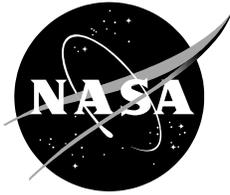


NASA/TM-2011-217351



An Examination of Cross-Cultural Interactions aboard the International Space Station

**Human Research Program
Behavioral Health & Performance Element
Space Medicine Division
September 24, 2010**

*Emily M. David, M.A.
Cristina Rubino, M.A.
Kathryn E. Keeton, Ph.D.
Christopher A. Miller, Ph.D.
Holly N. Patterson*

THE NASA STI PROGRAM OFFICE . . . IN PROFILE

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program Office plays a key part in helping NASA maintain this important role.

The NASA STI Program Office is operated by Langley Research Center, the lead center for NASA's scientific and technical information. The NASA STI Program Office provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program Office is also NASA's institutional mechanism for disseminating the results of its research and development activities. These results are published by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA's counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.
- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or cosponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and mission, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services that complement the STI Program Office's diverse offerings include creating custom thesauri, building customized databases, organizing and publishing research results . . . even providing videos.

For more information about the NASA STI Program Office, see the following:

- Access the NASA STI Program Home Page at <http://www.sti.nasa.gov>
- E-mail your question via the internet to help@sti.nasa.gov
- Fax your question to the NASA Access Help Desk at (301) 621-0134
- Telephone the NASA Access Help Desk at (301) 621-0390
- Write to:
NASA Access Help Desk
NASA Center for Aerospace
Information
7115 Standard
Hanover, MD 21076-1320

NASA/TM-2011-217351



An Examination of Cross-Cultural Interactions aboard the International Space Station

**Human Research Program
Behavioral Health & Performance Element
Space Medicine Division
September 24, 2010**

*Emily M. David, M.A.
Cristina Rubino, M.A.
Kathryn E. Keeton, Ph.D.
Christopher A. Miller, Ph.D.
Holly N. Patterson*

Available from:

NASA Center for AeroSpace Information
7115 Standard Drive
Hanover, MD 21076-1320
301-621-0390

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
703-605-6000

This report is also available in electronic form at <http://ston.jsc.nasa.gov/collections/TRS/>

Table of Contents

INTRODUCTION.....	1
BACKGROUND	1
STUDY 1.....	6
Objective	6
Method	6
Conclusions & Implications	11
STUDY 2.....	12
Objective	12
Method	12
Conclusions & Implications	16
STUDY 3.....	17
Objective	17
Method	18
Conclusions & Implications	29
GENERAL DISCUSSION	30
REFERENCES.....	32
APPENDIX A.....	35

Acronyms

ESA	European Space Agency
EVA	extravehicular activity
BHP	Behavioral Health & Performance
BMed	Behavioral Medicine
ISS	International Space Station
STS	Space Transportation System
VAMS	Video Assessment Management System

Introduction

The Behavioral Health & Performance Element (BHP) is one of six elements within the Human Research Program and is comprised of four Risks, namely the Risk of Behavioral Conditions (Behavioral Medicine [BMed]); the Risk of Psychiatric Disorders (BMed); the Risk of Performance Decrements due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team (Team); and the Risk of Performance Errors due to Sleep Loss, Circadian Desynchronization, Fatigue, and Work Overload (Sleep). BHP is tasked with designing, implementing, and managing research tasks that will develop tools, technologies, countermeasures, and other mitigation strategies to help support the crew on long-duration missions.

Within the Team Risk, seven specific gaps were identified in which critical knowledge is unknown or an adequate mitigation strategy has not yet been developed. Team Gap 4 poses the question “Given the context of long-duration missions, what are the optimal ways to select individuals and compose crews to ensure/optimize/facilitate task performance, teamwork, and psychosocial performance?” Additionally, Team Gap 5 asks, “Given the context of long-duration missions, what are the optimal ways to train crews, leaders, and ground support to ensure/optimize/facilitate task performance, teamwork, and psychosocial performance?” To address these gaps, it is important to first have a clear understanding of the individual differences contributing to astronaut success and well-being (i.e., task performance, teamwork, and psychosocial performance). Accordingly, by investigating whether cultural issues impact communication and team interaction, researchers will be well positioned to address the selection, composition, and training questions outlined in Team Gaps 4 and 5.

