** Marginal Means for Creative Involvement: Informative Advertisement
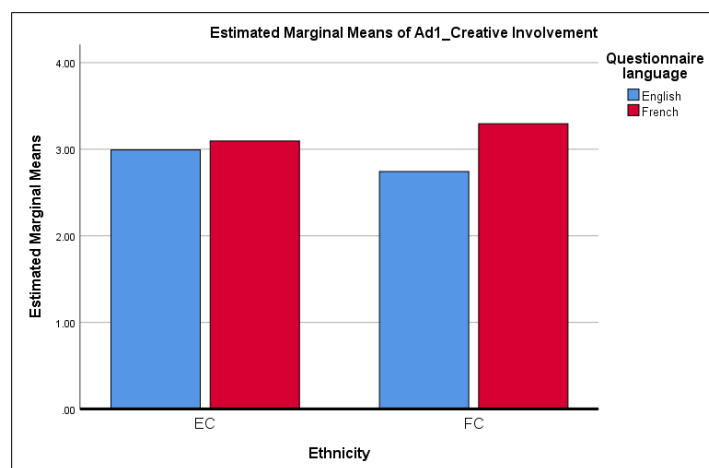
*Hypothesis Test: Informative Advertisement*

The MANOVA was followed up with a series of T-tests to confirm the between group differences and confirm the hypotheses. The results suggest that $H_1$ was statistically significant for media involvement and creative involvement, but in the opposite direction. This means that FC-French responses had higher means than EC-English responses. So, $H_1$ is not supported for any of the factors, but has two statistically significant results in the opposite direction. $H_3$ (EC acculturation to French) was partially supported only in media involvement. $H_4$ (FC acculturation to English) was partially supported for media involvement and creative involvement. The direction of mean differences shows that 5 mean differences are in the right direction, 4 in the opposite direction. The results of hypothesis testing are presented in table 2.21. Significant results are highlighted in the table.

**Table 2.21** Hypothesis Testing: Informative Advertisement

| Dependent Variable | Comparison | Hypothesis | *p* value | Hypothesis supported? | Direction of Mean Diff. |
|---|---|---|---|---|---|
| Ad1_Media Involvement | EC-English vs FC-French | $H_1$ | **.007** | **No** | **Opposite** |
| | EC-English vs. EC-French | $H_3$ | **.018** | **Yes** | **Correct** |
| | FC-French vs. FC-English | $H_4$ | **.004** | **Yes** | **Correct** |
| Ad1_Message Involvement | EC-English vs FC-French | $H_1$ | .6 | No | Opposite |
| | EC-English vs. EC-French | $H_3$ | .76 | No | Opposite |
| | FC-French vs. FC-English | $H_4$ | .54 | No | Correct |
| Ad1_Creative Involvement | EC-English vs FC-French | $H_1$ | **.01** | **No** | **Opposite** |
| | EC-English vs. EC-French | $H_3$ | .38 | No | Correct |
| | FC-French vs. FC-English | $H_4$ | **<.0001** | **Yes** | **Correct** |

*Effects of Demographics (Informative Advertisement):*

A series of MANOVAs were run to find the effects of age, gender, income, and education on the DVs. Significant effects of age and gender were observed while there were no effects of income and education on the responses. The results of the tests are shown in table 2.22.

**Table 2.22** Multivariate tests for Effects of Demographic Variables: Informative Ad

| Effect | | Value | F | Hypothesis df | Error df | Sig. |
|---|---|---|---|---|---|---|
| Age | Wilks' Lambda | .973 | 5.606[b] | 3.000 | 615.000 | .001 |
| Gender | Wilks' Lambda | .958 | 9.005[b] | 3.000 | 615.000 | .000 |
| Income | Wilks' Lambda | .983 | .875 | 12.000 | 1619.491 | .573 |
| Education | Wilks' Lambda | .967 | 1.356 | 15.000 | 1687.103 | .161 |

Because of the effects of gender and age, separate MANOVAs were run by splitting the data file across the gender (male/female) and the age factors (18-25/ 26-40). There were adequate cases in each of the conditions regarding ethnicity and questionnaire language in the split data.

*Effects of Age:* In the age group between 18-25 years, there was a significant effect of questionnaire language on the DVs (F (3,183) = 6.573, $p<0.001$; Wilk's $\Lambda$= 0.903). Univariate analysis later showed the significant effect of questionnaire language on media involvement ($p$=.00) and creative involvement ($p$=.001). Message involvement did not have a significant main effect of questionnaire language ($p$=.096)

For the age group 26-40 years, there were significant effects for questionnaire language (F (3,424)= 7.506, $p<0.001$; Wilk's $\Lambda$= 0.950) and the interaction term ethnicity*questionnaire language (F (3,424)= 3.745, $p$= 0.011; Wilk's $\Lambda$= 0.9574). Univariate analysis showed significant main effect of questionnaire language on creative involvement ($p$= .014), and a marginally non-significant effect on media involvement ($p$= .067). Main effect of the interaction term (ethnicity*questionnaire language) had a significant main effect on creative involvement only ($p$= .005).

*Effects of Gender:* For the female participants (N= 402), there was a significant effect of questionnaire language on the DVs (F (3,396)= 9.020, $p<0.001$; Wilk's $\Lambda$= 0.936). Univariate tests showed that the effect was on media involvement ($p$=.001) and creative involvement ($p$=.001).

For the male participants, there were significant effects for questionnaire language (F (3,211) = 3.927, $p$= 0.009; Wilk's $\Lambda$= 0.947) and the interaction term ethnicity*questionnaire language (F (3,211)= 3.570, $p$= 0.015; Wilk's $\Lambda$= 0.952). Univariate tests showed significant main effects of

questionnaire language on media involvement (*p*=.043) and creative involvement (*p*=.024), and a significant effect of the interaction term on creative involvement (*p*=.002). Effect of ethnicity on message involvement was not significant, but worth mentioning (*p*=.098).

### *Emotional Advertisements*

A similar multivariate analysis of variance was run with the data for the emotional advertisement chosen for this essay. At first, the assumptions for multivariate analysis of variance were tested. The dependent variables in this study are correlated and are theoretically related so the choice of a MANOVA over an ANOVA was deemed appropriate. The two independent variables ethnicity and language of questionnaire are categorical in nature which is required. The dependent variables are the mean values from a Likert-type scale and expected to behave like interval data required for MANOVAs. Observations are independent of each other and no case is placed in multiple conditions relating to the independent variables. There are around 150 cases in each condition which is adequate. As data is collected from a Likert type scale and numeric values between 1 and 7 are used to represent each option, the mean values for the items in each factor are not expected to contain very large outliers.

The assumption of normality was violated as Shapiro-Wilk test and Kolmogorov-Smirrnov test of normality was significant for all the DVs (table 2.22). A look into the Normal Q-Q plots suggested that the deviations for all the DVs were modest with creative involvement following the normal Q-Q most closely. It is reported that MANOVA is robust to modest violations of normality when sample sizes are equal and the degrees of freedom are at least 20 in the univariate analyses (Tabachnick and Fidell, 2007). So, this was not a concern in this analysis. Homogeneity of variance-covariance matrix was also violated as Box's M test of equality of covariance matrix returned a significant *p* value (table 2.23). MANOVA with each cell having more than 30 cases is reported to be robust against this violation (Allen & Bennett, 2008). Homogeneity of error variance was tested and no DV showed a significant p value in a Levene's test (table 2.24). So, it was appropriate to conduct a MANOVA.

**Table 2.23** Tests of Normality: Emotional Advertisement

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| Ad2_Media Involvement | .120 | 619 | .000 | .933 | 619 | .000 |
| Ad2_Message Involvement | .130 | 619 | .000 | .934 | 619 | .000 |
| Ad2_Creative Involvement | .112 | 619 | .000 | .968 | 619 | .000 |

a. Lilliefors Significance Correction

**Table 2.24** Box's Test of Equality of Covariance Matrices: Emotional Advertisement

| | |
|---|---|
| Box's M | 38.210 |
| F | 2.104 |
| df1 | 18 |
| df2 | 1316607.723 |
| Sig. | .004 |

**Table 2.25** Levene's Test of Equality of Error Variances: Emotional Advertisement

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| Ad2_Media Involvement | Based on Mean | .883 | 3 | 615 | .450 |
| Ad2_Message Involvement | Based on Mean | 1.759 | 3 | 615 | .154 |
| Ad2_Creative Involvement | Based on Mean | .076 | 3 | 615 | .973 |

A multivariate analysis of variance (MANOVA) with ethnicity and language of questionnaire as independent variables (IVs) and the three factors of overall advertising involvement with emotional advertisement as dependent variables (DVs) showed significant effects of ethnicity (F $(3,613)=3.904$, $p=0.009$; Wilk's $\Lambda = 0.981$), language of questionnaire (F $(3,613) = 3.268$, $p < 0.021$; Wilk's $\Lambda = 0.984$), and the interaction term ethnicity*questionnaire language (F $(3,613) = 5.347$, $p=0.001$; Wilk's $\Lambda = 0.974$). Table 2.25 shows descriptive statistics for the test. The data shows that FC-French responses have higher means for all the factors than EC-English responses. This supports H$_2$. Also, all the second language responses by both English and French Canadians showed lower mean values than first language responses, so H$_3$ (EC acculturation for second language responses) is not supported for this emotional advertisement. It appears that the

alternate explanation for lower involvement with second language responses is more appropriate for this emotional advertisement.

**Table 2.26** Descriptive Statistics for MANOVA: Emotional Advertisement

|  | Ethnicity | Questionnaire language | Mean | Std. Deviation | N |
|---|---|---|---|---|---|
| Ad2_Media Involvement | EC | English | 3.8360 | .91410 | 145 |
|  |  | French | 3.3756 | 1.04403 | 155 |
|  | FC | English | 3.7391 | 1.04735 | 155 |
|  |  | French | 3.8977 | .97247 | 164 |
| Ad2_Message Involvement | EC | English | 3.8262 | .94612 | 145 |
|  |  | French | 3.3587 | 1.07648 | 155 |
|  | FC | English | 3.6903 | 1.04078 | 155 |
|  |  | French | 3.8390 | .97876 | 164 |
| Ad2_Creative Involvement | EC | English | 3.2598 | 1.02399 | 145 |
|  |  | French | 3.1720 | 1.01884 | 155 |
|  | FC | English | 3.0538 | 1.06735 | 155 |
|  |  | French | 3.2886 | .99318 | 164 |

Table 2.27 shows between subject effects for this test. There is a significant main effect of ethnicity on media involvement and on message involvement. The effect of questionnaire language is only significant on message involvement, although the *p* value for media involvement is very close to 0.05. The effect of the interaction term is significant on all the three factors.

**Table 2.27** Tests of Between-Subjects Effects: Emotional Advertisement

| Source | Dependent Variable | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Ethnicity | Ad2_Media Involvement | 6.979 | 1 | 6.979 | 7.021 | .008 |
|  | Ad2_Message Involvement | 4.581 | 1 | 4.581 | 4.470 | .035 |
|  | Ad2_Creative Involvement | .309 | 1 | .309 | .294 | .588 |

| Questionnaire | Ad2_Media Involvement | 3.516 | 1 | 3.516 | 3.538 | .060 |
|---|---|---|---|---|---|---|
| language | Ad2_Message Involvement | 3.924 | 1 | 3.924 | 3.829 | .051 |
| | Ad2_Creative Involvement | .836 | 1 | .836 | .794 | .373 |
| Ethnicity * | Ad2_Media Involvement | 14.796 | 1 | 14.796 | 14.887 | .000 |
| Questionnaire | Ad2_Message Involvement | 14.662 | 1 | 14.662 | 14.305 | .000 |
| language | Ad2_Creative Involvement | 4.018 | 1 | 4.018 | 3.819 | .051 |

The univariate effects of the independent variables and the interaction term of the IVs are presented in table 2.28, 2.29, and 2.30.

**Table 2.28** Univariate Effects of Ethnicity: Emotional Advertisement

| | | | | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Dependent Variable | Ethnicity | Mean | Std. Error | Lower Bound | Upper Bound |
| Ad2_Media Involvement | EC | 3.606 | .058 | 3.493 | 3.719 |
| | FC | 3.818 | .056 | 3.709 | 3.928 |
| Ad2_Message Involvement | EC | 3.592 | .058 | 3.478 | 3.707 |
| | FC | 3.765 | .057 | 3.653 | 3.876 |
| Ad2_Creative Involvement N.S. | EC | 3.216 | .059 | 3.100 | 3.332 |
| | FC | 3.171 | .057 | 3.058 | 3.284 |

**Table 2.29** Univariate Effects of Questionnaire Language: Emotional Advertisement

| | | | | 95% Confidence Interval | |
|---|---|---|---|---|---|
| Dependent Variable | Questionnaire language | Mean | Std. Error | Lower Bound | Upper Bound |
| Ad2_Media Involvement N.S. | English | 3.788 | .058 | 3.674 | 3.901 |
| | French | 3.637 | .056 | 3.527 | 3.746 |
| Ad2_Message Involvement | English | 3.758 | .058 | 3.643 | 3.873 |
| | French | 3.599 | .057 | 3.488 | 3.710 |
| Ad2_Creative Involvement N.S. | English | 3.157 | .059 | 3.040 | 3.273 |
| | French | 3.230 | .057 | 3.118 | 3.343 |

**Table 2.30** Univariate Effects of Ethnicity * Questionnaire language: Emotional Advertisement

| Dependent Variable | Ethnicity | Questionnaire language | Mean | Std. Error | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Ad2_Media Involvement | EC | English | 3.836 | .083 | 3.673 | 3.999 |
| | | French | 3.376 | .080 | 3.218 | 3.533 |
| | FC | English | 3.739 | .080 | 3.582 | 3.896 |
| | | French | 3.898 | .078 | 3.745 | 4.051 |
| Ad2_Message Involvement | EC | English | 3.826 | .084 | 3.661 | 3.991 |
| | | French | 3.359 | .081 | 3.199 | 3.518 |
| | FC | English | 3.690 | .081 | 3.531 | 3.850 |
| | | French | 3.839 | .079 | 3.684 | 3.994 |
| Ad2_Creative Involvement | EC | English | 3.260 | .085 | 3.092 | 3.427 |
| | | French | 3.172 | .082 | 3.010 | 3.334 |
| | FC | English | 3.054 | .082 | 2.892 | 3.216 |
| | | French | 3.289 | .080 | 3.131 | 3.446 |

Figures 2.6, 2.7, and 2.8 show the bar charts for the marginal means of the three factors. Ethnicity is placed on the horizontal axis and estimated mean on the vertical axis. The bars represent the two language responses. The charts show that second language responses on all the factors of involvement show lower means than first language responses. Also, EC respondents seem to show a more significant difference between their first and second language responses than their French counterparts for media and message involvement, and FC respondents show marginally more differences for creative involvement than their English counterparts.

*Hypothesis Testing: Emotional Ad*

The MANOVA was followed up with a series of T-tests to confirm the between group differences and the hypotheses. The results suggest that $H_2$ (EC-English vs FC-French responses for Emotional Ad) was not statistically significant for any of the dependent variables. So, for an emotional advertisement, responses from EC and FC bilinguals in their native languages are not significantly different. The anticipated direction of the difference that FC-French would have a higher mean value than the EC-English response was correct in all instances. $H_3$ (EC acculturation to French) had statistical significant differences for media involvement and

message involvement, but it was in the opposite direction. $H_3$ did not have a significant $p$ value for creative involvement but followed the same direction. This means that EC responses do not support $H_3$ or English acculturation to French culture, but simply have lower involvement while responding in their second language. $H_4$ (FC acculturation to English) was statistically significant for only creative involvement. $H_4$ for all the three dependent variables showed the same direction of the mean differences, which may mean acculturation or simple support for the alternate explanation that second language responses to advertisements normally show a lower involvement. So, alternate hypotheses $H_{3a}$ and $H_{4a}$ seem to work for an emotional advertisement. Table 2.31 shows the results for testing $H_2$, $H_{3a}$, and $H_{4a}$. So, $H_{3a}$ is partially supported for media and message involvement, and $H_{4a}$ was partially supported for creative involvement. All mean differences were in the right direction. Supported hypothesis are highlighted in this regard.

**Table 2.31** Hypothesis Testing: Emotional Ad

| Dependent Variable | Comparison | Hypothesis | P value | Hypothesis supported? | Direction of Mean Diff. |
|---|---|---|---|---|---|
| Ad2_Media Involvement | EC-English vs FC-French | $H_2$ | .56 | No | Correct |
| | EC-English vs. EC-French | $H_{3a}$ | .0001 | **Yes** | **Correct** |
| | FC-French vs. FC-English | $H_{4a}$ | .16 | No | Correct |
| Ad2_Message Involvement | EC-English vs FC-French | $H_2$ | .9 | No | Correct |
| | EC-English vs. EC-French | $H_{3a}$ | .0001 | **Yes** | **Correct** |
| | FC-French vs. FC-English | $H_{4a}$ | .18 | No | Correct |
| Ad2_Creative Involvement | EC-English vs FC-French | $H_2$ | .8 | No | Correct |
| | EC-English vs. EC-French | $H_{3a}$ | .45 | No | Correct |
| | FC-French vs. FC-English | $H_{4a}$ | .04 | **Yes** | **Correct** |

*Effects of demographic variables (Emotional Advertisement)*

A series of MANOVAs were run to find the effects of age, gender, income, and education on the DVs. Significant effects of education and gender were observed while there were no statistical significant effects of age and income at the 95% confidence level. The results of the tests are shown in table 2.30.

**Figure 2.6** Marginal Means for Media Involvement: Emotional Advertisement
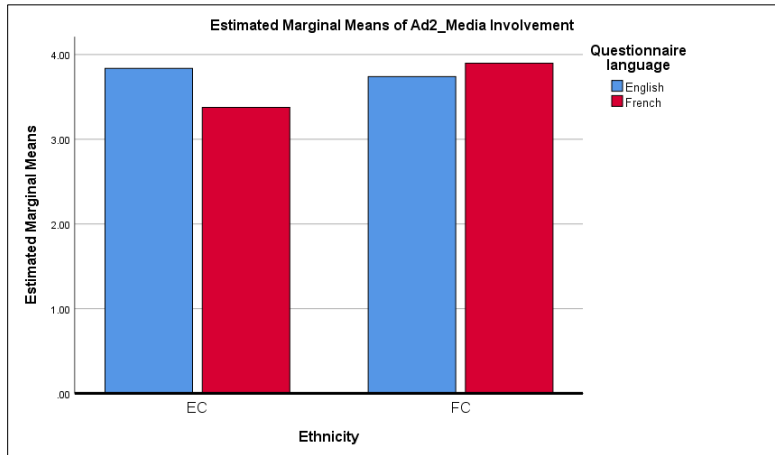


**Figure 2.7** Marginal Means for Message Involvement: Emotional Advertisement
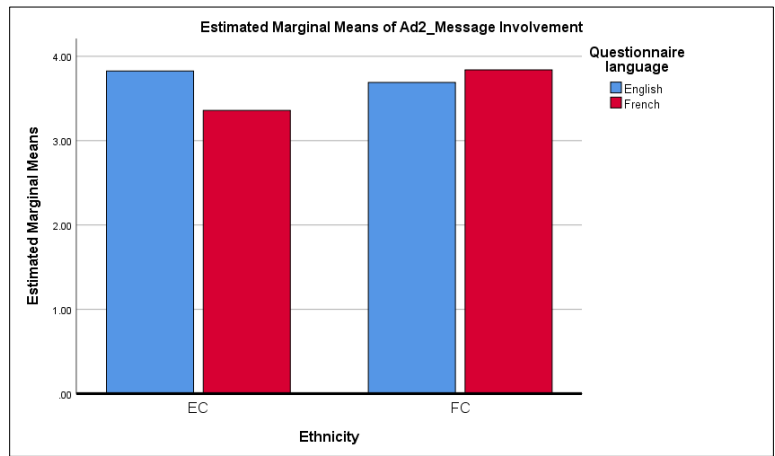


**Figure 2.8** Marginal Means for Creative Involvement: Emotional Advertisement
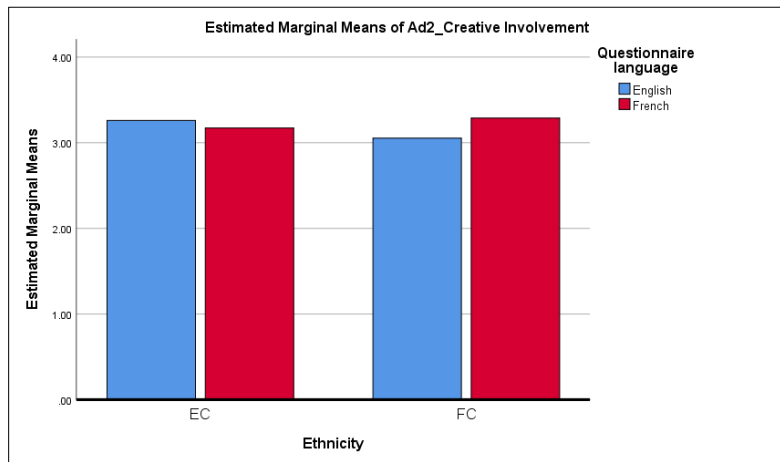
**Table 2.32** Multivariate Tests for Effects of Demographic Variables: Emotional Ad

| Effect | | Value | F | Hypothesis df | Error df | Sig. |
|---|---|---|---|---|---|---|
| Age | Wilks' Lambda | .998 | 0.392 | 3.000 | 615.000 | .759 |
| Gender | Wilks' Lambda | .982 | 3.731 | 3.000 | 615.000 | .011 |
| Income | Wilks' Lambda | .970 | 1.589 | 12.000 | 1619.491 | .088 |
| Education | Wilks' Lambda | .952 | 2.043 | 15.000 | 1687.103 | .010 |

*Effects of Gender:* Because of the effects of gender, separate MANOVAs were run by splitting the data file across the gender options (male/female). There were enough cases in both the groups and fairly equal number of cases to run MANOVAs. For the female participants, the MANOVA showed significant main effects of ethnicity (F $(3,396)$ = 3.279, $p$=0.021, Wilk's $\Lambda$= 0.976), questionnaire language (F $(3,396)$ = 2.952, $p$= 0.033, Wilk's $\Lambda$= 0.978, and the interaction term ethnicity*questionnaire language (F $(3,396)$ = 3.448, $p$= 0.017, Wilk's $\Lambda$= 0.975). As homogeneity of error variance was violated in a Levene's test, a stricter $p$ value=.01 was suggested for media and message involvement for the univariate tests. Only main effects of ethnicity on media involvement ($p$=.009) was significant in this regard. The main effects of the interaction term on media and message involvement were significant ($p$=.004 and .002).