Investigating the impact of culture within the astronaut population is a timely issue given that problems related to human interaction (including those that are culturally based) are likely to increase in prevalence as we move toward extreme long-duration space flight. In early space flight, the short duration of the missions caused psychological and interpersonal issues to be relatively inconsequential. Although one can cope and even ignore interpersonal conflicts and communication difficulties in the context of a 1- or 2-week mission, these factors can become a chronic stressor on long-duration missions given the heightened isolation and greater amount of downtime that crew members will experience. Further, it is likely that successfully completing a long-duration mission will require the cooperation of multiple nations and individuals with a variety of cultural backgrounds. Given these projections, the main objectives of this project were to: (a) identify, document, and describe any existing issues in communication occurring in cross-cultural teams; and (b) examine whether cultural differences in behavioral outcomes exist.

Background

In response to increased globalization and the advancement of communication technologies, researchers have increasingly studied the impact that national culture can have on interpersonal communication, relationships, and work outcomes (e.g., Davison, 1994; Kanter & Corn, 1994; Snow, Snell, Davison, & Hambrick, 1996). Although some researchers have noted a number of positive outcomes resulting from culturally diverse teams such as varied perspectives and skills (e.g., Maznevski, 1994; Watson, Kumar, & Michaelson, 1993), others have noted that communication decrements can hinder team effectiveness and cohesiveness (Bantz, 1993; Matveev & Nelson, 2004). Because multicultural team members vary in their

environmental perceptions, motives, and communication norms, several misunderstandings can occur that may impede effective team functioning. Indeed, research has shown that when a group consists of members from cultures with varying levels of power distance (Hofstede, 1980), for example, communication and leadership difficulties often arise (Bantz, 1993). Other studies have revealed that poor cross-cultural communication can lead to lowered social cohesion (Shaw, 1981), increased conflict, and lowered performance (Shenkar & Zeira, 1992), and social stigmatization (Molinsky, 2005).

Hofstede's (1980) cultural dimensions, which provide one of the most well-established methods of classifying culture, theoretically underlie many of these issues (although other researchers have proposed alternative dimensions to compare multiple cultures; e.g., McSweeney, 2002). Four dimensions (i.e., individualism/collectivism, power distance, uncertainty avoidance, and masculinity/femininity) were produced as an outcome of the original study that spanned over 117,000 employees from 72 different countries. More recently, Hofstede (2001) added a fifth dimension: long- versus short-term orientation. The existence of these dimensions was replicated, and the dimensions were found to be stable across time (Hofstede, 1980). The first, individualism versus collectivism, is arguably the most widely cited and reflects the degree to which individuals are integrated into groups (Hofstede & McCrae, 2004). Individualism involves a tendency to be more interested in one's own goals, needs, and interests, while collectivism involves a tendency to be more concerned with the needs, interests, and goals of the group or society to which one belongs (Vodosek, 2009). The second dimension, power distance, is an indicator of the equality or inequality of power reinforced by a society and refers to the extent to which hierarchies are emphasized and powerful individuals are treated differently. Uncertainty avoidance, the third dimension, is defined as the extent to which members of a particular culture are threatened by ambiguous situations. Masculinity versus femininity, the fourth dimension, refers to either a focus on material objects and success (i.e., high masculinity) or caring for others and quality of life (i.e., high femininity). This dimension also highlights cultural attitudes toward the roles of men and women (Hofstede, 1980; 2001). Finally, long- versus short-term orientation refers to the degree to which members of a particular culture are encouraged to delay gratification of material, social, and emotional needs.

Whereas each of these culture facets have been shown to impact the way that members of a particular culture think and behave, we contend that power distance and individualism-collectivism are particularly applicable to cross-cultural communication in the space flight context. Indeed, the individualism-collectivism and power distance dimensions have been related to both psychological and work outcomes (Fiske, Markus, Kitayama, & Nisbett, 1998). For example, Hofstede (1980) stated that management style is influenced by a combination of these two facets, and Camiah and Hollinshead (2003) found that these cultural dimensions greatly impacted communication difficulties between Russian and American managers. Additionally, individualism-collectivism and power distance also may influence verbal behavior norms, as well as the perception of these norms, which vary to a significant degree between cultures (e.g., Kowner & Wiseman, 2003). For example, several studies have found that individuals from more collectivistic cultures experience more communication apprehension than do North Americans (Watson, Monroe, & Atterstrom, 1984).