For the male participants, the MANOVA did not show any significant main effects of ethnicity (F $(3,211)$ = 0.782, $p$=0.505, Wilk's $\Lambda$= 0.989) or questionnaire language (F $(3,211)$ = 0.805, $p$= 0.492, Wilk's $\Lambda$= 0.989. The interaction term ethnicity*questionnaire language though was significant (F $(3,211)$ = 2.649, $p$= 0.05, Wilk's $\Lambda$= 0.964). Univariate test showed significant main effects of the interaction term on media and message involvement ($p$=.009 and .04).

*Effects of Education:* There was inadequate/incomparable number of cases in each of the education groups hence a similar analysis was not possible. Future studies can consider splitting the education data based on college education and find differences.

*Discussion on MANOVA*

There were no effects of ethnicity on the factors for an informative advertisement. Questionnaire language had an effect on media involvement and creative involvement, and the interaction term had an effect on creative involvement. The mean values for the FC-French condition were always higher than that in the EC-English condition, so, the hypothesis that EC bilinguals are

more involved with informative advertisements that FC bilinguals ($H_1$) is not supported. Presenting the informative advertisement to EC participants provided with higher involvement in two cases (media/creative involvement), so hypothesis about acculturation ($H_3$) was also not fully supported. FC participants showed lower involvement with second language responses, which supports $H_3$ or the alternate explanation. It could not be confirmed as the EC involvement with the informative advertisement did not follow an expected direction. From a managerial viewpoint, it appears that presenting informative advertisements in French (rather than in English) to bilinguals from both ethnicities would lead to more involvement.

For an emotional advertisement, there were statistically significant effects of both ethnicity and questionnaire language on media involvement and message involvement. The interaction term ethnicity*questionnaire language had significant effect on all the three factors. The hypothesis that French Canadians would have higher involvement with an emotional advertisement ($H_2$) was supported for all the factors of involvement. Also, second language response regarding involvement was lower for both French and English Canadians, hence confirming the alternate explanation for all the factors.

**Causal Path Analysis for Overall Advertising Involvement**

Advertising involvement affects attitudes towards a brand. As we found that responses in the two languages may have varying involvement with the factors of overall advertising involvement, a comparative path analysis for first and second language responses were conducted to see the results for such a scenario. The path model analysis in this study looked into the structural model for a second order overall advertising involvement proposed by Spielmann and Richard (2013). Their model showed the causal relationship regarding overall advertising involvement, brand attitudes, and behavioral intentions. In this study, the path models for English and French Canadians were constructed for their responses in both languages. One objective of this approach was to identify probable differences in path coefficients between the first and the second language responses.

*Measurement and Structural Model*

In addition to the measurement model for overall advertising involvement as developed earlier, the scale for attitude towards the brand (Sengupta and Johar, 2002) was added to the structural model. The brand attitude construct has three items reported on a 7 point Likert type scale. Principal component analysis and reliability analysis were done on this scale for the four conditions to check for variance explained by the items, factor loadings of the items, and Cronbach's alpha. For the EC-English condition, the factor explained an 86.7% variance with factor loadings between 0.93 and 0.94, Cronbach's alpha was 0.923. For EC- French condition, 80.8% of the variance was explained and factor loadings were between 0.89 and 0.91, Cronbach's alpha was 0.880. For FC-French condition, 84.5% variance was explained and factor loadings were between 0.90 and 0.95, Cronbach's alpha was 0.906. For FC-English condition, 85.7% variance was explained and factor loadings were between 0.92 and 0.93, Cronbach's alpha was 0.915. It appears that the items explained less variance for second language response from English Canadians which was the opposite for French Canadians. The EFA results were considered sufficient to use this scale in the full structural equation model for the causal relations.

A set of single item behavioral intention measures (Bergkvist and Rossiter, 2007) was modified to use in this study. For the informative advertisement, the modification was to split the item 'call the company/visit website' as they were deemed two distinct behavioral intentions. Appropriate adjustments were made to the items to accommodate the emotional advertisement with a non-product, non-brand scenario.

The full structural model used the second order measurement model for 'overall advertising involvement', measurement model for attitude towards the brand, and the single item behavioral intention measures (one at a time). The model shows the effect of the latent variable overall advertising involvement on attitude towards the brand, attitude towards the brand having an effect on the behavioral intention item, and message involvement having an effect on the behavioral intention item. There were 6 structural models for each of the behavioral intention measures in a condition related to ethnicity and questionnaire language.

## Informative Advertisement

A series of path models were developed for overall advertisement involvement, brand attitude, and each of the behavioral intentions for all the conditions regarding ethnicity and questionnaire language. The EQS program was used in this regard. The full structural equation model diagram including the measurement model and the path model is shown in figure 2.9.

The model fit indices showed significant $\chi 2$ test result, acceptable CFI values (between .92 and .95), good SRMR values (Between .045 and .067) and high RMSEA values (between .077 and .086). The model fit indices for the first behavioral intention are shown in the table 2.33.

**Table 2.33** EC-English Structural Equation Model Fit Indices, ML Estimator: Informative Ad

| Behavioral intention | $\chi 2$ | df | $p$ | CFI | RMSEA | (90% CI) | SRMR |
|---|---|---|---|---|---|---|---|
| Be tempted to buy this product | 322.17 | 160 | 0.0 | 0.93 | 0.08 | (.07, .1) | 0.067 |

**Figure 2.9** Measurement and Structural Model for Overall Ad Involvement, Brand Attitude and Behavioral Intentions (Be Tempted to tell a friend): Informative Ad.
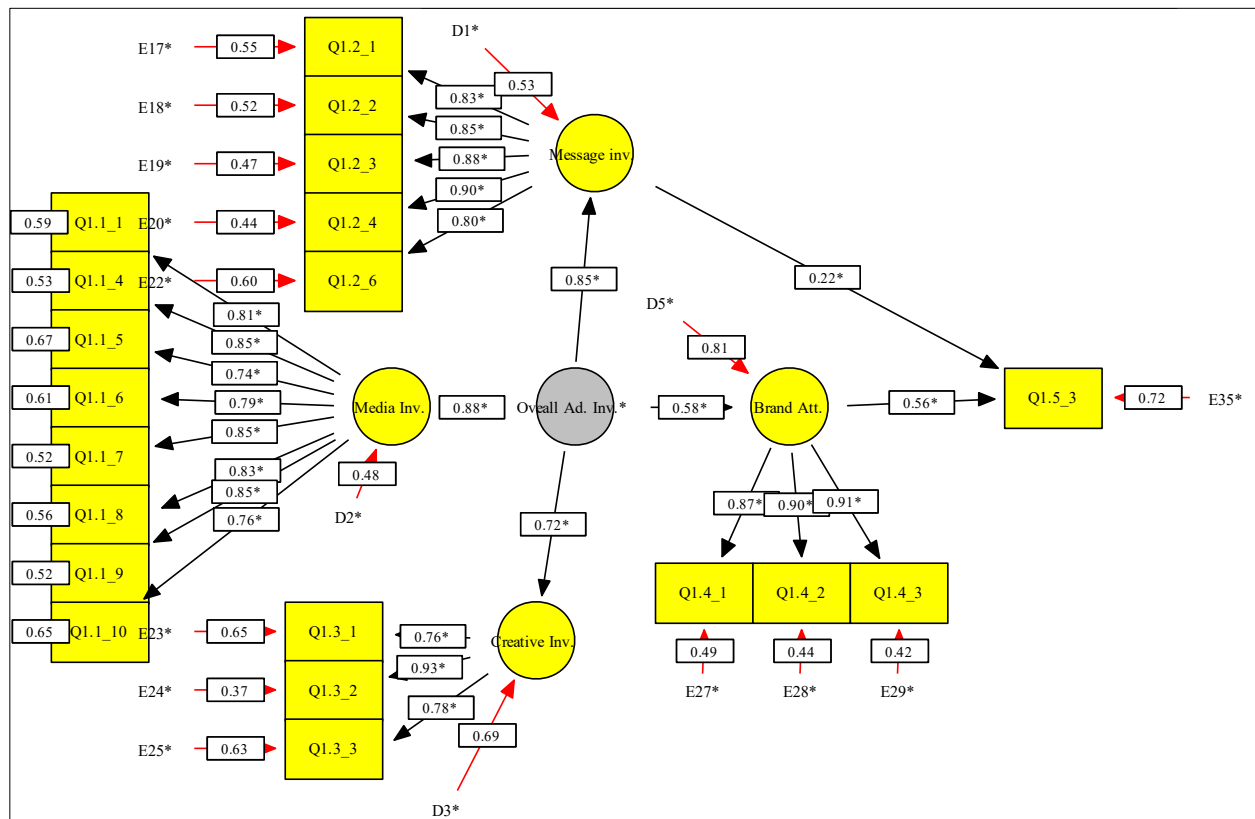
The EQS output shows significantly high values for multivariate Kurtosis for all models in all conditions. Normalized estimates of Kurtosis were around 20 for EC-English, EC-French, and FC-French conditions; and between 22 and 24 for the FC-English condition. For this reason, the ML robust estimator was used to run the models. The path coefficients and model fit indices for the models are presented in the tables 2.34, 2.35, 2.36, and 2.37. All the models for the different behavior intentions under a condition showed very similar fit indices with excellent CFI and very good RMSEA values, although Satorra- Bentler Scaled $\chi 2$ test was significant in all conditions. The reason for the significant $\chi 2$ test may be the same as was in the measurement model in the previous section, i.e. a very strongly correlated factor structure for the latent variable. The latent variable 'overall advertising involvement showed higher coefficients for media and message involvement compared to creative involvement.

**Table 2.34** EC-English Response to Informative Ad: Path Coefficient and Fit Indices

| EC-English Behavioral Intentions | Path coefficient | | | Satorra-Bentler Scaled $\chi 2$ (df=160) ($p<.01$) | CFI | RMSEA (90% CI) |
|---|---|---|---|---|---|---|
| | Overall ad involvement→ Brand attitude | Brand attitude→ Behavior intention | Message involvement→ Behavior intention | | | |
| - Be tempted to purchase this product | 0.58 | 0.53 | 0.23 | 216.634 | .973 | .05 (.03,.065) |
| - Make an effort to seek out more information | 0.58 | 0.51 | 0.23 | 223.594 | .97 | .053 (.035,.068) |
| - Tell a friend about the Brand | 0.58 | 0.56 | 0.22 | 209.345 | .977 | .046 (.026,.063) |
| - Call the company | 0.58 | 0.40 | 0.22 | 230.328 | .967 | .055 (.038,.07) |
| - Visit company website | 0.58 | 0.54 | 0.20 | 217.884 | .973 | .05 (.032,.066) |
| -Direct someone you know to the website | 0.58 | 0.51 | 0.23 | 200.537 | .981 | .042 (.019,.059) |

**Table 2.35** EC-French Response to Informative Ad: Path Coefficients and Fit Indices

| EC-French | Path coefficients | | | Satorra-Bentler Scaled χ2 (df=160) (p<.01) | CFI | RMSEA (90% CI) |
|---|---|---|---|---|---|---|
| | Overall ad involvement→ Brand attitude | Brand attitude→ Behavior intention | Message involvement→ Behavior intention | | | |
| - Be tempted to purchase this product | 0.64 | 0.53 | 0.29 | 254.563 | .955 | .062 (.047,.076) |
| - Make an effort to seek out more information | 0.64 | 0.50 | 0.32 | 237.427 | .963 | .056 (.04,.07) |
| - Tell a friend about the Brand | 0.64 | 0.58 | 0.17 | 248.304 | .957 | .06 (.045,.074) |
| - Call the company | 0.64 | 0.47 | 0.20 | 246.635 | .958 | .059 (.044,.073) |
| - Visit company website | 0.64 | 0.50 | 0.30 | 239.12 | .962 | .057 (.041,.071) |
| - Direct someone you know to the website | 0.64 | 0.44 | 0.32 | 244.875 | .959 | .059 (.043,.073) |

**Table 2.36** FC-French Response to Informative Ad: Path Coefficients and Fit Indices

| FC-French | Path coefficient | | | Satorra-Bentler Scaled χ2 (df=160) (p<.01) | CFI | RMSEA (90% CI) |
|---|---|---|---|---|---|---|
| | Overall ad involvement→ Brand attitude | Brand attitude→ Behavior intention | Message involvement → Behavior intention | | | |
| - Be tempted to purchase this product | 0.56 | 0.43 | 0.33 | 240.65 | .965 | .056 (.04,.069) |
| - Make an effort to seek out more information | 0.56 | 0.34 | 0.35 | 246.05 | .962 | .057 (.043,.07) |
| - Tell a friend about the Brand | 0.56 | 0.38 | 0.34 | 243.58 | .963 | .057 (.042,.07) |
| - Call the company | 0.56 | 0.23 | 0.36 | 243.65 | .963 | .057 (.042,.07) |

| | | | | | | |
|---|---|---|---|---|---|---|
| - Visit company website | 0.56 | 0.30 | 0.34 | 238.72 | .965 | .055 (.04,.069) |
| - Direct someone you know to the website | 0.56 | 0.30 | 0.35 | 242.31 | .964 | .056 (.041,.07) |

**Table 2.37** FC-English Response to Informative Ad: Path Coefficients and Fit Indices

| FC-English | Path coefficient | | | Satorra-Bentler scaledχ2 (df=160) (*p*<.01) | CFI | RMSEA (90% CI) |
|---|---|---|---|---|---|---|
| | Overall ad involvement→ Brand attitude | Brand attitude→ Behavior intention | Message involvement→ Behavior intention | | | |
| - Be tempted to purchase this product | 0.65 | 0.32 | 0.40 | 219.22 | .977 | .049 (.031,.064) |
| - Make an effort to seek out more information | 0.65 | 0.38 | 0.31 | 214.09 | .979 | .047 (.028,.062) |
| - Tell a friend about the Brand | 0.65 | 0.34 | 0.36 | 229.2 | .974 | .053 (.036,.068) |
| - Call the company | 0.65 | 0.23 | 0.19 | 231.44 | .972 | .054 (.038,.068) |
| - Visit company website | 0.65 | 0.46 | 0.24 | 223.08 | .976 | .051 (.033,.065) |
| - Direct someone you know to the website | 0.65 | 0.42 | 0.20 | 223.75 | .975 | .051 (.034,.066) |

*Analysis of Path Coefficients (Informative Ad)*

*Path for Overall Ad Involvement→ Brand Attitude:* The two measures related to this path did not change in the measurement model, so all models in a condition had the same coefficients for the paths. EC-English versus EC-French conditions showed a larger path coefficient for second language responses (.58 vs. .64). The same was observed for second language responses by FC participants (.56 vs. .65).

*Path for Brand Attitude→ Behavior Intention:* This path shows relatively larger but very similar coefficients for EC-English condition (between .4 and .56) and EC-French condition (between

.44 and .58). FC-French condition has a low path coefficient for 'call the company' (.23), the other coefficients are between .3 and .43. FC-French condition (second language) has a lower path coefficient for 'be tempted to buy' (.43 vs .32), and larger path coefficients for the items 'visit company website (.3 vs. .46) and 'direct someone to website' (.3 vs. .42).

*Path for Message involvement→ Behavioral intention:* EC-English models for all the behavioral intentions showed very similar path coefficients (between .20 and .23). Second language responses (EC-French) showed comparatively larger path coefficients for most items except for 'tell friends about the brand' (.20 vs. .17). The FC-French condition showed comparatively larger path coefficients (between .33 and .36) than EC counterparts. The FC-English condition (second language responses) showed larger coefficient for the item 'be tempted to purchase the product' (.33 vs .4), and visibly lower values for the last three items – 'call the company' (.36 vs. .19), 'visit company website' (.34 vs. .24), and 'direct someone you know to the website' (.35 vs. .20).

Figure 2.10 and 2.11 show the path models for EC and FC participants for their responses to first and second language advertisements. The diagrams are for only one behavioral intention item (be tempted to purchase this product). It appears that path coefficients for the second language response have higher values for most of the paths. Only the path for brand attitude on behavioral intention for FC participants showed higher coefficient for first language response.

**Figure 2.10** English Canadian (EC) Path Model for Informative Ad (First vs. Second Language)



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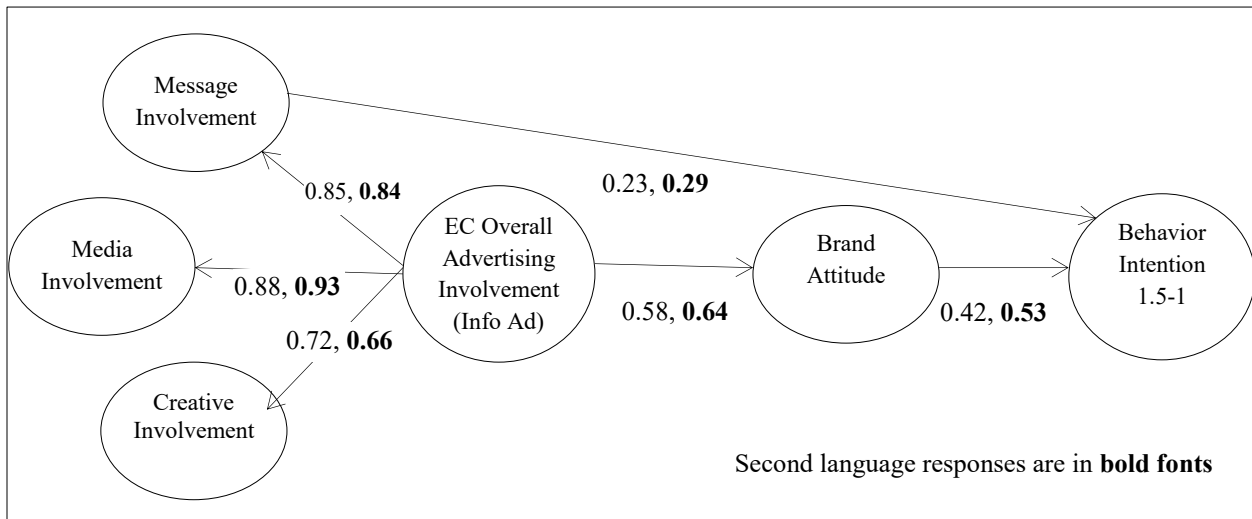
**Figure 2.11** French Canadian (FC) Path Model for Informative Ad (First vs. Second Language)
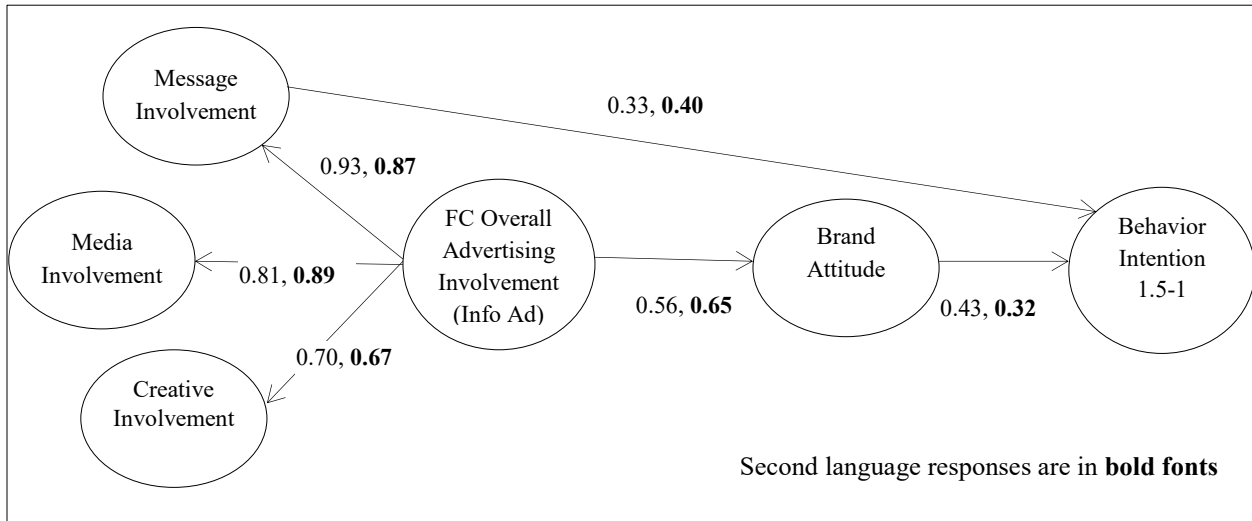


*Emotional Advertisement*

The structural equation model for involvement with the emotional advertisement, brand attitude, and behavioral intentions was developed with EQS software. The behavioral intentions and the items in brand attitude were modified to represent the type of the product/organization. Separate path models were developed for each of the behavioral intentions. The results for the first model (behavioral intention item 'be tempted to get involved') are presented in table 2.38. All the other models have similar fit indices. The fit indices for CFI and RMSEA are not acceptable in this regard. $\chi^2$ test was also significant in this instance.