Culture and NASA

The U.S. space program has seen a steady evolution in NASA missions, each with a different aim and at different levels of international cooperation. The first American human space program was the Mercury Program, which was tasked with investigating how to reach, live in, and return from space (Smith, 2000). Following this effort, the Gemini Program devised a way to dock with other spacecrafts in orbit and the Apollo Program allowed astronauts to explore the lunar surface (Naval Historical Center, 2003). The missions within these three programs were characterized by a relatively short duration (approximately 1 week) and devoid of international partnerships (Smith, 2000).

Starting in 1975 with the Apollo-Soyuz test project, American astronauts and Russians formed a series of international partnerships that changed the homogenous face of crews. In addition, the length of missions shifted to be longer in duration (i.e., several months at a time in space) in lower-Earth orbit beginning with Skylab in 1973. International cooperation and longer missions were then combined with the introduction of the Shuttle-Mir Program and finally with the birth of the International Space Station (ISS), which began construction in October 2000 (Oberg, 2007). Although other international partners are sometimes part of the crew, the primary cultural contrast aboard ISS is the juxtaposition of Russians and Americans. This is because all ISS crews have historically had at least one Russian and one American crew member, and both countries jointly plan missions (Boyd, Kanas, Gushin, & Saylor, 2007). Additionally, there are separate Russian and American segments, and both countries' science experiments are given equal priorities (Boyd, 2005). In line with the preceding information, we chose to limit our focus to these two cultures in the present studies.

As Russians and Americans are dissimilar along the individualism-collectivism and power distance dimensions, crew interaction aboard the ISS, which consists primarily of Russian and American astronauts¹, may be influenced by existing cultural differences. Although Russia was not included in Hofstede's original research, researchers have since conducted studies identifying this nation's standing on the various dimensions (e.g., Bollinger, 1994). For example, Russians tend to be more collectivistic in orientation and place a greater emphasis on group harmony, cooperation, and relationships. Americans, alternatively, are more individualistic and place a high value on autonomy, task performance, and self-interests. Additionally, in contrast with Americans, Russians are higher in power distance and make a greater distinction between people of high and low power and status. This can become particularly problematic in multicultural groups, where low-power distance individuals tend to treat everyone the same whereas high-power distance people make greater distinctions in the way they communicate with individuals in different social or organizational positions (Bantz, 1993). Accordingly, Russian culture is characterized by high power distance and a collectivistic orientation, which translates into a very autocratic management style (Bollinger, 1994). Low-power distance and individualistic Americans, alternatively, expect much more autonomy at work as well as ample rewards for individual performance.

A limited set of quantitative and theoretical articles have been published specifically focusing on cross-cultural issues that occur on longer-duration space missions. For example, a review piece by Boyd (2005) discusses relevant cultural differences among crew members in values, emotional expressivity, personal

¹ Although current ISS practice involves a small proportion of crew members from other cultures and nationalities, it seemed productive to begin our research with a focus on Russian and American interactions.

space norms, personality, foreign language competence, gender norms, personal relationships with co-workers, and cultural heterogeneity. She highlights that, if left unmanaged, these disparities have the potential to impact not only individual well-being but also mission success (Boyd, 2005). In a later review, Kanas and colleagues pointed to differences in emotional expressivity, manifestations of depression, cognitive and decision-making styles, norms of hygiene and privacy, and social behavior norms surrounding guests and meals (Kanas, et al., 2009).

Sandal and Manzey (2009) surveyed members of the European Space Agency (ESA) who reported that the greatest challenges of working on a multicultural team are differences in leadership preferences and conflicting management styles. This survey also revealed that a key challenge listed by the ESA members was interacting efficiently with other crew members (Sandal & Manzey, 2009). This finding further highlights the need to understand the impact of differing cultural backgrounds on communication in the space flight context. Researchers also have identified other outcomes of cultural differences on the space station. Specifically, Boyd, Kanas, Gushin, and Saylor (2007) found that cultural background predicted differing manifestations of distress. For astronauts aboard ISS, anxiety was a primary factor associated with depression, whereas for cosmonauts, fatigue was a primary indicator of depression.

Study Overviews

In Study 1, we outline case studies of instances aboard the ISS where we focus on the impact of power distance and individualism-collectivism (and their impact on direct and indirect communication), general cultural knowledge, and high- and low-context cultures (Hall & Hall, 1990). In contrast to the United States, Russia is considered a high-context culture (Brett, Adair, Lempereur, Okumura, Shikhirev, Tinsley, & Lytle, 1998). This is often displayed in the use of a circular manner of communication (Berdiaev, 1990), which people from low-context cultures may construe as secretive or excluding of those around them (Rajan & Graham, 1991; Lewis, 1996). High-context culture is also displayed through a host of commonly accepted nonverbal behaviors. For example, in Russia, public physical contact including hugs, backslapping, and kisses on the cheeks are common among friends or acquaintances and between members of the same sex (Morrison, Conaway, & Borden, 1994). Additionally, Russians tend to leave less interpersonal distance when conversing. It is also more common to hold a gaze and touch the other person when communicating in Russia than in America (Watson, 1970).

Conversely, in low-context cultures such as the United States, the message one is attempting to convey is stated explicitly. Alternatively stated, the actual words expressed are a literal transcription of the messenger's beliefs, attitudes, and requests (Schwartz, 1994). Individuals from low-context cultures also often have very visible external reactions when communicating, and tend to be much more task focused than relationship focused. In high-context cultures such as Russia, communication norms dictate that one should not be abrupt and should instead rely on tone, implications of words, and the nonverbal context to convey one's true meaning. In addition, there is heavy use of covert messages and metaphors, and much of the meaning relies on contextual and background knowledge (Morrison et al., 1994). In high-context cultures, the prime objective of communicating is preserving relationships and saving face rather than efficiently conveying task objectives (Matveev & Nelson, 2004).

Cross-cultural research also has suggested that culture impacts the way we perceive social behavior and the attributions made about that behavior (Pekerti, 2005). For example, people from individualistic cultures tend to make dispositional or internal attributions about social events rather than looking to contextual explanations. Those from more collectivistic cultures, in contrast, tend to attribute events to fate or other contextual factors (Betancourt & Weiner, 1982; Miller, 1984; Morris & Peng, 1994; Schuster, Forsterlung, & Weiner, 1989).

For the second study, we combined motivational facets derived from individualistic/collectivistic and high/low context cultures. Specifically, individuals who use communication to build and maintain relationships (i.e., collectivistic orientation) often do so by adopting an indirect communication style and are called sociocentric. Alternatively, those individuals more concerned with efficiently accomplishing task objectives (i.e., individualistic orientation) often adopt a more direct, no frills communication style and are called idiocentric (Triandis, McCusker, Betancourt, Iwao, Leung, Salazar et al., 1993). In Study 2, we looked at whether American and Russian crew members differed in communication style along these two dimensions. Specifically, we expected that Americans would demonstrate more behaviors indicative of an idiocentric communication style, whereas Russians would demonstrate more behaviors in line with a sociocentric communication style.

Another cultural issue impacting communication is the idea that politeness perceptions vary from nation to nation. Although attempts at politeness are perhaps more closely seen as aimed at making people feel at ease and even flattered, sociolinguistic theory (Brown and Levinson, 1987) documents that politeness is how power and familiarity (including team) relationships are negotiated and maintained, and how imposition, urgency, and obligation are established. Although politeness is seen as serving these roles in all cultures, the specific methods by which politeness is conveyed frequently differ across cultures—which establish opportunities for mismatches and misinterpretations. Brown and Levinson (1987) devised a model of politeness to capture how these discrepancies come into play. Although they contend that the idea of politeness is universal, cultures may prefer negative politeness (e.g., deference, being indirect, “if you don’t mind”) while others prefer positive politeness (e.g., establish familiarity with person, informal, jokes; Brown & Levinson, 1987). Also, not all strategies (e.g., a thumbs-up gesture) are perceived equivalently by all cultures. These politeness or redressive strategies are used to mitigate any potential face threat caused by a request or other action. If the appropriate redressive strategy is not chosen to counter the potential face threat, imbalance may occur that causes the speaker to be perceived as rude or even hostile. Because the cooperation aspect of teamwork involves a shared perspective and politeness for people to comply with requests, differing notions of politeness can certainly affect team functioning. For this reason, in Study 3 we examined the various components of face and politeness to examine imbalances that have occurred aboard the ISS.