**Table 2.38** EC-English Measurement Model Fit Indices, ML Estimator: Emotional Ad

|  | $\chi^2$ | df | $p$ | CFI | RMSEA | (95% CI) | SRMR |
|---|---|---|---|---|---|---|---|
| Be tempted to get involved with MADD Canada | 504.61 | 160 | 0.0 | 0.88 | 0.11 | (0.1,0.12) | 0.052 |

A look into multivariate Kurtosis revealed a rather large value for all the models. Normalized estimates of Kurtosis were significantly high (EC-English=35, EC-French= 28, FC-French= 39, and FC-English= 33). For this reason, ML Robust estimator was used to tackle the non-normality in data. Fit indices and path coefficients for the Robust ML estimates are presented in Tables 2.39, 2.40, 2.41, and 2.42. All models showed very good fit indices in terms of CFI (between .95 and .97) and RMSEA (between .052 and .067). Figure 2.12 shows the full structural model for

one of the behavioral intentions (tempted to get involved with the organization) for the EC-English condition. The latent variable 'overall advertising involvement' showed significantly higher factor coefficients for media and message involvement compared to creative involvement.

**Figure 2.12** Measurement and Structural Model for Overall Ad Involvement, Brand Attitude, and Behavioral Intention (Be Tempted to Get Involved): Emotional Ad.
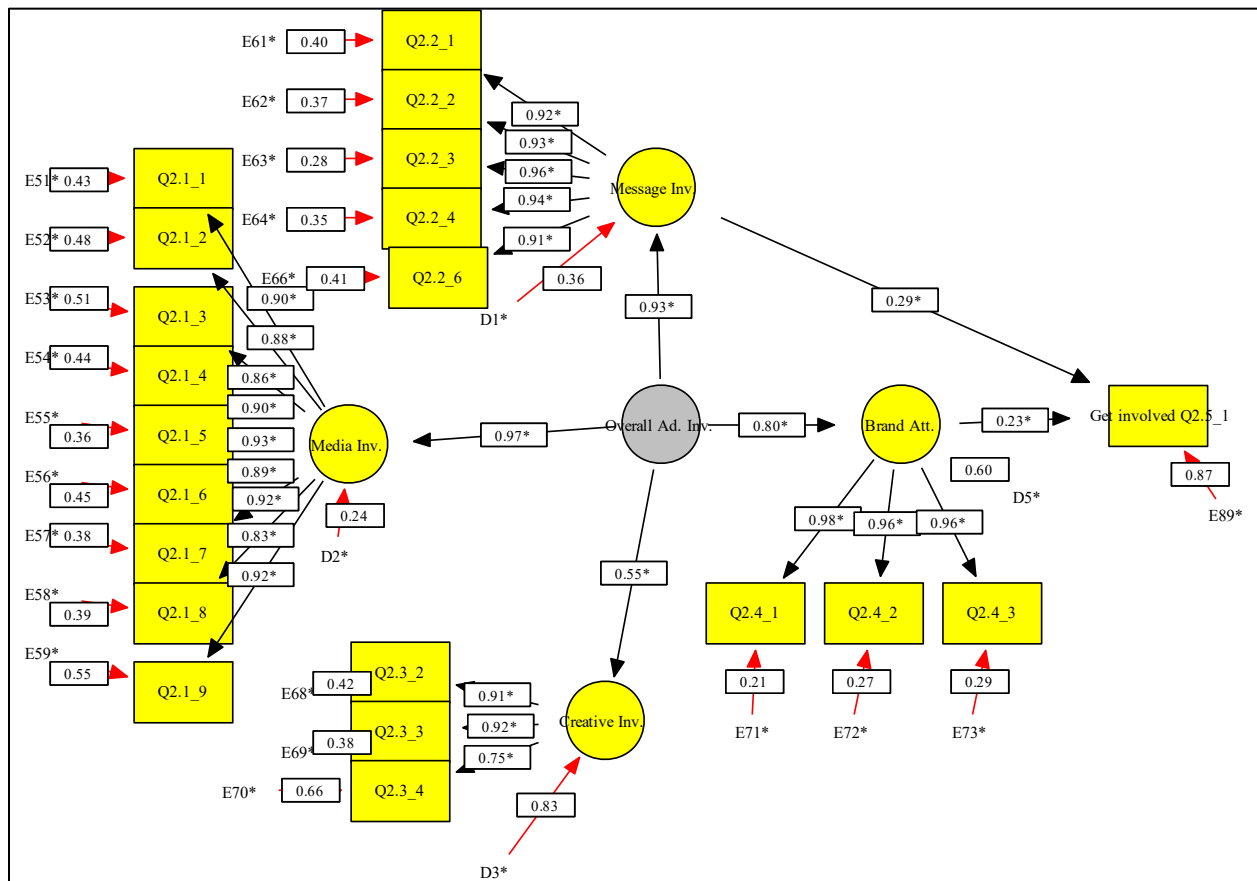


**Table 2.39 EC-English** Response to Emotional Ad: Path Coefficients and Fit Indices

| EC-English Emotional Ad | Path coefficient | | | Satorra-Bentler Scaled $\chi2$ (df=179) | CFI | RMSEA (90% CI) |
|---|---|---|---|---|---|---|
| | Overall ad involvement→ Brand attitude | Brand attitude→ Behavior intention | Message involvement→ Behavior intention | | | |
| Behavioral Intentions | attitude | | | | | |

| Behavioral Intentions | Overall ad inv.→ Brand attitude | Brand attitude→ Behavior intention | Message inv.→ Behavior intention | Satorra-Bentler Scaled χ2 | CFI | RMSEA (95% CI) |
|---|---|---|---|---|---|---|
| - Be tempted to get involved with MADD Canada | 0.79 | 0.23 | .29 | 278.686 | .95 | .062 (.047,.076) |
| - Make an effort to seek out more information about MADD Canada | 0.79 | 0.35 | .08 | 271.20 | .956 | .06 (.045,.074) |
| - Tell a friend about MADD Canada | 0.79 | 0.36 | .11 | 266.523 | 0.958 | .058 (.043,.072) |
| - Call the organization | 0.79 | .03 | .11 | 284.277 | 0.95 | .064 (.049,.077) |
| - Visit their website | 0.79 | 0.18 | .15 | 276.890 | 0.953 | .062 (.047,.075) |
| - Direct someone you know to the website | 0.79 | 0.22 | .11 | 274.963 | 0.954 | .061 (.046,.075) |

**Table 2.40 EC-French** Response to Emotional Ad: Path Coefficients and Fit Indices

| EC-French Emotional Ad | Path coefficient | | | Satorra-Bentler Scaled χ2 (df=179) | CFI | RMSEA (95% CI) |
|---|---|---|---|---|---|---|
| Behavioral Intentions | Overall ad inv.→ Brand attitude | Brand attitude→ Behavior intention | Message inv.→ Behavior intention | | | |
| - Be tempted to get involved with MADD | .76 | .35 | .24 | 267.796 | 0.963 | 0.057 (.042, .070) |
| - Seek out more info about MADD | .76 | .19 | .33 | 276.925 | 0.959 | 0.06 (.045, .073) |
| - Tell a friend about MADD Canada | .76 | .27 | .21 | 264.887 | 0.964 | 0.056 (.041, .069) |
| - Call the organization | .76 | -.19 | .33 | 283.827 | 0.956 | 0.062 (.048, .075) |

| | | | | | | |
|---|---|---|---|---|---|---|
| - Visit their website | .76 | 0 | 0.42 | 288.406 | 0.954 | 0.063 (.049, .076) |
| - Direct someone you know to the website | .76 | .02 | 0.31 | 279.167 | 0.958 | 0.060 (.046, 0.73) |

**Table 2.41 FC-French** Response to Emotional Ad: Path Coefficients and Fit Indices

| FC-French Emotional Ad | Path coefficient | | | Satorra-Bentler Scaled $\chi^2$ (df=179) | CFI | RMSEA (95% CI) |
|---|---|---|---|---|---|---|
| Behavioral Intentions | Overall ad inv.→ Brand attitude | Brand attitude→ Behavior intention | Message inv.→ Behavior intention | | | |
| - Be tempted to get involved with MADD Canada | .76 | .5 | -.16 | 257.896 | .966 | .052 (.037, .065) |
| - Make an effort to seek out more information about MADD Canada | .76 | .46 | -.17 | 257.027 | .966 | .052 (.037, .065) |
| - Tell a friend about MADD Canada | .758 | .52 | -.19 | 291.41 | .952 | .062 (.049, .075) |
| - Call the organization | .759 | .38 | -.36 | 292.913 | .952 | .062 (049, .075) |
| - Visit their website | .761 | .44 | -.2 | 282.942 | .955 | .06 (.046, .072) |
| - Direct someone you - know to the website | .759 | .48 | -.31 | 285.763 | .954 | .06 (.047, .073) |

**Table 2.42** FC-English Response to Emotional Ad: Path Coefficients and Fit Indices

| FC-English Emotional Ad | Path coefficient | | | Satorra-Bentler Scaled χ2 (df=179) | CFI | RMSEA (95% CI) |
|---|---|---|---|---|---|---|
| Behavioral Intentions | Overall ad inv.→ Brand attitude | Brand attitude→ Behavior intention | Message inv.→ Behavior intention | | | |
| - Be tempted to get involved with MADD Canada | .75 | .24 | .2 | 304.058 | .944 | .067 (.054, .08) |
| - Make an effort to seek out more information about MADD Canada | .752 | .21 | .27 | 298.202 | .947 | .066 (.052, .078) |
| - Tell a friend about MADD Canada | .753 | .3 | .109 | 302.276 | .945 | .067 (.053, .079) |
| - Call the organization | .751 | .071 | .079 | 304.063 | .944 | .067 (.054, .08) |
| - Visit their website | .75 | .133 | .284 | 290.975 | .950 | .064 (.05, .077) |
| -Direct someone you know to the website | .75 | .104 | .218 | 301.843 | .945 | .067 (.053, .079) |

*Analysis of Path Coefficients (Emotional Ad)*

*The Path Overall Advertising Involvement→ Brand Attitude:* As the concepts for the two measures related to this path did not change in the measurement model, all items in a condition had very similar (if not the same) path coefficients. EC-English versus EC-French conditions showed a very little difference (.79 vs. .76) for this path. There were no visible differences between the paths for FC-French and FC-English conditions.

*The Path Brand Attitude→ Behavior Intention:* This path shows moderate coefficients (between .18 and .36) for EC-English condition except for the item 'call the company' (path coeff. = .03). The second language condition EC-French has a negative coefficient for this item (-.17) and zero

or near zero (.02) coefficients for the items 'visit the website', and 'direct someone to the website'. FC-French condition showed good path coefficients for all the items (between .38 and .52). FC-English responses showed low path coefficients for three items: 'call organization', 'visit website', and 'direct someone to the website' (between .07 and .13), and relatively higher path coefficients for the first three items 'get involved', 'seek information', and 'tell a friend' (between .21 and .3).

*The Path Message Involvement → Behavioral Intention:* A look into the path coefficients reveal that path coefficients for the different behavioral intentions across the four conditions vary significantly. For example, the item 'be tempted to get involved' was the only item with a moderate path coefficient value. This path has reasonable coefficients (between .21 and .42) in the EC-French condition and negative values (between -.16 and -.36) in the FC-French condition. FC- English condition has two lower path coefficients for the items 'tell friends about the organization' and 'call the organization' (around 0.1) and values between 0.2 and 0.28 for the other items. It appeared that path coefficients for this path in native language did not have a strong meaning as it had in second language.

**Figure 2.13** English Canadian (EC) Path Model for Emotional Ad (First vs. Second Language)
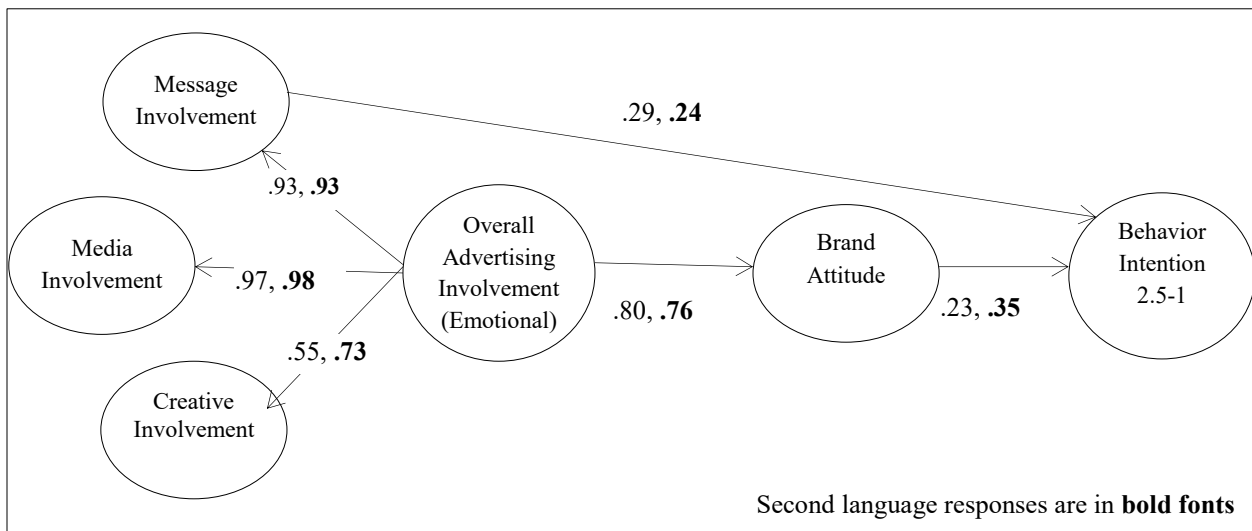
**Figure 2.14** French Canadian (FC) Path Model for Emotional Ad (First vs. Second Language)
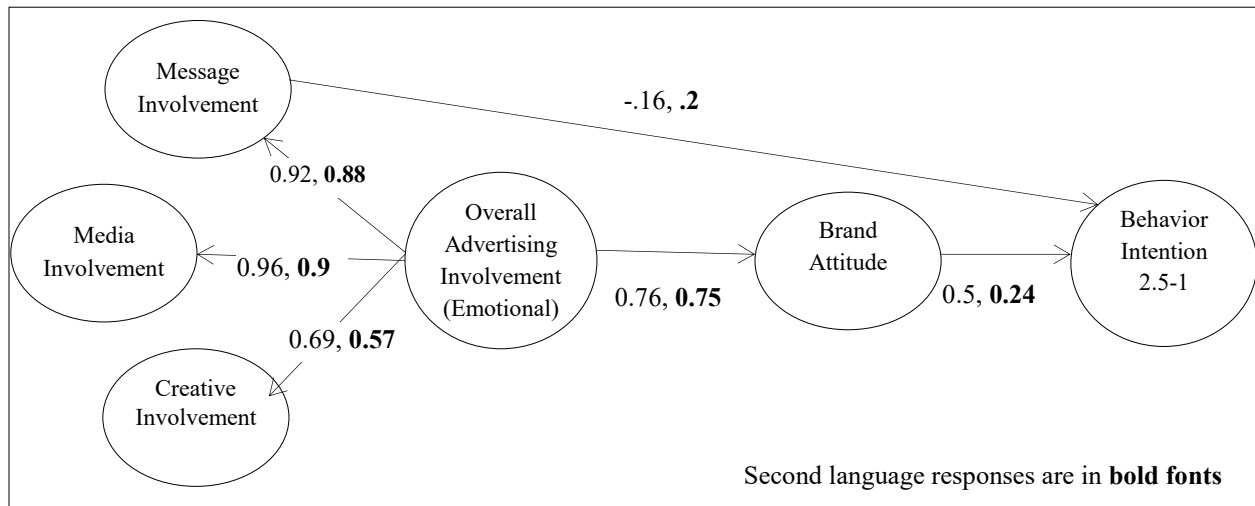


Figure 2.13 and 2.14 show the path models for EC and FC participants for their responses to the first and second language advertisements. The diagrams are for the item 'be tempted to be involved with MADD Canada'. It appears that coefficients for 'Brand attitude→ Behavior intention' for English Canadians were larger for their second language responses. The path for 'message involvement → behavioral intention' had a negative coefficient for first language responses of French Canadians.

## General Discussion

This study finds that it is possible to have a three factor measure for overall advertising involvement when English and French Canadian bilinguals respond to questionnaires and advertisements in the two languages. A discriminant validity analysis confirmed this three factor structure. The findings are that the first two factors 'media involvement' and 'message involvement' are strongly correlated while the third factor 'creative involvement' shows moderate correlation with the first two factors. The common item structure proposed across the four conditions regarding ethnicity and questionnaire language slightly varied for an informative versus an emotional advertisement which might be specific to the advertisement used and not generic. This study also suggested differences in involvement with advertisements in the first vs. second language. It was found that second language responses to the scale overall advertising involvement for an informative advertisement may follow acculturation. On contrary, second

language responses to the same scale for an emotional advertisement showed mostly lower involvement.

The multivariate analysis of variance showed that there is no significant main effect of ethnicity on any of the factors of advertisement involvement for the informative advertisement. But, there were significant effects of ethnicity on media and message involvement for an emotional advertisement. Questionnaire language had a significant effect on media involvement and creative involvement for an informative advertisement, and only on message involvement for an emotional advertisement. There was an observed effect of gender and age on the informative advertisement and an effect of gender and education for the emotional advertisement. A detailed analysis regarding the effects of demographics can be conducted in future to find the differences across demographic variables. The two age groups selected for this study (18-25 years, and 26-40 years) are important to Quebec as they include people born after the language regulations came in effect. The society has seen a significant change in the demographics of English speaking people since then. Also, the younger group consists of people born around the second referendum of independence of Quebec which had a deep impact on the society. These two groups also represent two separate generations: the Generation Y and Generation Z. It would be worth looking deeper into language related marketing behavior of these two groups. An extension of this study can consider how these two generations may respond to different scales like consumer ethnocentrism, and globalization. These concepts have high relevance in cross-cultural research.

Hypothesis testing regarding the differences between EC and FC respondents and on the role of acculturation for second language responses showed interesting insights. It showed that French Canadians show more involvement with the informative advertisement than English Canadians when responses are recorded in their first languages. This was the opposite of $H_1$. Responses in the second language from both groups moved towards the responses of the other group. This may be a result of acculturation shown by the groups. There was no statistically significant difference between the two groups regarding involvement with an emotional advertisement, although French Canadians showed higher involvement as hypothesized in $H_2$. Second language responses mostly showed lower involvement for an emotional advertisement. This means that the alternate hypothesis $H_{3a}$ and $H_{4a}$ about the second language having a lower involvement may be supported.

It appears that the informative and the emotional advertisements showed different mechanisms for second language responses. One showed acculturation with second language responses while the other showed lower involvement with the second language version. The hypotheses are composite in nature and each hypothesis applies to the three dependent variables and the two advertisements. Many of the hypotheses looking for the differences between the ethnic groups are not supported with statistical significance. A major cause for this may be the fact that bilinguals are already acculturated to the second culture. A comparison between the unilingual EC and FC participants might have better supported the hypotheses. Future research should look into this aspect.

The path models for the causal relationships regarding overall advertising involvement, brand attitude, and behavioral intentions provided some insights in a first versus second language scenario. It appears that, at times, the second language version has a higher path coefficient for the effect of advertising involvement on brand attitude, and of brand attitude on behavioral intentions. The path for message involvement on behavioral intentions for the emotional advertisement in the FC-French condition shows an unexpected negative value. Future research should look into this issue of why a path coefficient may change direction while participants respond to first versus second language questionnaires. Structural models for each of the behavioral intentions created too many models to analyze at the same time. The findings from the analysis could not be generalized in this regard. Selecting only one behavioral intention and developing a comparative path model for the two language versions helped in this regard. Similar models should be developed for the other behavioral intentions.

The findings and methods from this study may help marketing managers choose between languages to reach out to bilinguals. For example, it appears that advertisements for French Canadians can be both emotional and informative in nature. Normally, they are stereotyped to be receptive to emotional advertisements only. It is also realized that English Canadians in Quebec respond to emotional advertisements as much as the French Canadians. So, the English versions of original French advertisements need not try to adjust for the perceived 'less emotional' English speakers. Also, the finding that there is no significant effect of ethnicity on the informative advertisement is important for managers. This is in line with the finding that message involvement with an informative advertisement does not change for first versus second

language responses. The higher involvement with the other factors of involvement with informative advertisement was due to the language of the advertisement and questionnaire. This suggests that English Quebecer bilinguals may be more involved with the French version of certain advertisements while they are responding in French. The MANOVA based analysis with ethnicity and questionnaire language as the two independent variables provides with some interesting propositions for managers. For example, it would help managers isolate the effects of ethnicity and language of questionnaire on certain advertisements. Studies looking for the differences between the two groups do not necessarily make a distinction between these two sources of effects. It appears that the differences can be due to the fact that the EC and FC bilinguals are different people, or it may be because of the fact that the language of the instrument is causing the differences in responses. This understanding can be expanded to a lot of scenarios.

The study has some limitations. The results cannot be generalized for all emotional and informative advertisements as the findings are based on two advertisements only. The informative advertisement was about a high involvement product (mobile phone). The results that French Canadian bilinguals showed higher involvement with this informative advertisement might be different for other product categories. Future researchers can test different product categories and advertisements with different strategies. The emotional advertisement had a very strong fear/shock appeal. Other types of emotional advertisements like humor or sensuality should be used in future studies to generalize the findings. Another limitation of the study is the lack of location information of participants. It is reported that people from different regions of Quebec show subtle differences among them (Leger et al., 2016, page 21). This is not expected to have an impact as the differences are said to be subtle. As most bilinguals in Quebec are concentrated in the metropolitan Montreal and the Ottawa-Gatineau regions, the sample is expected to be quite homogenous.