Below we describe the method and results for the three studies that used videos taken from aboard the ISS, which captured interactions between American astronauts and Russian cosmonauts. Specifically, these investigations focused on exploring how various cultural facets, politeness norms, and communication style differences are exemplified in interactions aboard the ISS.

Study 1

Objective

The objective of Study 1 was simply to determine whether we could find cultural communication disparities in the video records available in the Video Assessment Management System (VAMS). VAMS is an online film repository that includes all video that has been collected by NASA, including those videos taken from the early space programs (including Apollo) to the present videos that are downlinked from shuttle and ISS.

Method

The videos selected for this first study were not a random sample from the whole collection of videos. Instead, we selected five video clips taken aboard the ISS from the online film repository, VAMS. These clips met the following criteria: a) clear audio to understand what was being said; b) at least one person each from Russia and the United States communicating with one another; and c) perceived cultural disparities observed during the communication.

A case study analysis approach was then taken to examine cultural differences observed in the videos. Below, each video is summarized and subsequently analyzed to highlight how these differences are manifested in crew member interactions.

Case Study Analysis

Videos 1 and 2—Power Distance and Group Participation

The first two videos demonstrated communication difficulties between Russian cosmonauts and American astronauts resulting from differences in power distance. As stated previously, Russians are higher in power distance than Americans (Bollinger, 1994). In the first video, DVCAM 32 (taken during an ISS Expedition), some members of the Expedition crew are interacting with members of the Space Transportation System (STS) crew. The group consists of five Americans, two Russians, and an Italian. The camera shows the two Russian cosmonauts, who are part of two different crews, sitting together in the corner. The topic being discussed is how tired the STS crew feels, which leads to a story about how they accidentally fell asleep an hour early the day before. Here is a sample of some of the dialogue:

All: [Laughter]

Italian: "...wake up earlier! Sleep well."

American 1: "Oh I will. I'm almost asleep right here just standing here. And then you guys..."

Various: "yeah." "Yeah!"

American 2: "Why are *you* tired?"

American 3: “I don’t know what did we do today?”

American 2: “We went to bed an hour early!”

American 3: “We didn’t know about it though!”

American 1: “Yeah we went to sleep and then mission control called in...”

American 3: “Are you guys on the same schedule as us?”

American 4: “We are about a half-hour off.”

The conversation is animated and details are supplied in a choppy manner from a number of different speakers around the room. Questions are thrown forth by various participants. Although the conversation is loud and informal and people are interrupting each other frequently, the two cosmonauts in the corner stay distinctly quiet throughout the whole exchange.

In the second video, DVCAM 05 (taken during an ISS Expedition), we once again see the same two crews interacting in a social setting. This time, they are having a makeshift luau with everyone dressed in Hawaiian shirts eating shrimp and pork chops. There is a lot of lighthearted conversation going on as the crew members work to distribute the “treat” food items and get into their shirts and sunglasses. There are even jokes about one of the American’s hair and then another astronaut calls out “Get Steve!” A life-sized cutout of Steve Martin is then produced and invited to join the party. There are once again several Americans shouting back and forth with stories and jokes, but the Russian crew members are noticeably quiet and once again sitting in close proximity to one another. There are even several times that an astronaut attempts to include one of the Russian crew members in the conversation, but the cosmonaut limits his answers to one line or less without follow up. The only time one of the Russian crew members participates in the conversation at length is when several of the members go away and the group is reduced to his three crew members (and he is commander).

The disparity in participation observed in these two videos can be explained by differing power distance norms in the two countries. In low-power distance cultures, no matter one’s social or hierarchical standing in an organization, everyone is encouraged to speak up. Indeed, having the courage to speak to one’s superior is seen as a virtue (Kirby & Barger, 2009). In high-power distance cultures, however, such differences in power are seen as instrumental in keeping peace and harmony among groups. In large groups, then, the average member from a high-power distance culture may not be inclined to speak up in group conversations. Such actions may be seen as trying to stand out or not knowing one’s place. Indeed, research suggests that members of collectivistic cultures experience more communication apprehension than those from individualistic cultures (Watson et al., 1989). Accordingly, the Russian cosmonauts may have refrained from group conversation, particularly when in the presence of commanders or people with more experience, to show deference and respect (Kirby & Barger, 2009).