This study would add significantly to the cross-cultural research stream on English and French Canadian bilinguals. Studies specifically involving bilinguals in the English community in Quebec are not too common. This would contribute to the analysis methods involving bilinguals from two ethnic groups and responses in two languages in the same study. This study also includes an interesting discussion on the involvement with informative and emotional

advertisements by these two ethnic groups and a comparative analysis of the responses from bilinguals in the two languages. This information is equally important for marketing managers and academic researchers working with an increasingly bilingual or multilingual population in this province.

**Essay 3: Analysis of Bilingual Responses to Advertisements in the Two Languages: A Consumer Neuroscience Study with a Commercial EEG Headset**

**Abstract**

This study used a commercial wireless EEG headset from Emotiv to collect data while bilingual participants viewed emotional and informative advertisements in their first and second languages. Bilingual English Canadian and French Canadian people living in the province of Quebec participated in this study. The main purpose of this study was to understand involvement with advertisements. In the first analysis, alpha activation from the F3 and F4 locations were analyzed. This found that second language advertisements mostly show higher alpha activation (lower involvement) on both the left and right frontal hemisphere for both the informative and the emotional advertisements. Frontal EEG asymmetry index was then looked into to compare between responses in the first and second languages. There was no conclusive finding that bilinguals may show more approach tendencies towards advertisements in their first languages. Trend lines plotted for frontal alpha activation and frontal asymmetry index over the duration of the stimuli show that responses to the two languages fluctuate and cross path. Lastly, performance metrics data for interest (valence) and excitement (arousal), as provided by the manufacturer software, were analyzed to see differences between the two language versions of the two types of advertisements. A few significant results in the expected and unexpected directions suggest that such outputs may be used in standard statistical analysis for mean differences and have comparability with results from self-assessment surveys. The merits of the portable and wireless EEG data collection equipment and preprocessed output were commented on in this regard. Apart from reporting on the findings, this study proposes that the term advertising involvement in the consumer neuroscience/linguistics context may be reviewed in light of literature in consumer behavior/advertising. Also, separation of the term into emotional involvement and cognitive involvement may be considered while describing such analysis from the neuroscience/linguistics perspectives.

*Keywords:* Consumer neuroscience; bilingual advertising involvement; emotional advertisement; informative advertisement; frontal EEG asymmetry; valence; arousal; alpha activation.

**Introduction**

Consumer neuroscience techniques in academic advertising research have been of interest for some time now (Krugman 1971, 1979; Weinstein et al., 1980; Weinstein et al., 1984). Recently, there was renewed interest in the topic as neuromarketing emerged as a new scientific method for consumer research (Morin, 2011), and commercial use of such technology became popular (Ohme, Matukin et al., 2011; Spence, 2016). The various reasons that marketers may want to use such methods include limitations of self-reported measures, and the possibility to tap in unconscious memory (Ohme, Reykwoska et al., 2010). Neuroscience is also a popular method in linguistics research involving bilinguals as numerous studies have concentrated on the effects of age of acquisition, language proficiency, and cognitive control on bilingual responses (Hernandez, 2013; Wong, Yin, and O'Brien, 2016). Another popular stream of research in linguistics showed how bilinguals respond to advertising (Luna and Peracchio, 1999, 2001, 2005; Noriega and Blair, 2008). In this research, we wanted to use EEG based neuroscience methods to study how bilinguals get involved with informative and emotional advertising appeals in the two languages. It is understood that the literature regarding bilingual advertising involvement has a general theme around the idea of language proficiency, cognitive loads, and the differences between the left or the right hemispheric involvement which is linked to approach and avoidance (Reiterer, Pereda, and Bhattacharya, 2009). It is reported that the more cognitive processing is required to understand an advertisement, the more involvement is observed. Also, a lot of studies measured cerebral lateralization of people, and identified that there are differences in activation (involvement) of the left or the right brain when people use the two languages (Hull and Vaid, 2007; Reitener, Pereda, and Bhattacharya, 2009). On the contrary, involvement with advertisements, as developed in the marketing/advertising literature, is not necessarily about cognitive loads or proficiency in the second language or has anything to do with the side of the brain that gets more active during such processes. It is more of a perception of the advertisement along dimensions relevant to the construct. For example, the items in the factor 'advertising media involvement' in the measure for 'overall advertising involvement' are about finding an advertisement to be important, of concern, relevant, meaningful, valuable, beneficial, mattering, essential, significant, and motivating (Spielmann and Richard, 2013). This is more like having a general perception about an advertisement which is not really a discussion point in the neuroscience/linguistic perspective of bilingual involvement with advertisements. This study

wanted to point out this discrepancy in conceptualization of 'advertising involvement' between the two streams of thoughts.

Emotional and informative appeals are two distinct advertising strategies used by marketers around the world (Yoo and MacInnis, 2005). Advertising campaigns often use either of the two strategies or use both of them at the same time. An analysis of 1400 case studies at the 'Institute of Practitioners in Advertising' in the UK has reported that successful advertising campaigns with purely emotional contents performed better twice as much (31% vs 16%) than purely rational appeals and slightly better than a combination of these two (Dooley, 2009). For these reasons, study of emotional responses from the brain and other physiological signals became very popular over the years across disciplines. These methods are expected to provide with unbiased and better responses than traditional self-assessment methods. Researchers in advertising, consumer research, neuroscience, psychology, neuro-economics, psychophysiology, computer science, education, and child studies are working on such topics. One of the major streams of research using neuroscience tools is on activation of frontal regions of the brain and its relevance to emotional and cognitive behavior (Mittal, 1987; Ohme, Reykwoska et al., 2010). There are also plenty of reports on emotion recognition from the brain signals (Schmidt and Trainor, 2011; Chanel et al., 2006; Wang et al., 2011). This study wanted to build on these reports and analyze emotional involvement of consumers with advertisements. The basic proposition was to show advertisements to participants and find their emotional involvement with the first versus second language advertisements. Another goal was to see emotional responses to emotional and informative advertisements. An exploratory approach towards the issue was taken in this regard. We looked into involvement with advertisements in a linguistic context and took a neuroscience approach to explain an advertising/marketing issue. There have been plenty of studies with EEG based neuroscience techniques that dealt with involvement with advertisements, bilingualism, and emotion recognition. Relevant studies can be traced back to the early seventies. It was deemed appropriate to use this method for this study.

Another objective of this study was to comment on an EEG based neuroscience technique that would be very convenient to participants from a data collection perspective. For example, proposing use of a system that would be non-invasive allows normal activity in front of a computer screen while participants view stimulus, and allows participants to interact with the

interface without much fear and anxiety about the data collection process. Also, it should be relatively easy to set up such a system. Consumer neuroscience research often requires collaboration with specialized research facilities and experts in other domains without much control over the data collection scheme. Such simplified equipment setup and method may help researchers rooted mostly in advertising or consumer behavior to work on consumer neuroscience topics independently without the extensive support from experts from other disciplines. Consumer neuroscience research with imaging based methods (fMRI, PET) normally does not allow use of large samples. Looking for an EEG based system that would allow data collection from a decent sample size for standard statistical analysis was also a motivation.

**Conceptual Framework**

*Involvement and Hemispherical Lateralization*

There have been many studies regarding involvement with advertisements and the medium. Krugman (1979) suggested that high involvement meant left brain activity and print advertisements were left brain functions. On contrary, low involvement was related to right brain activity and television commercials were right brain functions. Hansen (1981) supported this view and added that the left brain specializes in verbal, cognitive, and attributional information processing and the right brain specializes in non-verbal, pictorial, and holistic perception. Later, Mittal (1987) mentioned that left/right brain engagement depends upon the type of involvement, and described the three probable types: high-cognitive, high-affective, and low cognitive/low affective. He reported that the left brain is primarily engaged in the high-cognitive involvement condition and the right brain is primarily engaged in the high-affective involvement condition. The difference in the activation of the brain between the left and the right parts of the brain is termed frontal asymmetry. In a more recent study Ohme, Reykwoska et al. (2010) reported that frontal asymmetry measure may be a diagnostic tool in examining the potential of advertisements to generate approach related tendencies. This study wanted to use two advertisements as visual stimuli and look into activation/involvement as explained in the relevant literature. An informative and an emotional advertisement were selected to represent a high-cognitive and a high-affective scenario.

*Bilingual Language Lateralization*

Numerous studies have reported accounts of differential hemispheric involvement related to the use of the two languages by bilinguals. There are relevant reports involving English and French bilinguals which may be dated back to the early eighties (Albanese, 1985; Vaid and Lambert, 1979). A more recent meta-analysis on the issue summarized the progress in this field. Hull and Vaid (2007) reported that bilinguals who learn both languages very early (before 6 years) show bilateral hemispheric involvement for both languages. People who learn the second language at a later stage in life show left hemisphere dominance for both languages. Also, left hemisphere involvement is found to be greater for people with less proficiency in the second language. Some other reports mentions that second language processing of low proficiency bilinguals show more right hemispheric involvement (Reitener, Pereda, and Bhattacharya, 2009). Many studies are in the context of education and learning and the emphasis is on language proficiency and age of learning. Some reports are confounding and not ready to come to a conclusion. Based on these reports, an analysis to compare responses associated with the two language versions of an advertisement seemed appropriate. Equipment to use in this study was selected on capability to provide with a strategic coverage of the left and right side of the brain. Also, it was felt that a more homogenous sample size would be necessary to negate the effects of age of learning. Bilinguals who learnt the second language at a later stage in life and had very good proficiency in both languages were recruited. Compound bilinguals are people who have started learning both languages at the same time in the same context (like at home). Also, there are trilingual and multilingual people who speak other languages than English and French at home. People from these groups were not included in the study.

*Emotion Recognition with EEG*

The circumplex model of emotion has reported that our emotions can be interpreted as a neurophysiological experience of the dimensions valence and arousal (Russell, 1980, 2003). These two core dimensions explain other emotions that can be presented in a circular order along these dimensions. Valence is a measure of liking or general preference and arousal explains the intensity of emotional responses. Studies have used the stimuli response theory (Mehrabian and Russell, 1974) and showed how emotions invoked by visual and auditory stimuli can be captured along these dimensions (Lang et al., 2008). Since the early 2000s, many studies captured these emotional dimensions from EEG signals while participants viewed affective stimuli (Dos,

Chanel et al., 2006; Schmidt and Trainor, 2011; Wang et al., 2011). While valence is a general measure of pleasure-displeasure with a stimulus, arousal measures the intensity of the affect. It appears logical to use emotional measures from participants over the duration of the stimulus and term that as emotional/affective involvement with an advertisement. This study wants to find similarities of such neuroscience-based measures with advertising involvement measures from self-assessment surveys.

*Frequency Band Analysis*

In the EEG method, electrical activity in the brain is collected with electrodes from different locations on the scalp. This data related to electrical activity is represented in amplitude, frequency, and voltage. This electrical wave form data is called a raw EEG signal. The data are processed and separated into different frequency bands to analyze different mental activities and states. The frequency bands used in various analysis are Delta (.5- 4 Hz), Theta (4- 7 Hz), Alpha (8- 12 Hz), Beta (13-30 Hz), and Gamma (30- 80 Hz). Different frequency bands on different locations of the brain show association with different mental processes. A very brief summary mentioned in the iMotions website summarized that the Delta band is associated with motivational processes, the Theta band is linked with memory and emotional regulation, the Alpha band is associated with emotional and motivational tendencies, the Beta band is associated with sensorimotor functioning, and the Gamma band is linked with object representation and cognitive processing (Suurmets, 2018). Band power is the measure obtained by squaring the amplitude of the wave oscillations. Frequency band powers are widely used in neuroscience research broadly termed as power spectrum analysis. The Alpha band power is used in emotion research and reported to be inversely related to cortical activation. So, more alpha activation means lower emotional engagement with a stimulus. In this study, alpha activation from the frontal part of the brain was the main method for analysis.

*Frontal EEG Asymmetry*

Davidson (1984) measured the alpha frequency band and proposed the term frontal EEG asymmetry which is the observation of asymmetrical activity between the left and the right sides of the brain. It is reported to be a predictor of emotional valence (pleasant/unpleasant) and motivational tendencies (approach/avoidance). Also, it is reported that the left frontal brain is associated with approach and positive valence and the right frontal brain is associated with

withdrawal and negative valence (Rodrigues, Müller et al., 2018). Coan and Allen (2003) studied frontal alpha asymmetry and its relationship with the behavioral activation and inhibition. They concluded that greater left frontal activity of the brain was positively correlated with the behavioral activation scale. So greater left frontal activity can indicate positive feelings, higher engagement, or in general approach tendencies. This study looked into frontal EEG asymmetry of bilinguals when they viewed advertisements in their first and second languages.

*Hypothesis*

The following hypotheses are proposed based on the literature regarding approach-avoidance, cortical activation, frontal asymmetry, and valence-arousal based emotion extraction.

**H$_1$**: English and French Canadians would show lower frontal alpha activation (greater emotional involvement) with the first language version of an advertisement than with the second language version.

**H$_2$**: English and French Canadians would show more approach tendencies (higher frontal EEG asymmetry index values) towards advertisements in their first languages than in their second languages.

**H$_3$**: English and French Canadian bilinguals will show more 'valence' with their first language advertisements.

**H$_4$**: English and French Canadian bilinguals will show more 'arousal' towards an emotional advertisement in their first languages.

**Method**

*Equipment Choice*

Different EEG hardware companies were researched to find a suitable equipment for this project. A list of top 14 EEG hardware companies, as reported by biometric research company iMotions, was consulted in this regard. This report ranked the companies in terms of number of publications they are associated with in Google Scholar (Farnsworth, 2017). NeuroScan tops this list with 12300 publication and is followed by Brain Products (6690 publications), BioSemi

(5750 publications), EGI (5000 publications), Emotiv (3990 publications), and NeuroSky (2290 publications). All other companies in this list have less than 800 publications each. Emotiv caught our attention mainly for two reasons. The top four companies were established more than 20 years ago, while Emotiv was established in 2011 and had significantly higher number of publications per year. Also, it appeared to be the most viable option from the price point as monthly subscription fees for data collection software were required only for one month or two, and the headset was very modestly priced. EEG systems in the lower price range (Emotiv included) are normally termed commercial headsets while expensive equipment used by large research facilities are termed research grade equipment (e.g., NeuroScan). Normally research grade EEG equipment cost in tens of thousands of dollars. Some researchers compared data from research grade equipment with Emotiv headsets and reported to find very similar results (Badcock et al., 2013; Ekanayeke, 2015). Several academic articles also found the wireless and low cost equipment suitable for field studies (Debener et al., 2012).

From the two options available from this manufacturer, Emotiv EPOC 14$^+$ headset was chosen for this research. This headset has 14 electrodes and two reference points. The electrode placements, although modest compared to most other research grade options, give a strategic coverage of the different regions of the brain that was deemed good enough to serve in this study. Most importantly, it had the required electrode positions F3/F4 and F7/F8 that are relevant to the measurement of frontal EEG asymmetry. Also, Emotiv Epoc 14+ has some unique characteristics that are considered revolutionary in neuroscience research. The equipment uses a proprietary saline soaked felt pad to make contact between the electrodes and the scalp. This does not use abrasive gel to make contact as found in most other equipment. The electrodes are mounted on a headset and look more like a fun gaming headset than an intimidating scalp cap full of cables and wires connecting to large machines. These not-so-technical issues of this equipment are important as they are related to convenience of data collection at a minimum hassle to the participants. This wireless set also removes any remote chance of accidental electrocution. Sometimes, it took as little as 5 minutes to mount the headset on a participant and get them ready for data collection. Most other gel based research grade equipment take around half an hour to prepare each participant. The saline water based contact method leaves no residue on the scalp and participants need not wash their heads immediately after an experiment. These

features were deemed exciting as relatively larger sample sizes from the two ethnic groups were planned for this research.

Apart from these equipment advantages, other features of the Emotiv Pro data collection software looked very promising. Subscription based access to Emotiv Pro allows raw EEG data collection, data preprocessing and fast Fourier transformation (FFT), easy record management, easy export of recorded data, etc. Two promising features available through the subscription were down-sampled FFT band separated data and performance metrics data which can be used to run simpler statistical analysis on these outputs. A two month subscription was sufficient to get familiar with the system, mobilize participants, and collect the required data. The performance metrics available, as mentioned by the manufacturer, are excitement (arousal), interest (valence), stress (frustration), engagement/boredom, attention (focus) and meditation (relaxation). It seemed be a good idea to have these measures that sound like meaningful concepts from the behavioral research perspective. Unfortunately, only excitement (arousal), interest (valence), and focus data showed up in the collected data for some technical errors/issues. Figure 3.1 shows the headset and electrode placement diagram available from this equipment.

*EEG Equipment Setup*

We wanted to show visual stimulus to participants on a screen and collect data from their heads through the headset. Open source software OpenSesame Experiment builder (Mathôt, Schreij, and Theeuwes, 2012) was used to develop the stimuli slideshow with specific instructions for interaction with the program like stimulus duration or advance on click of a button. The first slide was instructions and the slideshow of the stimulus started only after a key was pressed. Triggers/markers associated with start and end of a slideshow were sent from the experiment builder software to the data collection software EmotivPro. In-line scripts were introduced into the OpenSesame program codes for this purpose. EEG recording was captured with Emotiv Pro software. Marker settings were adjusted in EmotivPro to receive the triggers and show in recorded data timeline.

**Figure 3.1** EEG Headset and Sensor Location Diagram



Image source: https://www.emotiv.com/product/emotiv-epoc-14-channel-mobile-eeg/
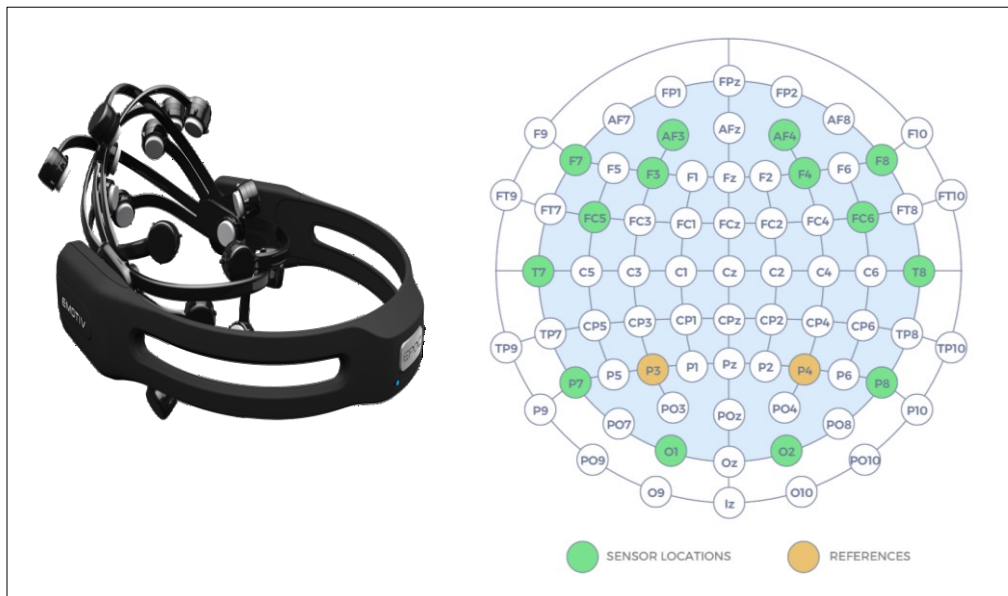
OpenSesame and Emotiv Pro ran on the same laptop and were linked by a pair of virtual communication ports created in the laptop. A utility software 'free virtual serial port' was used in this regard. This program created two virtual communication ports (COM1 and COM2) and made a pair to connect these two virtual ports. The visual stimulus showing software (OpenSesame) sent commands to open and close the ports and stimulus related markers to one end of the pair. The other end of the port received the marker information. Data collection software (Emotiv Pro) collected the marker information from the receiving port. Figure 3.2 shows the experiment setup. Figure 3.3 shows the graphical user interface of OpenSesame used in this regard.

It was challenging to set up the equipment and collect data at the beginning. The stimuli showing software and the EEG acquisition software are from two different developers and it was tough to get them to work perfectly from one computer. This was aggravated with an update error and the system shutdown during data collection. Emotiv Pro was reinstalled on a different laptop and OpenSesame was run on a separate laptop. They were manually synced together. There was a very small delay in stimuli presentation and EEG data collection for the rest of participants which was later adjusted from exported data in the Excel file.