Videos 3 and 4 - Individualism–Collectivism and Direct Communication

The third and fourth clips are taken another Expedition crew, which is comprised of two Russian cosmonauts and one American astronaut. In the first clip, DVCAM 38 (taken during an ISS Expedition), two cosmonauts are getting ready for an extravehicular activity (EVA) while an American astronaut is

videotaping them. The American filming the EVA preparation asks the two cosmonauts questions as well as tells them to smile at the camera. When a Russian cosmonaut complies with the American astronaut's request, the astronaut states "good job." The following is an excerpt taken from this video.

American: "Smile for the camera. This'll go down today. Thumbs up."

Russian: [Does not seem to respond as he is busy putting on his suit].

American: "Ready?"

Russian: "Ready."

American: "Everything is good?"

Russian: [Gives a thumbs up].

American: "Good job."

American: "(Calls his name). Smile. Ready to go?"

American: "(Calls his name)."

American: "(Calls his name)."

Russian: [nods]

Russian: "Ready."

American: "Good job."

In the second video clip, DVCAM 42 (taken during an ISS Expedition), the same cosmonaut is about to leave for the spacewalk as the American astronaut continues to film. The following excerpt is taken from this video clip.

American: "Very good."

American: "First time that hatch is open in space."

American: "Good job. Good pilot. Still works."

Russian: "See it."

American: "Let's go look."

American: "Here, film it. Take a picture."

Russian: "I am the first touch it."

American: "Show me."

American: “Very good. First time.”

American: “Here, take one this way. Good job.”

These clips highlight cultural differences in direct versus indirect communication styles as well as in giving individual recognition, which are associated with Hofstede’s individualism-collectivism cultural dimension. First, individualistic cultures tend to communicate in a direct manner, which explicitly communicates the wants, needs, and desires of the speaker (Jandt, 2006). In collectivist cultures, the indirect communication style is preferred. With indirect communication, “the wants, needs, and goals of the speaker are not obvious in the spoken message” (Jandt, 2006, p. 162). In the first clip, the American astronaut is much more direct as he calls the cosmonaut’s name repeatedly even when the cosmonaut does not give a response. Also, in both clips, the American directly requests that the cosmonaut smile or do a “thumbs up” without stating “please” or “would you mind.” Although this may not be perceived as an order in cultures that are accustomed to communicating in a direct manner (i.e., individualistic cultures), Russians, who come from a collectivist culture and are therefore accustomed to more indirect forms of communication, may perceive this as an order rather than a request. Although the Russians in these clips do not respond negatively, there is a notable difference in their communication style. The Russians in both clips do not tend to respond directly or make similar requests of the American. Instead, they continue to focus on their work tasks and respond to questions as needed.

Another cultural difference that is exemplified in these clips is the differing importance ascribed to recognizing contributions on an individual level. Individualistic cultures are more prone to recognize and reward individual behavior. However, in collectivist cultures, individuals are more concerned with the success of the group and therefore do not seek individual recognition. Although the American is frequently positively praising the Russians in both clips (e.g., “good job, good pilot”), the Russians may feel uncomfortable being singled out as they are not used to receiving direct praise for their individual accomplishments.

Video 5—Culturally Ingrained Knowledge

The fifth video, DVCAM 05 (taken during an ISS Expedition), shows the arrival of the STS crew (five Americans and one Russian crew member) on the space station. They are greeted by the Expedition crew, which contained two Russian and one American crew member. Despite the greater number of American crew members, most of the greetings and conversations were conducted in Russian. A translator was contracted to translate this dialogue and dialogue from other video clips as well as to give an idea of the context behind any of the colloquial expressions used. Below is an excerpt of the conversation that occurred as the hatch was opened and the STS crew entered the space station (note that this entire conversation occurred in Russian):

Russian 1: “True...true...presents.”

Russian 2: “Good ones...with arrival!!” (*Transcriber’s note: “with arrival” is a Russian greeting to guests with a similar meaning as “welcome!”*)

Russian 1: “Hi!”

Russian 3: “Congratulations! Congratulations!”

Russian 2: “We spoke with [Nickname] (*Transcriber’s note: short for [longer Russian name]*) and I congratulate you!”