**Figure 3.2** Equipment setup and Data Collection Scheme
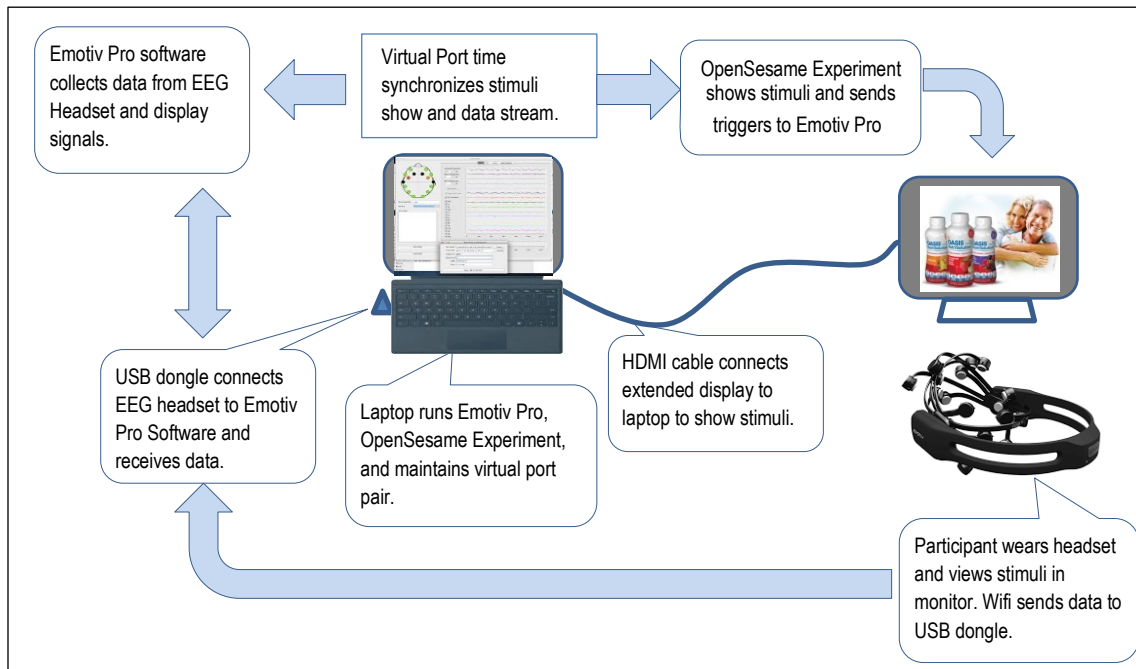


**Figure 3.3** OpenSesame Experiment Builder Graphical User Interface
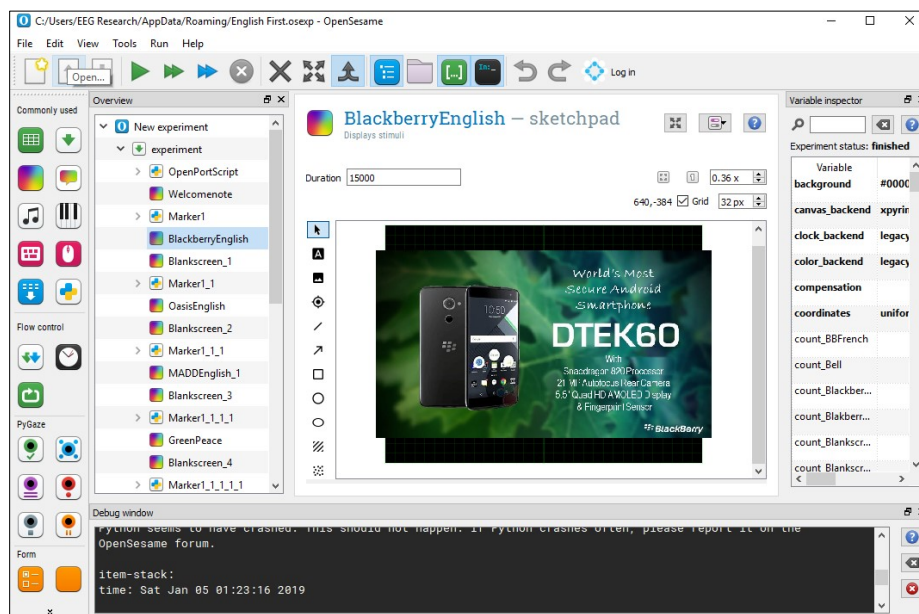


*Stimuli Selection and Experiment Design*

Stimuli for this study were selected from a related study that used pretests and measures to find a mostly informative advertisement (Blackberry DTEK60 smartphone), and a mostly emotional advertisement (a road accident awareness advertisement from an organization 'Mothers against

Drunk Driving'- MADD Canada). 20 English Canadian and 10 French Canadian participants rated the advertisements on being informative and emotional. The Blackberry advertisement was perceived to be more informative by the English Canadians than French Canadians, and the perceptions about the MADD Canada advertisement were not significantly different.

Normally, in consumer research, two language versions of an advertisement are shown to different groups or, shown after a significant time gap in case of a longitudinal study. Here, the English and the French versions of the advertisement were shown after a short break to each participant. English bilinguals viewed the English versions first and the French bilinguals viewed the French versions first. Another informative advertisement on a nutrition drink (Oasis NutroSolution) and an emotional advertisement on the dangers of texting and driving (SAAQ Awareness Campaign 2016) were used as separators to keep the first and second language versions of the advertisements apart. Cook et al. (2011) used real print advertisements for a neuroscience study and used 20 second duration for each image. It was realized that the advertisements selected for this study do not have a lot of information to keep the attention or focus of participants to the screen for that long. The duration of the images were set to 15 seconds in this regard. Each advertisement was followed by a 5 second blank screen to allow cool down.

*Participant Recruitment*

An initial call out was posted on the Facebook page of the undergraduate students at the School of Business and the Faculty of Engineering. Some posters were posted in the buildings in the campus. Because of very low response through these methods, another call out was sent through the newsletter of the Graduate Students' Association. Most participants recruited mentioned the call out in the newsletter, and a few of the participants came through acquaintance of other participants. Participants were compensated for an hour irrespective of the duration of their stay which was between 35 minutes to an hour. Interested participants were informed of some details of the study, and the criteria for selection in initial communications. The criteria was to have good bilingual proficiency in both the languages, be a speaker of English or French as a mother tongue, and a history of learning the second language at a later stage in life (normally at school). Participants contacted the researcher by emails and appointments were scheduled for data collection. Candidates who spoke another language at home or learned both English and French

together at home were not included. Selected participants were sent a summary of the study that gave an idea of the data collection procedure and probable discomfort. Around 10 participants did not follow up after receiving the details of the study. A total of 34 participants (20 female and 14 male) came for data collection. Eighteen bilingual participants identified themselves as English Canadians and sixteen of them identified themselves as French Canadians.

An important insight about linguistic identity emerged in some of the interactions with potential participants. There were people who speak only English and French at home, but come from parents who speak another language. A few of them mentioned that they have never learned the language their parents speak or have completely forgotten what they had learned as children. It was a moral dilemma as a researcher whether to include them or not. As the dominant cultures of Canada, both English and French Canadian identities are inclusive and mostly based on language than ethnicity. So, all people identifying themselves to be English Canadians and French Canadians are not necessarily people of Caucasian origins. A couple of participants were allowed in the study who claimed to have never learned the language their parents speak. A few participants were born and brought up outside of Quebec and/or Canada and are now residents of Quebec. Their data was carefully checked in the analysis and no anomaly was observed. This inclusion may be a limitation of the study, but the interaction with these participants provided valuable insights about the overall linguistic diversity of the society.

*Data Collection and Procedure*

An office in the department of marketing was turned into a laboratory for data collection. The window blinds were pulled down to make a calm and quiet space and to reduce distraction from buildings across the street. Data collection during the summer ensured that there was barely any noise or traffic in adjacent office rooms. The participants were greeted by the researcher and seated at the workstation facing a computer monitor. The researcher sat facing the participant at a short distance. Participants were given a brief description of the data collection procedure and asked if they had any question. Upon their consent, the EEG headset was mounted on their heads and contact quality was checked in Emotiv Pro. For most participants, it took between 3-5 minutes to get 100% contact quality (meaning all 14 electrodes had good contacts). For some people, it took around 10 minutes to get good contacts. Three participants took a break after 10 minutes, and then good contacts were achieved. For 3 participants (2 English + 1 French

Canadians), it was not possible to have good contact quality. However, their data was collected and later removed from analysis as it was not coherent. Figure 3.5 shows the contact quality screen in the software. After satisfactory contact quality was achieved, data collection was started and the participants viewed the instruction screen on the monitor. Upon pressing of any key, the slideshow of advertisements started on the monitor in front of the participant. At the end of the slideshow, data collection was stopped. The recording was checked to see if the markers were properly picked. Figure 3.4 shows the data collection screen on the researcher's laptop with the pink markers on the timeline of the recording at the bottom. After the slideshow ended, the EEG headset was removed from the head. Participants filled out the online survey and were interviewed about their use of the two languages in daily lives. They signed the participation form and received the compensation for their time at the end of the session. The sessions lasted between 35 minutes to 60 minutes based on the time to find good electrode contacts and the length of the interviews that lasted between 8-20 minutes.

One challenge with the equipment was getting perfect contact quality. There was an element of uncertainty with the time frame to get proper contact. Properly following instructions could not solve the issue, and it was not known why three participants had only 0% contact quality, and for some people it took about 15 minutes. This situation improved significantly over time. From equipment documentation, it was feared to have an issue with long hair of participants. Later, it was not found to be an issue to find good contact quality.

**Figure 3.4** Emotiv Pro User Interface for EEG Data Collection

**Figure 3.5** Contact Quality and Event Markers for a Participant Data
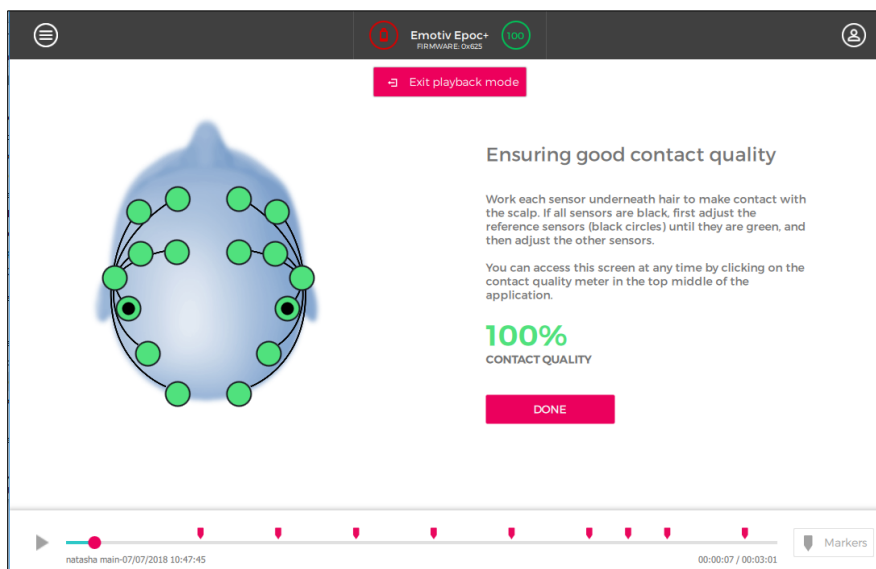


## Frontal Alpha Activation and Involvement

This study used the EEG alpha band power data and ran analysis to find cortical activation in the left and right frontal hemispheres (F3 and F4) relating to advertising stimulus in the two languages. The literature suggests that lower alpha activation is related to higher engagement or involvement. Also, frontal alpha activations are said to be related to emotional responses. So the data regarding alpha activation are expected to provide an indication of emotional involvement. Two versions (English and French) of an emotional and an informational advertisements were used in this analysis.

*Data Processing*

*Pre-processing and Frequency Transformation:* Data preprocessing means using different filters to remove noise and artifacts and running transformations to find a useful data format for analysis. The major preprocessing is done automatically by the Emotiv Pro software. The software documentation mentions that the software uses noise filters to get rid of 50Hz or 60 Hz power line noises, and digital filters and cut-off limits to get rid of all high frequency signals above 43 Hz. Fast Fourier transformation (FFT) is then used to get the different frequency bands from raw EEG data. After these on-board preprocessing, FFT band data were available in 8 bits per second format. This means that there were 8 values per second of stimuli duration. The different bands available from Emotiv Pro were theta, alpha, low beta, high beta, and gamma.

This information was available for all the 14 electrodes of the equipment. In this particular analysis, only the alpha band power information from F3 and F4 locations were captured. From information regarding event markers, the data associated with particular stimulus were separated for further analysis. The Alpha band data from these two locations from the frontal left and right sides of the brain are very popular in research regarding engagement or involvement with stimulus.

*Epochs:* The process of segmenting data for the duration of a stimulus into smaller overlapping time segments is called epoching. The main purpose is to smoothen out the data waves. Here in our analysis, 2 second epochs were created with a one second overlap. So, for the 15 second duration of an advertisement, there are 14 epochs. Epoch 1 contained data for the 1$^{st}$ and the 2$^{nd}$ second, epoch 2 contained data for the 2$^{nd}$ and the 3$^{rd}$ second and so on. In this section, the alpha band power data for the 14 epochs were calculated from the exported data for the stimuli durations. The values were tabulated for further analysis. Figure 3.6 shows a section of the tabulated data. EC participants had an ID starting from 2001, and FC participants had an ID starting from 1001.

**Figure 3.6** Sample Tabulation of Alpha Band Power Data from F3 and F4: BB English Ad

| ID | EEG Band | Epoch 1 | Epoch 2 | Epoch 3 | Epoch 4 | Epoch 5 | Epoch 6 | Epoch 7 | Epoch 8 | Epoch 9 | Epoch 10 | Epoch 11 | Epoch 12 | Epoch 13 | Epoch 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2003 | F3 Alpha | 0.25 | 0.48 | 1.04 | 1.40 | 1.07 | 0.73 | 0.41 | 0.13 | 0.25 | 0.46 | 0.53 | 0.78 | 0.64 | 0.30 |
| | F4 Alpha | 2.04 | 29.49 | 30.14 | 3.72 | 1.99 | 1.25 | 0.81 | 0.42 | 0.71 | 1.21 | 1.24 | 1.37 | 1.01 | 0.94 |
| 2004 | F3 Alpha | 0.47 | 0.51 | 0.48 | 0.38 | 0.55 | 0.93 | 1.10 | 0.96 | 0.93 | 1.20 | 0.97 | 0.55 | 0.43 | 0.48 |
| | F4 Alpha | 0.63 | 0.70 | 0.65 | 0.47 | 0.56 | 0.99 | 1.56 | 1.59 | 1.57 | 1.75 | 1.26 | 0.76 | 0.58 | 0.51 |
| 2005 | F3 Alpha | 1.19 | 1.16 | 1.53 | 2.07 | 1.94 | 1.48 | 1.20 | 0.97 | 0.89 | 1.08 | 1.19 | 0.75 | 0.36 | 1.13 |
| | F4 Alpha | 1.09 | 1.59 | 2.64 | 3.50 | 2.81 | 1.65 | 1.34 | 1.41 | 1.46 | 2.11 | 2.78 | 1.80 | 0.85 | 1.59 |
| 1002 | F3 Alpha | 0.35 | 0.26 | 0.31 | 0.30 | 0.31 | 0.27 | 0.13 | 0.21 | 0.26 | 0.31 | 0.46 | 0.31 | 0.13 | 0.09 |
| | F4 Alpha | 0.45 | 0.44 | 0.37 | 0.31 | 0.31 | 0.32 | 0.23 | 0.20 | 0.22 | 0.28 | 0.37 | 0.30 | 0.23 | 0.24 |
| 1003 | F3 Alpha | 0.31 | 0.20 | 0.22 | 0.26 | 0.47 | 0.63 | 0.42 | 0.28 | 0.30 | 0.39 | 0.47 | 0.52 | 0.71 | 0.95 |
| | F4 Alpha | 1.00 | 0.59 | 0.71 | 1.09 | 1.82 | 2.21 | 1.25 | 0.62 | 0.59 | 0.78 | 1.24 | 1.69 | 2.30 | 3.42 |
| 1004 | F3 Alpha | 1.92 | 0.65 | 0.40 | 0.39 | 0.64 | 0.56 | 0.49 | 0.60 | 0.44 | 0.41 | 0.46 | 0.58 | 0.62 | 0.63 |
| | F4 Alpha | 2.08 | 0.67 | 0.35 | 0.38 | 0.69 | 0.66 | 0.52 | 0.63 | 0.53 | 0.43 | 0.38 | 0.44 | 0.50 | 0.55 |

*Left Frontal Activation (F3 Alpha)*

*Mean Activation:* In this section, the mean values for the total duration of stimuli in the two languages were calculated for the two advertisements. Outliers were calculated to get rid of possible artifact related noise. The upper and the lower bounds were set at a distance of 1.5 times the inter quartile range from the 1$^{st}$ and the 3$^{rd}$ quartile. Paired t-tests were conducted on the mean activation over the stimuli duration for the two language versions of the advertisements.

The results are presented in table 3.1. The results show a consistent pattern that the second language responses have a higher alpha activation (lower involvement). Only FC response to the emotional ad did not show much significance. Both EC and FC responses to the BB advertisement showed significance at around 80-85% confidence intervals.

**Table 3.1** F3 Alpha Activation: Paired T-test Results

| F3 | Mean (SD) | | t | df | Sig. (2 tailed) |
| --- | --- | --- | --- | --- | --- |
| | English | French | | | |
| EC response for BB | .6507 (.34) | .7638 (.46) | -1.44 | 13 | .17 |
| EC response for MADD | .6891 (.38) | .8878 (.61) | -2.19 | 12 | .05 |
| FC response for BB | .517 (.19) | .4805 (.18) | 1.366 | 11 | .2 |
| FC response for MADD | .4951 (.16) | .4732 (.13) | .819 | 11 | .43 |

*Trend Analysis:* As the paired t-test results are not conclusive, trend analysis was planned to see the differences in epoch values over time for the two versions of an advertisement. This made perfect sense as bilinguals tend to switch frames between the languages and mean values for the total duration do not say much about the underlying processes along the length of the stimulus. The plan was to plot the activation data for both languages for each person and then get a group - mean for each epoch for the two ethnic groups. Trend lines for EC participants and FC participants were plotted for both the electrode locations (F3 and F4).

Data for two EC participants were removed as all their responses were considered potential outliers. So, there were data from 14 EC participants. Plotting the mean for F3 alpha values for each epoch shows that the second language alpha activation for English Canadians mostly stays above their activation regarding first language responses. This suggests that, for the duration of an advertisement, the EC participants mostly showed lower emotional involvement with the second language version of the advertisements.

For FC analysis, the alpha values for two participants were outliers compared to rest of the participants. The mean value did not include data from these two persons. So, there were data from 12 FC participants. First language alpha activation stayed above second language for 2-5 seconds and then second language activation took over. This means that FC participants showed more involvement with the English version of the advertisement at the beginning and it took

them time to get involved with their native language version. The mean F3 alpha band power plots for the two language version of the Blackberry and MADD Canada advertisements are presented in figure 3.7.

**Figure 3.7** F3 Alpha Activation over Stimulus Duration: EC and FC Participants with Informative and Emotional Ad
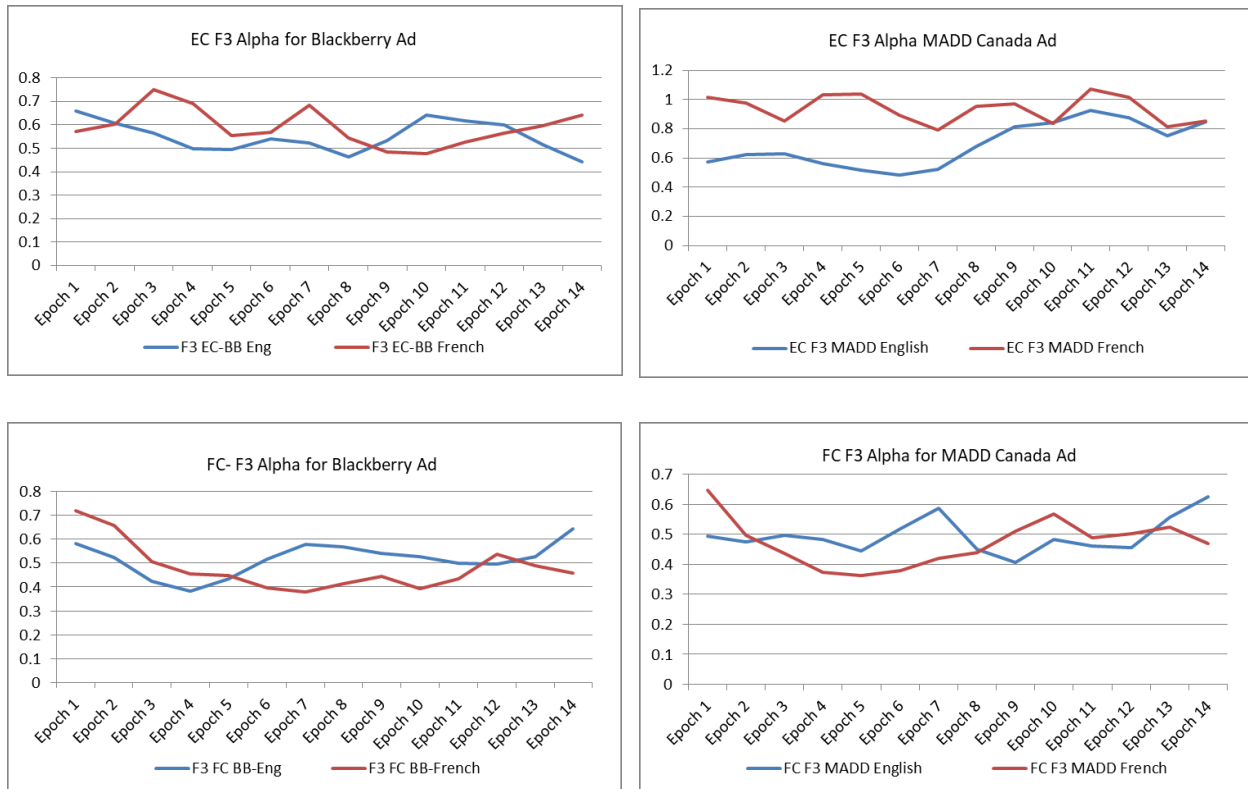


*Right Frontal Activation (F4 Alpha)*

*Mean Analysis:* A similar paired t-test was conducted for the F4 position after removing potential outliers from the data. The results are shown in table 3.2. Results show that the EC responses to the emotional advertisement are significant at 95% confidence interval; and the EC and FC responses to the informative advertisement are significant at the 80% confidence interval. The FC responses to the emotional advertisement could not be considered significant. Results for this F4 position are very consistent with F3 alpha activation. All the results show the same direction for the mean differences, that second language responses have a higher alpha activation which is linked to lower emotional involvement with the stimuli.