Russian 3: “His birthday!” (*Transcriber’s note: Russian word for word translation of “happy birthday!” is “I congratulate you with birthday!”*)

American 1: “Congratulations!”

Russian 1: “[American astronaut name]!! Good to see you! I must kiss you. Three...”
(*Transcriber’s note: Russian tradition is to give three kisses on the cheeks upon meeting someone*)

Later, after a safety briefing in English:

Russian 2: “We are going to capture this historic moment.”

Russian 2: “If *you* have no objections, of course.” (*Transcriber’s note: The word “you” that is used here is the formal form of addressing another person in Russian. This form of address is usually used with strangers, with those who are much older, or those in a position of authority. Here it is used as a joke.*)

As can be seen here, there are a number of cultural nuances that must be understood for cross-cultural communication to be effective. Even a thorough knowledge of the Russian language might not fully prepare the American crew member for the cultural implications of what is actually being said if one was only focused on literal translations. For example, without the proper cultural knowledge, Americans may misunderstand “with arrival” as the first part of a sentence, and may be left waiting to hear what has arrived instead of understanding this to mean “welcome.” This tentative and emotionless (or even confused) reaction may in turn be perceived as rude by the Russian greeter, leading to an early communication breakdown. Similarly, one might misunderstand “I congratulate you” for a job well done while docking or completing some other task objective, rather than wishing someone a happy birthday. Even in this conversation, there is some evidence of misunderstanding, as one of the cosmonauts must clarify the reason for the congratulatory message by saying “his birthday.” In addition, knowing that three kisses are traditional would help to avoid any awkwardness associated with one person coming in and the other pulling away. Once again, we see clarification being used as the cosmonaut tells the American crew member how many kisses to expect (i.e., “three”). Knowledge of this custom may also help to avoid any misunderstandings regarding why the cosmonaut feels he must kiss the American (female) astronaut. As

kissing is not a customary greeting among friends in the United States, such traditions should be explained and understood to avoid miscommunication.

Finally, the grammatical distinctions between things like the formal and informal “you” reflect a subtle distinction that can be used to give context and meaning to what is actually being said. As discussed previously, Russia is a high-context society (Brett et al., 1998). Therefore, Russians tend to rely on the tone and context of what is being said to carry much of the true meaning. In this example, the crew member is using a very formal version of the word “you” when requesting to take pictures. Although the content of the words literally are asking something of someone else with a high level of deference and formality, in this instance, the opposite meaning is actually intended. Specifically, in the context of their apparently close relationship and following laughter and hugs, using such a formal “you” is an instance of sarcasm. Such a joke has the intention of showing the closeness between the two individuals rather than showing any sort of stilted formality as the words would suggest. This is important to understand from an American viewpoint, because otherwise one might mistakenly understand the conversation to have a completely different implication.

Conclusions & Implications

The results of these case studies clearly demonstrate that cultural differences do indeed impact communication between astronauts aboard ISS on, at least, some occasions. For example, these clips show instances where the high-power distance and collectivistic Russian crew members are apprehensive about participating in large group conversations. Further, they highlight differences in direct and indirect communication as well as individual recognition preferences associated with individualistic and collectivist cultures. Finally, we noted several instances where specific knowledge of Russian culture is needed to fully understand what is being communicated.

Certain limitations to this approach must be addressed. First, we purposely selected the videos that we perceived as displaying difficulties in cross-cultural communication. Although these clips are illustrative of cross-cultural communication challenges that have occurred aboard ISS, they are not a random sample from the whole collection of videos. It is important to keep in mind, however, that the videos collected in this repository were previously filtered by both the crew (as they have discretion to turn the video cameras on and off) and possibly by NASA officials on the ground as well. Accordingly, the fact that we were able to identify any evidence of such instances where culture may have impacted communication warrants future research to further explore this topic. A second limitation exists within alternate explanations to the various communication phenomena observed in the videos. For example, we described the first two videos within the context of power distance differences. An alternative explanation for the non-participation of the Russians in the larger group was that both conversations were conducted in English and there may have been a language barrier preventing their full immersion in the conversation. Even if this were the case, however, language barriers still represent communication difficulties with cultural relevance.