**Table 3.2** F4 Alpha Activation: Paired T-test Results

| F4 Alpha Activation | Mean (SD) | | t | df | Sig. (2 tailed) |
|---|---|---|---|---|---|
| | English | French | | | |
| EC response for BB | 1.1429 (.74) | 1.3079 (.84) | -1.66 | 15 | .12 |
| EC response for MADD | 1.1592 (.64) | 1.5423 (.41) | -2.43 | 14 | .03 |
| FC response for BB | .6866 (.18) | .623 (.17) | 1.58 | 10 | .14 |
| FC response for MADD | .6722 (.17) | .6332 (.15) | .886 | 11 | .39 |

*Trend analysis:*

Very similar trends were observed for the F4 alpha band power; that second language involvement was low most of the time during stimulus presentation. French Canadian participants showed the similar trend of having momentary more involvement with the English version and then eventually being more involved with their native language version. Figure 3.8 shows the alpha activation plots for F4 position for the EC and FC participants with the two advertisements.

**Figure 3.8** F4 Alpha Activation over Stimulus Duration: EC and FC Participants with Informative and Emotional Ad
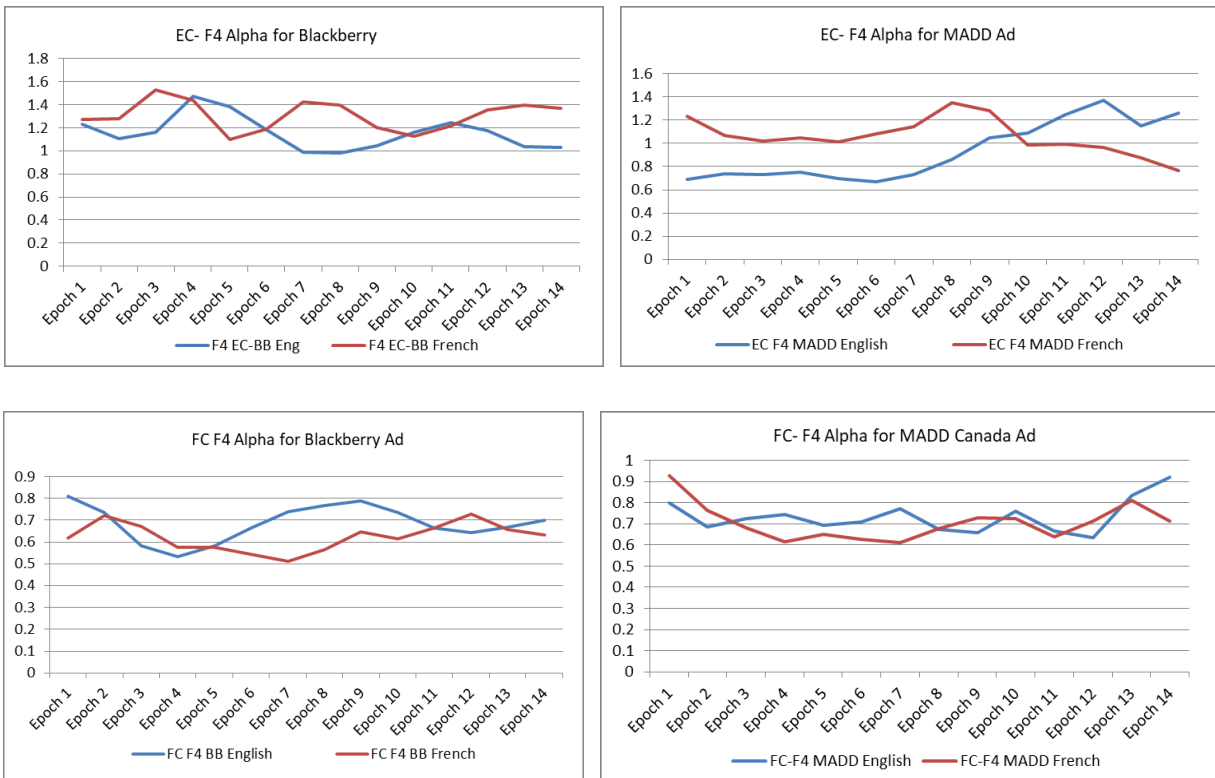
*Discussion on Frontal Alpha Activation*

The analysis of the average alpha activation shows that it is possible to capture emotional involvement with both an informative and an emotional advertisement. First language version of the advertisement mostly showed more involvement with both types of advertisements. It is observed that $H_1$ was supported for the informative advertisement with a low confidence interval of 80%. This is an acceptable practice given the nature of EEG data and the low number of participants from each ethnic group. $H_1$ was not supported by the FC participants for the emotional advertisement. So, it is partially supported for the emotional advertisement. Table 3.5 shows the summary of the hypotheses tests.

The trend line plot for the mean alpha activation for each epoch shows that frontal alpha activation does not show constant differences over the entire duration of the first and second language advertisement exposures. Participants 'mostly' were more involved with an advertisement in their first language than with the second language. Involvement with two different language versions showed fluctuations and the trend lines crossed paths at times.

The analysis removed all data from a couple of participants that seemed to be completely off calibration with very large deviations from the rest. The reason for this problem is unknown. As data could only be processed offline, there was no way to correct this during data collection. Apart from that, a few 'outlier' data points were replaced with a mean of the adjacent epoch values from the same participant. This helped remove some of the 'unusual' spikes and troughs in the data. Such spikes in data may be a result of facial muscle movement, eye blinking, or hand movement. Participants were requested to make minimal movements during the stimuli slideshow, yet it is not possible to get that with perfect accuracy. A few participants were selected randomly and their data for the alpha band power for the two language versions of an advertisement were checked. This showed that involvement with a particular language version is more of an individual level occurrence, that some participants may very well be 'more involved' with the second language version. So, the mean value in the trend line for each epoch is a good representation of the group behavior. There are plenty of reports of approach and avoidance measures with alpha activation from the F3 and F4 positions. This analysis based on trend lines could not confirm it in that regard. This analysis can be regarded as a measure for emotional involvement with the first language version of the advertisements for both F3 and F4 positions.

This is not a measure for approach towards the first language version while collecting data from F3 and avoidance from the second language version while collecting data from F4.

**Analysis of Frontal EEG Asymmetry**

This study looked into frontal EEG asymmetry of EC and FC bilinguals while they viewed advertisements in the two languages. The Alpha band power data collected from F3 and F4 locations in the previous sections are used to calculate the frontal asymmetry index over the epochs of stimulus duration. The expectations are that frontal asymmetry index values (approach tendencies) would be higher for the first language advertisements.

*Data Processing*

*Data Preprocessing and Epoching:* Raw EEG data were processed in Emotiv Pro to remove noise and artifacts. Then band power information for the 5 frequency bands from the 14 electrode positions were exported from the software. Then F3 and F4 alpha band power for the 4 relevant stimuli for the 15 second duration were separated for further analysis. The stimuli used in this study are the Blackberry advertisement (informative in nature) in English and French and the MADD Canada advertisement (emotional in nature) in English and French. At this stage, 14 overlapping epochs of 2 second duration were calculated for each stimulus. Adjacent epochs overlapped by one second.

*Computation of the Frontal Asymmetry Index:* The Frontal Asymmetry Index (FAI) can be calculated from the alpha power values from F3 and F4 regions. The equation to calculate the frontal asymmetry index is: FAI = log (Alpha Power F4/Alpha Power F3), where F3 and F4 are electrode positions in the left frontal and the right frontal part of the brain (iMotions, 2017).

Alpha power values were obtained from Emotiv Pro data-export termed FFT band power data. These data are available in two formats, a 128 bit/sec format and a down sampled 8 bit/sec format. The 8 bit/sec format was used in this study. For every two consecutive seconds (1 epoch) there were 16 values available. So the F3/F4 alpha power for an epoch was the mean alpha power value of the two consecutive seconds (16 values). FAI values for all the epochs for all participants and all advertisement versions were extracted, calculated, and tabulated.

*Frontal Asymmetry Index Plots*

The Frontal asymmetry index contains some negative values for some epochs for certain participants. This happens to calculations with a higher left frontal (F3) alpha activation value than the right frontal (F4) alpha activation value at a given time frame. For this reason, an average value for the entire stimuli duration (global frontal asymmetry index) was not a useful measure to run a paired t-test like for the previous study. For this reason, only a trend analysis was performed.

The Root mean squared (RMS) value seemed to be an appropriate measure for this analysis. The Frontal asymmetry index RMS values over the epoch were plotted for both EC and FC participants for their response to the two versions of the advertisements. As expected, all the figures showed that frontal asymmetry index trend lines for the first language responses stay above the trend line for the second language responses. Although the trend line analysis is a rough estimate, it gives an idea of the underlying pattern to support the hypothesis and is considered a reasonable explanation at this moment. The plots for the EC and FC participants are presented in Figure 3.9 and Figure 3.10.

**Figure 3.9** EC Mean Frontal Asymmetry Index Value (RMS) over Epoch Duration
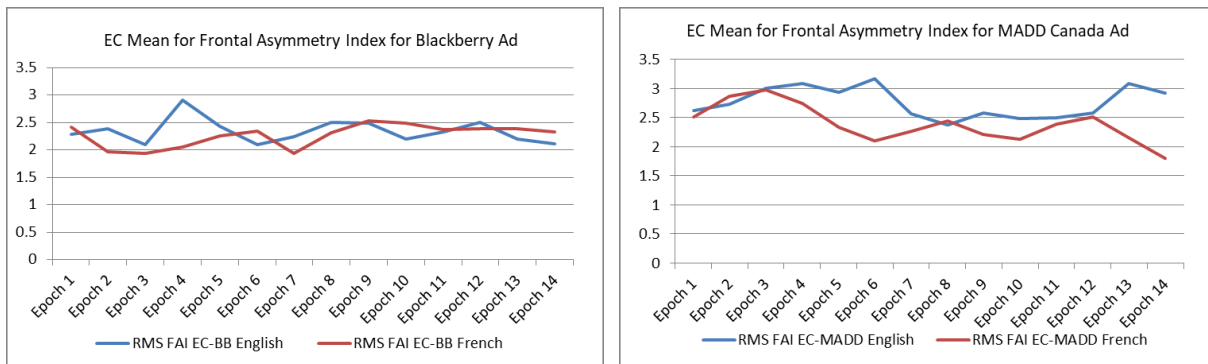


**Figure 3.10** FC Mean Frontal Asymmetry Index Value (RMS) over Epoch Duration
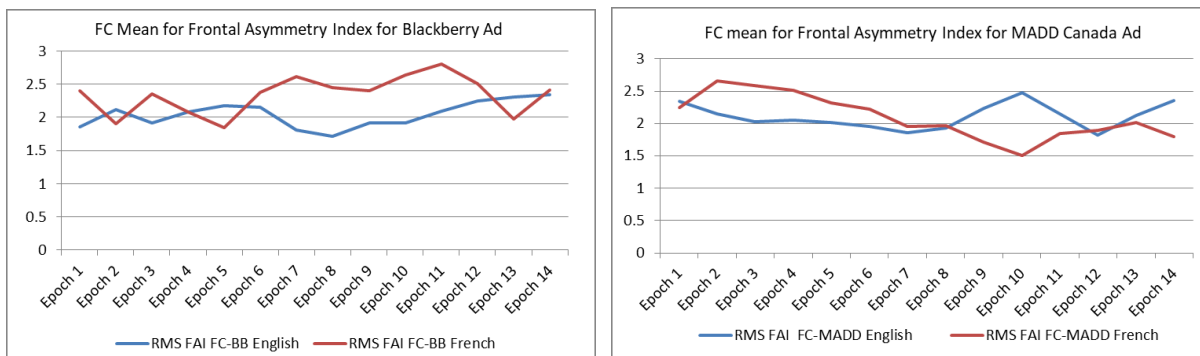
*Discussion on Frontal Asymmetry Index Analysis*

A look into the plots reveals that the first language responses 'mostly' have higher values for the frontal asymmetry index than second language responses over the duration of a stimulus. It also appears that the FAI for the two separate language versions of an advertisement may not show two constant trend lines apart from each other. They may fluctuate and intersect each other at some point like the frontal alpha activation trend lines discusses earlier. For example, FC mean for the MADD Canada advertisement showed a reversal of the trend from around the 8th epoch. EC response to the Blackberry advertisement also showed a similar result. It appears that there are more fluctuations in the plots towards the beginning and the end of the stimulus duration. It can be concluded that the FAI relating to language versions of a certain advertisement can be variable, but the first language versions would show more approach tendencies in general at the beginning. It is not possible to draw a conclusion on $H_2$, that bilinguals show more approach towards an advertisement in their first language. This was true for both the emotional and the informative advertisement.

## Emotional Valence and Arousal with Advertisements

This study looked into emotional valence and arousal with the advertisements in the two languages. The proposition is to measure emotions from the brain signals while participants view advertisements in their first and second languages. It is expected that the emotional measures for the duration of a stimulus will resemble emotional involvement and this would have correlations with the established measures of advertising media involvement as reported in the advertising/consumer behavior literature. The Emotiv Pro software provides some measures like interest (valence) and excitement (arousal). This information was used in the analysis.

*Data Processing*

Performance metrics data from Emotiv Pro provide two types of values. One value is for the performance metrics data, normally a single digit number with a positive or a negative sign. This value is reported to be a reasonable measure at the individual level analysis, but not so useful for comparing across people in a group (Emotiv, 2019b). The other value available is called a scaled value which gives a decimal value between 0-.99 for each stimulus. This value is obtained by

monitoring brain activity for the duration of the entire stimulus show (including advertisements used as fillers) and then scaling the data to provide a comparable estimate. So, a higher scaled value for a stimulus is expected to be associated with higher emotional involvement. This scaled data is deemed appropriate for comparisons with other stimuli or other participants. This output has a frequency of 0.1 Hz meaning we have one value for every 10 seconds of data. Both these values for performance metrics are available for each stimulus and can be exported to Excel for analysis. The contact quality for two EC participants (participant ID EC 2001 and EC 2002) and one FC participants (participant ID FC 1011) were very poor. As expected, their performance metric data was not available from the software. Unavailable data for a particular performance metrics is marked with a binary marker (0, 1) in the exported data file. All other participants except these three had a marker value of '1'. Another participant's (participant ID FC 1001) data was not included in analysis as it was accidentally collected with an earlier version of the slideshow with 20 second stimuli durations. Three FC participants (participant ID 1004, 1005, and 1007) had contact quality less than perfect. This means that some of the electrodes did not have good connection during data collection. A look at the electrode quality diagram showed that the electrodes with relatively bad connections were all located at the back of the head, which are normally not used in measure of performance metrics data related to emotions. Their data was retained as no anomaly in the values was observed in the outputs.

One problem with this approach was that the performance metrics coverage over the full duration of the stimulus was not available. As data was processed at 0.1 Hz, one value for the emotional state for every 10 seconds was calculated by the software. So, response for the last 5 seconds of each stimulus was not retained in this value. A look at the trends for frontal asymmetry and alpha activation suggest that there should be a reasonable representation of the emotional involvement without the last 5 seconds of each stimulus. This was a limitation with the equipment used, and no way around was available to have information for the full duration of the stimulus.

*Analysis*

The first analysis is done between the first and second language responses from English and French Canadians. As each participant viewed both language versions of the advertisements, paired T-tests were run on the data. Given the nature of EEG data, and claims from Emotiv about the accuracy of the performance metrics, it was tough to decide on a confidence interval

appropriate for this study. For example, Emotiv mentions accuracy of the interest dimension at about 70% and the arousal dimension for over 85% for their insight headset. And it mentions that the Epoc+ headset (the one we used) normally fares better than that (Emotiv, 2019b). There are reports of independent studies supporting these measures, and Emotiv have reported the use of multi modal systems involving heart rate, skin impedance, respiration, blood pressure, and eye tracking to validate the performance metrics information (Emotiv, 2019). Although not common in statistical analysis, given the success rate for such measures and the low participant numbers, a confidence interval between 80-90% seemed logical for such analysis.

*First vs. Second Language Responses:* Paired two sample t-tests for means were run on Microsoft Excel. A look into the first versus the second language responses for each advertisement from each ethnic group shows that EC respondents had a significantly higher interest (valence) rating for the second language version of the Blackberry advertisement (informative advertisement). This had statistical significance in the opposite direction. EC responses to the emotional advertisement was not statistically significant but had the same opposite direction. So, $H_3$ is not supported by EC participants for any of the advertisements. FC responses to the Blackberry advertisement showed a non-significant higher valence rating for the first language responses and a significant higher valence rating for the emotional advertisement. So, $H_3$ is only partially supported for FC participants for the emotional advertisement only. The results are presented in table 3.3.

**Table 3.3** Results for Paired t-Test for Interest (Valence): First vs. Second Language

| | Mean (SD) | | t | df | Sig. (2 |
| --- | --- | --- | --- | --- | --- |
| | English | French | | | tailed) |
| EC response for BB | .443 (.006) | .516 (.016) | -2.46 | 15 | .026* |
| EC response for MADD | .466 (.004) | .471 (.004) | -.335 | 15 | .74 |
| FC response for BB | .512 (.039) | .523 (.025) | -.452 | 13 | .659 |
| FC response for MADD | .502 (.025) | .532 (.017) | -3.17 | 13 | .007* |

The test for excitement (arousal) was significant at the 90% level for EC responses to the emotional advertisement. It shows that EC respondents have a higher arousal rating for the French version (second language version). This does not support $H_4$. The emotional

advertisement MADD Canada shows the right direction for FC participants (that first language version has a higher arousal rating), but is only statistically significant at a very low confidence interval (75%). The results for the t-tests are showed in table 3.4.

**Table 3.4** Paired t-Test Results for Excitement (Arousal): First vs. Second Language

|  | Mean (SD) | | t | df | Sig. |
|  | English | French |  |  | (2 tailed) |
| --- | --- | --- | --- | --- | --- |
| EC response to BB | .234 (.006) | .234 (.012) | -.005 | 15 | .99 |
| EC response to MADD | .218 (.018) | .262 (.043) | -1.75 | 15 | .1* |
| FC response to BB | .298 (.054) | .289 (.059) | -.107 | 13 | .92 |
| FC response to MADD | .275 (.043) | .333 (.06) | 1.232 | 13 | .24 |

*Discussion on Emotional Involvement with Advertisements*

The analysis for valence suggests that EC respondents had lower valence ratings for the first language version of advertisements for both the emotional and the informative advertisement, though only the responses for the informative advertisement were significant. On contrary, FC respondents showed higher valence ratings for both types of advertisements with statistical significance for the emotional advertisement.

The analysis of arousal shows that there were absolutely no mean differences between the English and the French versions of the informative advertisement for both EC and FC participants. This was expected as the informative advertisement was not too high on the emotional dimension. The EC response to the emotional advertisement had a significant mean difference at the 90% level, but in the opposite direction, the French version of the advertisement had a higher arousal. FC respondents showed a mean difference in favor of the first language version, but the effect was not significant with a high confidence interval.

**Summary of Hypotheses**

All the hypotheses results are shown in table 3.5. It is observed that $H_1$ is supported for the informative ad (low CI) and partially supported (only EC) for the emotional ad. $H_2$ could not be concluded, but has possibility to hold true if studied further. $H_3$ was not supported for the informative advertisement and partially supported (FC only) for the emotional advertisement. EC

responses to both ads were in the opposite direction, which suggest that they may show acculturation in their responses. $H_4$ was partially supported (FC only) at a very low confidence interval. EC responses, again, were statistically significant in the opposite direction.

**Table 3.5** Summary of Hypothesis Results

| No. | Hypothesis | Results and Comments |
|---|---|---|
| $H_1$ | EC and FC show low alpha activation (high emotional involvement) for first language advertisements | - **Supported** at low CI for **informative ad** (p<.2)<br>- **Partially supported** (only for EC) for **emotional ad** (p<.05)<br>* Note: not-significant result for FC participants for emotional advertisement follows expected direction of the mean difference. |
| $H_2$ | EC and FC show higher FAI (more approach) for first language advertisements | **Not conclusive**. First language trend line for FAI mostly stays above that for the second language. This indicates that the hypothesis probably has less chance to be false.<br>*Note: FAI trend lines for the two versions fluctuate over epochs and cross path |
| $H_3$ | EC and FC show more valence for first language advertisement | Informative ad:<br>- **Not supported**<br>- EC response is significant (p=.02), but in opposite direction.<br>- FC response is not significant, but in right direction<br>Emotional ad:<br>- **Partially supported** (FC only) at p<.01, EC response shows right direction though not significant<br><br>Note: EC responses to both ads has higher valence for French version (opposite to hypothesis). This may be related to acculturation. |
| $H_4$ | EC and FC show more arousal with emotional ad in first language | - **Partially supported** (FC only) with very low CI (p=.24)<br>- EC response has a significant value in low confidence interval (p=.1) in opposite direction |

**General Discussion**

This study looked into involvement with advertisements from a neuroscience perspective. Although there is a healthy number of neuroscience studies on Canadian bilinguals, studies regarding advertising involvement with this bilingual group are not abundant. As mentioned earlier, this study wanted to bridge two different streams of research with the term involvement with advertising, from an advertising perspective and from a linguistics or neuroscience approach. It appears that advertising involvement as developed in the field of marketing can be extended to discuss bilingual involvement with advertisements and involvement with advertisements in the brain. The findings for emotional valence are exciting. Here EC respondents had a higher mean valence for the second language advertisements for both an emotional and an informative advertisement. In a related study, the exact conclusion was made when media involvement was measured with the same advertisements. This suggest that it may be possible to locate acculturation from the brain signals, and EEG based research can provide results comparable to that received from traditional consumer research methods.

The study has strong managerial implications. Marketing managers are already taking help from such neuromarketing analyses to develop the right communication material to engage 'emotional' consumers. Television commercials, advertising copies, and packaging labels are being checked with neuromarketing methods to make them more effective. This study suggests that bilingual engagement with a stimulus in the two languages follow certain patterns. Analysis of such patterns may help marketing managers select the right language and duration of advertisements to maintain the optimal involvement with advertisements. Managers can also see if it is possible to stop or force the switch with change in the original copy or the translation. For example, manipulating the duration of an online banner may help marketers find the desired behavioral outcome from bilinguals. The proposal to compare measurement scales with neuroscience methods is also very encouraging. Managers would be able to get better insights from these methods and compare with the findings from previous survey data for references.

This study used commercial EEG equipment Emotiv Epoc $14^{+}$ to study bilingual involvement with advertisements. The manufacturer provided software was used to preprocess data and extract frequency band information. The equipment was low cost and easy to set up. The data collection ease for participants suggests that such equipment can be used to collect data from

relatively larger sample sizes. This is encouraging for academic researchers considering consumer neuroscience research with EEG based methods.

**Limitations and Further Research**

Initially it was planned to use all the performance metrics data provided by the EEG equipment manufacturer. After data processing, it was realized that only four metrics (interest, excitement, focus, and overall excitement) were available and useful for analysis. A call with the Emotiv support team revealed that this may be due to the threshold of the metrics, or unknown reasons related to the system crash mentioned earlier. As our literature supports the use of valence and arousal measures, this was not an issue. This study developed a basic system with mostly open source software and used the features of Emotiv Pro. Studies around the globe use numerous options available to work with raw data. That requires considerable proficiency with programming languages, and sometimes reasonable budget to acquire such software. Some options like open source software Brainstorm, or MATLAB toolbox EEG Lab may provide researchers with neuro-imaging based analytical tools. That would be a worthy extension of this study to find the left and right hemispheric activations and involvement. This study was not exactly focused on that particular aspect of the issue. As a suggestion for researchers rooted in marketing to conduct neuroscience research, it can be said that this equipment is safe, easy to use, and is good for data collection from a large group. But, analysis capabilities may be reduced if researchers are not prepared to work with raw EEG format files and programming. There are software companies (e.i., iMotions) who provide support software to work with a variety of similar equipment and even allow addition of other popular sensory modalities like eye tracking, and heart rates. It seems that access to such resources would help researchers have a foothold in consumer neuroscience research.

The study could not provide very strong statistical significance for some of the hypotheses. Which is not very uncommon given the main focus was to explore emotional involvement from different perspectives. For example, the insight that the trend line for involvement with advertisements in the two languages may cross each other is a very significant one. This suggests that the search for a statistically significant result for a mean difference for the entire stimuli

duration may not provide with the correct picture or may provide with just half the story. Bilingual people frequently switch between the two language frames that they have developed over the years. They may start translating in their mind or may see the stimulus in one language and think in the other. These actions may show differences in the brain activity. Analysis trend lines over the full duration of stimulus exposure may be a very good approach to understand bilingual involvement.

Another limitation of the study was that all the participants were greeted and briefed in English. It is reported that bilingual frame-switching is instantaneous and can be initiated with any cue. Also, almost all FC participants were highly conversant in English and students at an English medium university. It was not expected to see any effect of this on their data. Also, the participants did not know of the language sequence of the advertisements and responded to advertisements as they were shown. So, it is not clear if any of the versions of the advertisements startled participants. Some of the trend lines show an early intersection between the two language versions which may be an indication of these issues. But, this limitation speaks for the strength of this trend line based analysis; that it may provide with more insights than a mean difference.

This study only focused on issues that are more related to emotional involvement. An obvious extension would be analyzing cognitive involvement. As literature goes, it is possible to locate cognitive load from T3 positions with beta waves. Also, the F7 position is promising to locate cognitive load (Lee, 2014). Research in that stream would help distinguish between emotional and cognitive involvement and help clarify the concept of advertising involvement as described in linguistics and neuroscience research. Then, it would be easier to relate this concept with the regular literature on advertising involvement as developed with consumer research methods.

As mentioned earlier, this study is exploratory in nature. A goal was on suggesting neuroscience based measures of emotional involvement with advertisements and address different measures of advertising involvement. In a related survey study, it is observed that EC participants show a significantly lower mean value for the factor 'media involvement' with an informative advertisement in the first language. This EEG based method found a similar counterintuitive result that EC respondents have a significantly lower valence rating for the first language version

of the same advertisement. Future research can explore more in this regard to find how the advertising involvement concept, as developed in marketing, can be looked into from the neuroscience perspective. The use of the term 'advertising involvement' can be reconsidered by each stream. One of the original scales for the 'media involvement' factor was 'ad perception index' (Brunel, and Nelson, 2000). The word 'perception' can be brought back into the name of the concept as it may be a better 'term' for the concept. For the neuroscience and linguistic streams, a distinction between the emotional and cognitive involvement would clarify a lot of confusion regarding the concept.

# Conclusion

This thesis aimed to understand second language responses from bilinguals in the marketing context and covered related discussions on cross-cultural research, advertising, bilingualism, and consumer neuroscience. The focus was on the bilingual population from the two major ethnic groups living in the province of Quebec in Canada (French Quebecers and English Quebecers). A brief description of these two groups of people and the background of the study were followed by a discussion on the theoretical foundation for work on bilinguals in a cross-cultural context. Then three essays were developed to address the issues at hand.

The first essay looked into the factors of ethnic change of English and French Canadian bilinguals and found a three factor structure with media involvement, social interaction, and cultural attachment. This found that mostly French Canadian bilinguals show acculturation to English culture while responding in their second language (English). The second essay looked into the concept of overall advertising involvement as responded to by the bilinguals. This essay reported on the three factor structure of overall advertising involvement and on the effects of ethnicity and language of questionnaire on the responses on those factors. It was found that there may be two different mechanisms at play when bilingual involvement is measured for an emotional versus an informative advertisement. Second language response to the informative advertisement showed acculturation while the same to an emotional advertisement showed lower involvement. The third essay took a neuroscience approach to study emotional involvement with advertisements. Frontal asymmetry index, alpha band power activation, and measures for emotional valence and arousal were used to explain the issue. The general findings are that bilinguals may get more emotionally involvement with advertisements in their first languages. But, this involvement in the two languages is fluctuating in nature and shows intersecting trend lines when plotted for the duration of the stimulus. This essay made an attempt to relate the advertising involvement concept as developed in the marketing literature with that in the linguistics/neuroscience literature.

The three essays have strong managerial implications. The fact that French Canadians may be more receptive of an informative message than the English Canadians and that both groups are

equally receptive of emotional messages would encourage marketers to develop advertisements accordingly. Acculturation of English Quebecers to the informative advertisement suggests that, in some conditions, advertisements and communication in French might be a better tool to connect to English bilingual consumers. The finding that French Canadians show more acculturation while responding in English is also very important to marketing managers looking to find a foothold into the Quebec market. One important contribution of this study is the isolation of the effects of ethnicity and language of questionnaire. Similar analysis would help managers understand if the expected differences between the French Canadians and the English Canadians are providing the differential results or the language of questionnaire is responsible for the differences in responses. This would allow marketers to plan advertising campaigns accordingly. As bilinguals seem to show acculturation on second language responses, marketers need to be careful while collecting data for surveys. Settings of personal devices often automatically choose surveys in the language of the device or browser settings. It was found from our interviews that some bilinguals set some/all of their devices in their second languages. Also, computers at work or personal devices provided by the workplace are often set to the language used at the institutions. Marketers should try to find a way to reach consumers in a language that is more appropriate.

The three essay based research was very useful to bring together different issues across related disciplines. The first essay laid down a foundation to understand how the French and English Quebecers may respond to questionnaires in the two languages. The second essay built on this knowledge to discuss their involvement with two apparently contrasting types of advertising strategies that were expected to provide with differential results for these two groups of people. This essay realized that the concept of involvement with advertisements is not consistent across concerned disciplines like advertising, linguistics, and neuroscience. The third essay used a neuroscience approach to address these discrepancies and find a common ground for researchers. It is not common to see a neuroscience study into a marketing doctoral thesis. So, the suggestion for future doctoral researchers is to be to open to this possibility. With the advent of affordable new technologies and standardized methods for analysis, it is easier than ever for marketing researchers to conduct consumer neuroscience research.

The thesis was focused to the discipline of marketing, yet made significant contributions in cross-cultural and social science research with bilinguals. The proposition to study language acculturation and cultural attachment of two ethnic groups is very pertinent to the unique linguistic environment of Quebec. This study was not a socio-linguistic study, but realized several related issues that would be important for other social science researchers, marketers, and (may be) decision makers. The interviews at the time of EEG data collection sessions allowed fairly deep discussions on language related topics. Language is a popular topic of discussion in Quebec and often a source of a never ending debate. There is a lot of tension over the language rights of people. The linguistic atmosphere in Quebec is very different than most places in the western world. While recruiting and interviewing, it was realized that some 'Allophone' people (a French term for people who speak a different language than English or French at home) have a strong desire to be part of the French identity. They might have learned a third language at home at an early age, but do not speak that language any more. It was mandatory for them to attend French medium schools and they strongly associated themselves with the French language and culture in general. They do not feel they belong to the culture of their parents, and do not have the status to be officially considered English speaking (as they have attended French-medium schools in Canada). They mentioned that they feel being denied access to a 'French' identity; while they do not have any other identity than French to associate themselves with. This phenomenon appears to be more recent for Quebec. It is reported that most immigrant people chose English schools before the language laws were enacted in Quebec in the seventies (Ryan, 2016). The laws made it mandatory for children of all immigrant families (where the parents did not attend English medium schools in Canada) to go to French medium schools. Now, the French Quebecer identity is more diverse than it ever was. The policy makers should look deeper into this assimilated or acculturated group of French Quebecers who may be a visible minority, a religious minority, or an ethnic minority. These people have embraced the French language and many cultures in Quebec, but most probably did not receive much access to the social structure of the society. Some English Quebecer participants voiced similar concerns about being left out despite being perfectly bilingual. The representation of the Allophones (also termed as the cultural minority groups) in public service is 7.1% while they roughly constitute 12.3% of the population. English Quebecers hold 7.6% of the population and 0.9% of the public service positions (Evan Dyer, 2013). The numbers that 70% of the English Quebecers and 50% of the

Allophones are bilinguals question rationality of this data. Although policies to support immigrants to learn and speak French have been very popular and successful in Quebec, practices to employ minority people in public service or giving them access to higher positions were not aligned with those policies. Also, there are efforts to transfer/force French-Quebecer cultural values upon the minority. The ban on visible religious symbols for public service employees is a recent example of these efforts. Language acculturation can be natural for societies with a dominant language and is shown by the minorities in Quebec. But forcing people to assimilate into the cultural norms and practices of the host culture (that are contradictory to the values of the minority population) is a serious issue for the minority communities. English Quebecers are the best example of natural acculturation that made them a distinct identity in between French Quebecers and English speakers in rest of Canada. Policy makers can look deeper into the theories, history, and results of 'forced' assimilation practices in this regard. The history of the residential schools in Canada to assimilate indigenous children into the 'Canadian' culture might be the best example from the recent past to learn from.

One very positive thing that emerged from this study is that bilingual people grow tolerance towards the people from the second culture. Some participants mentioned that they grew up bitter towards the other ethnic group, and changed views after moving into the metropolitan areas where they started meeting a lot of people from the other group. Some of them have partners from the other ethnic group, and a few of them mentioned that they want to reconcile through their partnerships. The factor that age has an effect on the responses is very significant in this regard. Bilinguals seem to evolve over time with more exposure to people from other cultures. Linguistic policies in Quebec do not promote bilingualism in French medium schools; and English medium schools are only for children of families who are 'officially/legally' considered English speaking. Also, young French people in rural areas in Quebec do not get the chance to feel the diversity as most ethnic minority people live in the concentrated metropolitan areas. More opportunity for French/English/other children to learn the other language and different cultures in the multicultural society would be very helpful to alleviate some of the tension among these ethnic groups. There are also positives in the fact that many of the hypotheses were not supported. It appears that the bilingual English Quebecers and French Quebecers may not be that different from each other.

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# Appendices

# Appendix A1

Survey Questionnaire (English version)

Evaluation of Advertisements by English and French Canadian Bilinguals

**Q42** Do you consider yourself a Canadian bilingual with good proficiency in both English and French?

- Yes (1)
- No (2)

**Q45** What is your native language?

- English (1)
- French (2)
- Other (please mention) (3)

**Q8.1** How old are you?

- 18-25 (1)
- 26-40 (2)
- 41-54 (3)
- 55-64 (4)
- 65 or over (5)

**Q48** Which province do you live in?

- AB  (1)
- BC  (2)
- MB  (3)
- NB  (4)
- NL  (5)
- NT  (6)
- NS  (7)
- NU  (8)
- ON  (9)
- PE  (10)
- QC  (11)
- SK  (12)
- YT  (13)


**Q8.2** What is your gender?

- Male  (1)
- Female  (2)


**Q8.3** What is your annual household income?

- Less than $ 20,000  (1)
- $ 20,000 - $ 39,999  (2)
- $ 40,000 - $ 59,999  (3)
- $ 60,000 - $ 79,999  (4)
- $ 80,000 and up  (5)

**Q8.4** What is the highest level of education that you have completed?

- Primary school  (1)
- High school graduate  (2)
- College (2 years)  (3)
- Bachelors (B.Sc., B.A or other)  (5)
- Professional degree  (6)
- Masters or Doctorate  (7)

**Q41** This survey is part of a study to understand how Canadian bilinguals evaluate print advertisements and how they use the languages in everyday life. It has six sections and may take 12-14 minutes to complete.

We are looking for Canadian bilinguals who have good proficiency in both English and French and can respond to this survey in any of the two languages. This survey is in English, but we also encourage bilingual participants who may not speak English as a first language. Thank you very much for your participation.



Please respond to questions regarding the advertisement above.

**Q1.1** When looking at the ad, you find what is advertised to be:

| | Not at all (1) | Somewhat (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|---|---|---|---|---|
| Important (1) | ● | ● | ● | ● | ● |
| Of concern to you (2) | ● | ● | ● | ● | ● |
| Relevant (3) | ● | ● | ● | ● | ● |
| Meaning a lot to you (4) | ● | ● | ● | ● | ● |
| Valuable (5) | ● | ● | ● | ● | ● |
| Beneficial (6) | ● | ● | ● | ● | ● |
| Mattering to you (7) | ● | ● | ● | ● | ● |
| Essential (8) | ● | ● | ● | ● | ● |
| Significant to you (9) | ● | ● | ● | ● | ● |
| Motivating (10) | ● | ● | ● | ● | ● |

**Q1.2** When thinking of the ad, did you find yourself doing any of the following?

| | Not at all (1) | Somewhat (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|---|---|---|---|---|
| - Paying attention to the content (1) | ● | ● | ● | ● | ● |
| - Concentrating on the content (2) | ● | ● | ● | ● | ● |
| - Thinking about the content (3) | ● | ● | ● | ● | ● |
| - Focusing on the content (4) | ● | ● | ● | ● | ● |
| - Spending effort looking at the content (5) | ● | ● | ● | ● | ● |
| - Carefully reading the content (6) | ● | ● | ● | ● | ● |

**Q1.3** When thinking of the ad, did you find yourself doing any of the following?

|  | Not at all (1) | Somewhat (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|---|---|---|---|---|
| - Taking note of the visual aspects of the ad (1) | ● | ● | ● | ● | ● |
| - Focusing on the colors and/or images of the ad (2) | ● | ● | ● | ● | ● |
| - Noting some specific colors or images in the ad (3) | ● | ● | ● | ● | ● |
| - Paying close attention to the ad as a piece of art (4) | ● | ● | ● | ● | ● |

**Q1.4** How would you agree with the statements about the brand BlackBerry?

|  | Not at all (1) | Somewhat (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|---|---|---|---|---|
| - I think BlackBerry is a very good brand (1) | ● | ● | ● | ● | ● |
| - I think BlackBerry is a very useful brand (2) | ● | ● | ● | ● | ● |
| - My opinion about the brand BlackBerry is very favorable (3) | ● | ● | ● | ● | ● |

**Q1.5** After viewing the Advertisement, how likely you are to do the following?

| | Not at all (1) | Somewhat (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|---|---|---|---|---|
| - Be tempted to purchase BlackBerry DTEK60 (1) | ● | ● | ● | ● | ● |
| - Make an effort to seek out more information about BlackBerry DTEK60 (2) | ● | ● | ● | ● | ● |
| - Tell a friend about BlackBerry DTEK60 (3) | ● | ● | ● | ● | ● |
| - Call the company (4) | ● | ● | ● | ● | ● |
| - Go to their website (5) | ● | ● | ● | ● | ● |
| - Direct someone you know to the website (6) | ● | ● | ● | ● | ● |



*Please respond to questions regarding the advertisement above.*

**Q2.1** When looking at the ad, you find what is advertised to be:

| | Not at all (1) | Somewhat (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|:---:|:---:|:---:|:---:|:---:|
| - Important (1) | ● | ● | ● | ● | ● |
| - Of concern to you (2) | ● | ● | ● | ● | ● |
| - Relevant (3) | ● | ● | ● | ● | ● |
| - Meaning a lot to you (4) | ● | ● | ● | ● | ● |
| - Valuable (5) | ● | ● | ● | ● | ● |
| - Beneficial (6) | ● | ● | ● | ● | ● |
| - Mattering to you (7) | ● | ● | ● | ● | ● |
| - Essential (8) | ● | ● | ● | ● | ● |
| - Significant to you (9) | ● | ● | ● | ● | ● |
| - Motivating (10) | ● | ● | ● | ● | ● |

**Q2.2** When thinking of the ad, did you find yourself doing any of the following?

| | Not at all (1) | Somewhat (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|:---:|:---:|:---:|:---:|:---:|
| - Paying attention to the content (1) | ● | ● | ● | ● | ● |
| - Concentrating on the content (2) | ● | ● | ● | ● | ● |
| - Thinking about the content (3) | ● | ● | ● | ● | ● |
| - Focusing on the content (4) | ● | ● | ● | ● | ● |
| - Spending effort looking at the content (5) | ● | ● | ● | ● | ● |
| - Carefully reading the content (6) | ● | ● | ● | ● | ● |

**Q2.3** When thinking of the ad, did you find yourself doing any of the following?

| | Not at all (1) | Somewhat (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|---|---|---|---|---|
| - Taking note of the visual aspects of the ad (1) | ● | ● | ● | ● | ● |
| - Focusing on the colors and/or images of the ad (2) | ● | ● | ● | ● | ● |
| - Noting some specific colors or images in the ad (3) | ● | ● | ● | ● | ● |
| - Paying close attention to the ad as a piece of art (4) | ● | ● | ● | ● | ● |

**Q2.4** How would you agree with the statements about MADD Canada?

| | Not at all (1) | Somewhat (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|---|---|---|---|---|
| - I think MADD Canada is a very good brand (1) | ● | ● | ● | ● | ● |
| - I think MADD Canada is a very useful brand (2) | ● | ● | ● | ● | ● |
| - My opinion about MADD Canada is very favorable (3) | ● | ● | ● | ● | ● |

**Q2.5** After viewing the Advertisement, how likely you are to do the following?

| | Not at all (1) | Some-what (2) | Moderately (3) | Very much (4) | Absolutely (5) |
|---|---|---|---|---|---|
| - Be tempted to get involved with MADD Canada (1) | ● | ● | ● | ● | ● |
| - Make an effort to seek out more information about MADD Canada (2) | ● | ● | ● | ● | ● |
| - Tell a friend about MADD Canada (3) | ● | ● | ● | ● | ● |
| - Call the organization (4) | ● | ● | ● | ● | ● |
| - Go to their website (5) | ● | ● | ● | ● | ● |
| Direct someone you know to the website (6) | ● | ● | ● | ● | ● |

**Q4.1** Explain how much you agree or disagree with the statements:

| | Strongly dis-agree (1) | Dis-agree (2) | Some-what dis-agree (3) | Neither agree nor dis-agree (4) | Some-what agree (5) | Agree (6) | Strong-ly agree (7) |
|---|---|---|---|---|---|---|---|
| -I always speak English to my spouse (1) | ● | ● | ● | ● | ● | ● | ● |
| -I always use English with my friends (2) | ● | ● | ● | ● | ● | ● | ● |
| - I mostly think in English (3) | ● | ● | ● | ● | ● | ● | ● |
| - In general, I speak in English (4) | ● | ● | ● | ● | ● | ● | ● |
| - I mostly speak in English at family gatherings (5) | ● | ● | ● | ● | ● | ● | ● |
| - I mostly carry on conversations in English every day (6) | ● | ● | ● | ● | ● | ● | ● |
| - The TV programs that I watch are | ● | ● | ● | ● | ● | ● | ● |

always in the English language (7)

| | | | | | | |
|---|---|---|---|---|---|---|
| - The radio programs that I listen to are always in the English language (8) | ● | ● | ● | ● | ● | ● | ● |
| - The newspapers and magazines that I read are always in the English language (9) | ● | ● | ● | ● | ● | ● | ● |
| - The movies and DVDs that I watch are always in the English language (10) | ● | ● | ● | ● | ● | ● | ● |
| - Most of my friends are English speaking (11) | ● | ● | ● | ● | ● | ● | ● |
| - Most of the people at the places I go to have fun and relax are English speaking (12) | ● | ● | ● | ● | ● | ● | ● |
| - Most of people I go to parties with are English speaking (13) | ● | ● | ● | ● | ● | ● | ● |
| - I get together with English speaking people very often (14) | ● | ● | ● | ● | ● | ● | ● |
| - I have many English speaking friends with whom I am very close (15) | ● | ● | ● | ● | ● | ● | ● |
| - The English culture has the most positive impact on my life. (16) | ● | ● | ● | ● | ● | ● | ● |
| - I feel very proud of the English culture. (17) | ● | ● | ● | ● | ● | ● | ● |
| - I feel most comfortable in the English culture. (18) | ● | ● | ● | ● | ● | ● | ● |
| - I feel a strong attachment to the English culture. (19) | ● | ● | ● | ● | ● | ● | ● |
| - I feel very proud to identify with the English. (20) | ● | ● | ● | ● | ● | ● | ● |
| - I consider the English culture rich and precious. (21) | ● | ● | ● | ● | ● | ● | ● |

| | Strongly dis-agree (1) | Dis-agree (2) | Some-what dis-agree (3) | Neither agree nor dis-agree (4) | Some-what agree (5) | Agree (6) | Strong-ly agree (7) |
|---|---|---|---|---|---|---|---|
| - I have the sentiment of being ''English speaking''. (22) | ● | ● | ● | ● | ● | ● | ● |
| - I consider myself to be "English speaking" (23) | ● | ● | ● | ● | ● | ● | ● |
| - I would like to be known as ''English speaking'' by people of English descent. (24) | ● | ● | ● | ● | ● | ● | ● |

**Q5.1** Explain how much you agree or disagree with the statements:

| | Strongly dis-agree (1) | Dis-agree (2) | Some-what dis-agree (3) | Neither agree nor dis-agree (4) | Some-what agree (5) | Agree (6) | Strong-ly agree (7) |
|---|---|---|---|---|---|---|---|
| -I always speak French to my spouse (1) | ● | ● | ● | ● | ● | ● | ● |
| - I always use French with my friends (2) | ● | ● | ● | ● | ● | ● | ● |
| - I mostly think in French (3) | ● | ● | ● | ● | ● | ● | ● |
| - In general, I speak in French (4) | ● | ● | ● | ● | ● | ● | ● |
| - I mostly speak in French at family gatherings (5) | ● | ● | ● | ● | ● | ● | ● |
| - I mostly carry on conversations in French every day (6) | ● | ● | ● | ● | ● | ● | ● |
| - The TV programs that I watch are always in the French language (7) | ● | ● | ● | ● | ● | ● | ● |
| - The radio programs that I listen to are always in the French language (8) | ● | ● | ● | ● | ● | ● | ● |
| - The newspapers and magazines that I read are always in the French language (9) | ● | ● | ● | ● | ● | ● | ● |
| - The movies and DVDs that I watch are | ● | ● | ● | ● | ● | ● | ● |

always in the French language (10)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - Most of my friends are French speaking (11) | ● | ● | ● | ● | ● | ● | ● |
| - Most of the people at the places I go to have fun and relax are French speaking (12) | ● | ● | ● | ● | ● | ● | ● |
| - Most of people I go to parties with are French speaking (13) | ● | ● | ● | ● | ● | ● | ● |
| - I get together with French speaking people very often (14) | ● | ● | ● | ● | ● | ● | ● |
| - I have many French speaking friends with whom I am very close (15) | ● | ● | ● | ● | ● | ● | ● |
| - The French culture has the most positive impact on my life. (16) | ● | ● | ● | ● | ● | ● | ● |
| - I feel very proud of the French culture. (17) | ● | ● | ● | ● | ● | ● | ● |
| - I feel most comfortable in the French culture. (18) | ● | ● | ● | ● | ● | ● | ● |
| - I feel a strong attachment to the French culture. (19) | ● | ● | ● | ● | ● | ● | ● |
| - I feel very proud to identify with the French. (20) | ● | ● | ● | ● | ● | ● | ● |
| - I consider the French culture rich and precious. (21) | ● | ● | ● | ● | ● | ● | ● |
| - I have the sentiment of being ''French speaking''. (22) | ● | ● | ● | ● | ● | ● | ● |
| - I consider myself to be "French speaking" (23) | ● | ● | ● | ● | ● | ● | ● |
| - I would like to be known as ''French speaking'' by people of French descent. (24) | ● | ● | ● | ● | ● | ● | ● |

**Q7.1** Please mention the order in which you learned English and French.

- I learned English before French.  (1)
- I learned French before English.  (2)
- I learned English and French together.  (3)

**Q7.2** What was the medium of instruction in your high school?

- English  (1)
- French  (2)
- Both French and English  (3)
- Others (please explain)  (4)

**Q7.3** How would you rate your proficiency in English?

- Excellent  (1)
- Very Good  (2)
- Good  (3)
- Fair  (4)

**Q7.4** How would you rate your proficiency in French?

- Excellent  (1)
- Very Good  (2)
- Good  (3)
- Fair  (4)

- - - - - - -

## Appendix A2

Survey Questionnaire (French version)

Evaluation of Advertisements by English and French Canadian Bilinguals

**Q42** Vous considérez-vous comme un(e) canadien(ne) bilingue (possédant une maitrise de l'anglais de du français)?

- Oui  (1)
- Non  (2)

**Q45** Quelle est votre langue maternelle?

- Anglais  (1)
- Français  (2)
- Autres (nommez-les)  (3)

**Q8.1** Quel âge avez-vous?

- 18-25  (1)
- 26-40  (2)
- 41-54  (3)
- 55-64  (4)
- 65 et plus  (5)

**Q48** Dans quelle provice habitez-vous?

- AB  (1)
- BC  (2)
- MB  (3)
- NB  (4)
- NL  (5)
- NT  (6)
- NS  (7)
- NU  (8)
- ON  (9)
- PE  (10)
- QC  (11)
- SK  (12)
- YT  (13)

**Q8.2**  Quel est votre sexe?

- masculin  (1)
- féminin  (2)

**Q8.3** Quel est votre revenu annuel du ménage?

- Inférieur à 20 000$  (1)
- 20 000$ - 39 999$  (2)
- 40 000$ - 59 999$  (3)
- 60 000$ - 79 999$  (4)
- 80 000$ et plus  (5)

**Q8.4** Quel est le plus élevé niveau d'instruction que vous avez complété?

- École primaire  (1)
- Diplôme d'école secondaire  (2)
- Collège (2 ans)  (3)
- Baccalauréat (B.Sc., B.A. ou autre)  (5)
- Diplôme professionnel  (6)
- Maîtrise ou doctorat  (7)

**Q41** Ce sondage fait partie d'une étude qui cherche à comprendre comment les canadiens bilingues évaluent l'imprimé publicitaire et comment ils utilisent leurs langues quotidiennement. Ce sondage est divisé en 6 sections qui peuvent prendre entre 12 à 14 minutes à compléter.

Nous ciblons des Canadiens bilingues qui maîtrisent bien l'anglais et le français, et qui peuvent compléter le sondage dans ces 2 langues. Même si ce sondage est écrit en français, nous encourageons aussi les personnes bilingues dont le français n'est pas leur langue maternelle à le remplir. Merci beaucoup pour votre participation.



*S'il vous plaît, répondez aux questions suivantes pour cette annonce publicitaire:*

**Q1.1** *Lorsque vous regardez une annonce publicitaire, vous trouvez que ce qui est présenté:*

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|---|---|---|---|---|
| - est important (1) | ● | ● | ● | ● | ● |
| - vous préoccupe (2) | ● | ● | ● | ● | ● |
| - est pertinent (3) | ● | ● | ● | ● | ● |
| - compte beaucoup pour vous (4) | ● | ● | ● | ● | ● |
| - est utile (5) | ● | ● | ● | ● | ● |
| - est bénéfique (6) | ● | ● | ● | ● | ● |
| - compte pour vous (7) | ● | ● | ● | ● | ● |
| - indispensable (8) | ● | ● | ● | ● | ● |
| - signifie quelque chose pour vous (9) | ● | ● | ● | ● | ● |
| - est motivant (10) | ● | ● | ● | ● | ● |

**Q1.2** Lorsque vous pensez à l'annonce publicitaire, trouvez-vous que:

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|---|---|---|---|---|
| - vous faites attention à son contenu (1) | ● | ● | ● | ● | ● |
| - vous vous concentrez sur son contenu (2) | ● | ● | ● | ● | ● |
| - vous pensez à son contenu (3) | ● | ● | ● | ● | ● |
| - vous mettez l'accent sur le contenu (4) | ● | ● | ● | ● | ● |
| - vous vous efforcez à regarder son contenu (5) | ● | ● | ● | ● | ● |
| - vous lisez consciencieusement son contenu (6) | ● | ● | ● | ● | ● |

**Q1.3** Lorsque vous pensez à l'annonce publicitaire, trouvez-vous que:

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|---|---|---|---|---|
| vous tenez compte de l'aspect visuel de l'annonce publicitaire (1) | ● | ● | ● | ● | ● |
| vous mettez l'accent sur les couleurs et-ou les images de l'annonce publicitaire (2) | ● | ● | ● | ● | ● |
| vous remarquez des couleurs ou des images particulières dans l'annonce publicitaire (3) | ● | ● | ● | ● | ● |
| vous considérez cette annonce publicitaire comme une oeuvre d'art (4) | ● | ● | ● | ● | ● |

**Q1.4** Êtes vous d'accord avec les énoncés suivants concernant la marque BlackBerry?

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|---|---|---|---|---|
| - Je pense que BlackBerry est une très bonne marque (1) | ● | ● | ● | ● | ● |
| - Je pense que BlackBerry est une marque très utile (2) | ● | ● | ● | ● | ● |
| - J'apprécie beaucoup la marque BlackBerry. (3) | ● | ● | ● | ● | ● |

**Q1.5** Après avoir regardé l'annonce publicitaire,

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|---|---|---|---|---|
| - Vous êtes très tenté(e) d'acheter BlackBerry DTEK60 (1) | ● | ● | ● | ● | ● |
| - Vous faites un effort pour chercher plus d'informations sur BlackBerry DTEK60 (2) | ● | ● | ● | ● | ● |
| - Vous parlez de BlackBerry DTEK60 à un ami (3) | ● | ● | ● | ● | ● |
| - Vous appelez la compagnie (4) | ● | ● | ● | ● | ● |
| - Vous visitez son site web (5) | ● | ● | ● | ● | ● |
| - Vous demandez à une personne de votre connaissance de visiter le site web. (6) | ● | ● | ● | ● | ● |



*S'il vous plaît, répondez aux questions suivantes pour cette annonce publicitaire:*

**Q2.1** Lorsque vous regardez une annonce publicitaire, vous trouvez que ce qui est présenté:

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|---|---|---|---|---|
| - est important (1) | ● | ● | ● | ● | ● |
| - vous préoccupe (2) | ● | ● | ● | ● | ● |
| - est pertinent (3) | ● | ● | ● | ● | ● |
| - compte beaucoup pour vous (4) | ● | ● | ● | ● | ● |
| - est utile (5) | ● | ● | ● | ● | ● |
| - est bénéfique (6) | ● | ● | ● | ● | ● |
| - compte pour vous (7) | ● | ● | ● | ● | ● |
| - indispensable (8) | ● | ● | ● | ● | ● |
| - signifie quelque chose pour vous (9) | ● | ● | ● | ● | ● |
| - est motivant (10) | ● | ● | ● | ● | ● |

**Q2.2** Lorsque vous pensez à l'annonce publicitaire, trouvez-vous que:

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|---|---|---|---|---|
| - vous faites attention à son contenu (1) | ● | ● | ● | ● | ● |
| - vous vous concentrez sur son contenu (2) | ● | ● | ● | ● | ● |
| - vous pensez à son contenu (3) | ● | ● | ● | ● | ● |
| - vous mettez l'accent sur le contenu (4) | ● | ● | ● | ● | ● |
| - vous vous efforcez à regarder son contenu (5) | ● | ● | ● | ● | ● |
| - vous lisez consciencieusement son contenu (6) | ● | ● | ● | ● | ● |

**Q2.3** Lorsque vous pensez à l'annonce publicitaire, trouvez-vous que:

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|:---:|:---:|:---:|:---:|:---:|
| - vous tenez compte de l'aspect visuel de l'annonce publicitaire (1) | ● | ● | ● | ● | ● |
| - vous mettez l'accent sur les couleurs et-ou les images de l'annonce publicitaire (2) | ● | ● | ● | ● | ● |
| - vous remarquez des couleurs ou des images particulières dans l'annonce publicitaire (3) | ● | ● | ● | ● | ● |
| - vous considérez cette annonce publicitaire comme une oeuvre d'art (4) | ● | ● | ● | ● | ● |

**Q2.4** Êtes vous d'accord avec les énoncés suivants concernant la marque MADD Canada?

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|:---:|:---:|:---:|:---:|:---:|
| - Je pense que MADD Canada est une très bonne marque (1) | ● | ● | ● | ● | ● |
| - Je pense que MADD Canada est une marque très utile (2) | ● | ● | ● | ● | ● |
| - J'apprécie beaucoup la marque MADD Canada. (3) | ● | ● | ● | ● | ● |

**Q2.5**  Après avoir regardé l'annonce publicitaire, dans quelle mesure vous  feriez la chose suivante?

| | Pas du tout (1) | Un peu (2) | Modérément (3) | Beaucoup (4) | Absolument (5) |
|---|---|---|---|---|---|
| - Vous être très tenté(e) de m'engager avec MADD Canada (1) | ● | ● | ● | ● | ● |
| - Vous faites un effort pour chercher plus d'informations sur la organisation MADD Canada (2) | ● | ● | ● | ● | ● |
| - Vous parlez de la organisation MADD Canada à un ami (3) | ● | ● | ● | ● | ● |
| - Vous appelez la compagnie (4) | ● | ● | ● | ● | ● |
| - Vous visitez son site web (5) | ● | ● | ● | ● | ● |
| - Vous demandez à une personne de votre connaissance de visiter le site web. (6) | ● | ● | ● | ● | ● |

**Q4.1**  Quel est votre avis à propos des énoncés suivants?

| | Désapprouve totalement (1) | Désapprouve (2) | Désapprouve un peu (3) | N'approuve ni ne désapprouve (4) | Approuve un peu (5) | Approuve (6) | Approuve totalement (7) |
|---|---|---|---|---|---|---|---|
| - Je parle toujours l'anglais avec mon épouse (1) | ● | ● | ● | ● | ● | ● | ● |
| - J'utilise toujours l'anglais avec mes ami(e)s (2) | ● | ● | ● | ● | ● | ● | ● |
| - Je pense surtout en anglais (3) | ● | ● | ● | ● | ● | ● | ● |
| En général, je parle l'anglais (4) | ● | ● | ● | ● | ● | ● | ● |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - Je parle surtout l'anglais lors des réunions familiales (5) | ● | ● | ● | ● | ● | ● | ● |
| - Je tiens surtout mes conversations en anglais tous les jours (6) | ● | ● | ● | ● | ● | ● | ● |
| - J'écoute toujours les programmes de télévision en langue anglaise (7) | ● | ● | ● | ● | ● | ● | ● |
| - J'écoute toujours les programmes de - radio en langue anglaise (8) | ● | ● | ● | ● | ● | ● | ● |
| - Je lis toujours les journaux et magazines écrits en anglais (9) | ● | ● | ● | ● | ● | ● | ● |
| - Je regarde toujours les films et DVDs en langue anglaise (10) | ● | ● | ● | ● | ● | ● | ● |
| - La plupart de mes amis sont anglophones (11) | ● | ● | ● | ● | ● | ● | ● |
| - La plupart des personnes que je rencontre qui s'amusent et sont décontractées sont anglophones (12) | ● | ● | ● | ● | ● | ● | ● |
| - La plupart des personnes avec qui je fais la fête sont anglophones (13) | ● | ● | ● | ● | ● | ● | ● |
| Je rencontre très souvent des personnes anglophones (14) | ● | ● | ● | ● | ● | ● | ● |
| - J'ai beaucoup d'amis très proches qui sont anglophones (15) | ● | ● | ● | ● | ● | ● | ● |
| La culture anglaise a un effet très positif sur ma vie (16) | ● | ● | ● | ● | ● | ● | ● |
| - Je me sens très fier(e) de la culture anglaise (17) | ● | ● | ● | ● | ● | ● | ● |
| - Je me sens très confortable dans la culture anglaise (18) | ● | ● | ● | ● | ● | ● | ● |
| - Je me sens très attaché(e) à la culture anglaise (19) | ● | ● | ● | ● | ● | ● | ● |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - Je me sens très fier(e) de m'identifier aux Anglais (20) | ● | ● | ● | ● | ● | ● | ● |
| - Je considère que la culture anglaise est riche et inestimable (21) | ● | ● | ● | ● | ● | ● | ● |
| - J'ai le sentiment d'être anglophone (22) | ● | ● | ● | ● | ● | ● | ● |
| - Je me considère comme étant anglophone (23) | ● | ● | ● | ● | ● | ● | ● |
| - J'aimerais bien être reconnu(e) comme anglophone par les personnes de descendance anglaise (24) | ● | ● | ● | ● | ● | ● | ● |

**Q5.1** Quel est votre avis à propos des énoncés suivants

| | Désapprouve totalement (1) | Désapprouve (2) | Désapprouve un peu (3) | N'approuve ni ne désapprouve (4) | Approuve un peu (5) | Approuve (6) | Approuve totalement (7) |
|---|---|---|---|---|---|---|---|
| - Je parle toujours le français avec mon épouse (1) | ● | ● | ● | ● | ● | ● | ● |
| - J'utilise toujours le français avec mes ami(e )s (2) | ● | ● | ● | ● | ● | ● | ● |
| - Je pense surtout en français (3) | ● | ● | ● | ● | ● | ● | ● |
| En général, je parle le français (4) | ● | ● | ● | ● | ● | ● | ● |
| - Je parle surtout le français lors des réunions familiales (5) | ● | ● | ● | ● | ● | ● | ● |
| - Je tiens surtout mes conversations en français tous les jours (6) | ● | ● | ● | ● | ● | ● | ● |
| - J'écoute toujours les programmes de télévision en langue française (7) | ● | ● | ● | ● | ● | ● | ● |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - J'écoute toujours les programmes de radio en langue française (8) | ● | ● | ● | ● | ● | ● | ● |
| - Je lis toujours les journaux et magazines écrits en français (9) | ● | ● | ● | ● | ● | ● | ● |
| - Je regarde toujours les films et DVDs en langue française (10) | ● | ● | ● | ● | ● | ● | ● |
| - La plupart de mes amis sont francophones (11) | ● | ● | ● | ● | ● | ● | ● |
| - La plupart des personnes que je rencontre qui s'amusent et sont décontractées sont francophones (12) | ● | ● | ● | ● | ● | ● | ● |
| - La plupart des personnes avec qui je fais la fête sont francophones (13) | ● | ● | ● | ● | ● | ● | ● |
| - Je rencontre très souvent des personnes francophones (14) | ● | ● | ● | ● | ● | ● | ● |
| - J'ai beaucoup d'amis très proches qui sont francophones (15) | ● | ● | ● | ● | ● | ● | ● |
| - La culture française a un effet très positif sur ma vie (16) | ● | ● | ● | ● | ● | ● | ● |
| - Je me sens très fier(e) de la culture française (17) | ● | ● | ● | ● | ● | ● | ● |
| - Je me sens très confortable dans la culture française (18) | ● | ● | ● | ● | ● | ● | ● |
| - Je me sens très attaché(e) à la culture française (19) | ● | ● | ● | ● | ● | ● | ● |
| - Je me sens très fier(e) de m'identifier aux français (20) | ● | ● | ● | ● | ● | ● | ● |
| - Je considère que la culture française est riche et inestimable (21) | ● | ● | ● | ● | ● | ● | ● |
| - J'ai le sentiment d'être francophone (22) | ● | ● | ● | ● | ● | ● | ● |
| - Je me considère comme étant | ● | ● | ● | ● | ● | ● | ● |

francophone (23)

- J'aimerais bien être reconnu(e) comme
francophone par les personnes de
descendance française (24)

    •    •    •    •    •    •    •

**Q7.1** Comment avez-vous appris le français et l'anglais?

- J'ai appris l'anglais avant le français  (1)

- J'ai appris le français avant l'anglais  (2)

- J'ai appris l'anglais et le français en même temps  (3)

**Q7.2** Quelle était la langue d'enseignement utilisée par votre école secondaire?

- Anglais  (1)

- Français  (2)

- Français et anglais  (3)

- Autres (nommez les)  (4)

**Q7.3** Comment évalueriez-vous vos compétences en anglais

- Excellentes  (1)

- Très bonnes  (2)

- Bonnes  (3)

- correctes  (4)

**Q7.4** Comment évalueriez-vous vos compétences en français

- Excellente  (1)

- Très bonnes  (2)

- Bonnes  (3)

- Correctes  (4)

- - - - - -

# Appendix A3

Certification of Ethical Acceptability for Research involving Human Subjects

UNIVERSITÉ
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UNIVERSITY

## CERTIFICATION OF ETHICAL ACCEPTABILITY
## FOR RESEARCH INVOLVING HUMAN SUBJECTS

**Name of Applicant:**   Golam Mohammad Aurup

**Department:**   John Molson School of Business\Marketing

**Agency:**   Concordia University

**Title of Project:**   Effects of bilingualism on the response in the two languages

**Certification Number:**   30008050

**Valid From:**   April 30, 2018      **To:**   April 29, 2019

The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

Dr. James Pfaus, Chair, University Human Research Ethics Committee