In conclusion, we believe these case studies highlight the fact that cross-cultural communication issues do currently occur aboard the ISS. The prevalence and intensity of the resulting misunderstandings is something that future research should explore. These issues are likely to increase in importance as more

and more international partners send their representatives into space. Instead of learning cultural nuances for only one other nation, present and future astronauts will have to learn a variety of cultural norms from Japan, Canada, and European nations. Future research also should be directed at identifying potential selection criteria and training modules aimed at increasing cross-cultural communication competency.

Study 2

Objective

The ultimate goal of this case study was to investigate whether or not significant communication differences exist in multicultural dyads when compared to same culture dyads—that is, to establish whether ISS residents interact differently with members of their same culture than with those from a different culture. Additionally, we hoped to observe any cultural differences in influence outcomes observed in the videos.

Method

This study utilized a modified version of the culture by condition comparison method outlined by Pekerti and Thomas (2003). Similar to the first case study, we again utilized the VAMS online repository system to select the video clips that would be coded. We first identified 20 video clips from the same VAMs site used in the previous study that were a) 10 minutes or less in duration and b) featured verbal and nonverbal interactions among the astronauts. Ten of the videos had a Russian and an American astronaut interacting and the other 10 had two American astronauts interacting. We then compiled these file names into a spreadsheet and labeled individuals in the videos as either Astronaut A or Astronaut B (e.g., Astronaut A has a blue suit and a mustache) to reduce bias in the coding.

Three independent raters were then given the materials and a calibration training session that involved going over the operational definitions for each of the rating categories and then going through a sample video and coding it together to get an idea of what different verbal and nonverbal behaviors may look like. Raters were instructed that a single frequency of a behavior should be defined as a sentence or less in duration, and that only interactions between the two focal astronauts should be counted. The raters then coded frequency counts of behaviors for each of the 20 videos.

In Appendix A, we include the full behavioral indicators as listed in the survey used by the raters to make the frequency counts (Pekerti & Thomas, 2003). Below we list the operational definitions provided to the raters. The first eight behaviors reflect idiocentric tendencies whereas the next four reflect sociocentric tendencies. The final two represent the behavioral outcomes that we measured:

- **Expressive** – outwardly displaying emotions in pitch of voice, laughter, anger, and also not being extremely "technical" or strict/formal in communication style; outwardly displaying emotions through hand gestures, facial expressions, smiling, and loud volume, etc.
- **Dominant** – overpowers others, projects/talks louder than other people they are speaking with, talks more, takes the reins of a task, etc.

- **Initiate Action** – begins the conversation, offers assistance more than conversing partner, positions body to be the center of attention, etc.
- **Aggressive** – sound of voice has aggressive tone, seems brash, asserts more power in actions than others involved, etc.
- **Logical and Systematic** – presents well thought out ideas, convincing, following procedures, etc.
- **Regulates Flow** – communicates well with everyone, fills in conversation gaps when others fall silent, keeps conversations going, changing topics, etc.
- **Concerned with Finishing the Task** – comments to steer the conversation back toward the task at hand and away from leisure or tangential topics; body and verbal language imply one is unconcerned about any other topics than getting the job done, etc.
- **Strong Opinions** – speaks openly about thoughts/opinions; not afraid to say how they really feel about something, especially if it goes against popular belief, etc.
- **Agreeable** – doesn't show much self-confidence in opinions or thoughts, doesn't share opinions, goes with majority or other crew member's ideas/thoughts/actions, etc.
- **Avoid Arguments** – doesn't go against another's ideas or thoughts, changes topics when someone appears aggressive, etc.
- **Shift Opinions** – readily changes train of thought or idea to coordinate with others, etc.
- **Eye Contact** – physically making eye contact with other crew members, etc.
- **Influence** – does this person influence (as indicated by facial/body/language expression) another person to change their way of thinking or action, etc.
- **Change behavior** – does this person engage in different verbal or nonverbal reactions as a result of the words or actions of the other person, etc.

Results

Once the ratings were completed, we first assessed the degree of interrater reliability to justify aggregation. According to Landis and Koch (1977), an interrater agreement of .41-.60 is considered moderate, a range of .61-.80 is considered substantial, and .81-1 is considered almost perfect agreement. Given these criteria and, as shown in Table 1, all of our videos had adequate levels of agreement to justify averaging the ratings of the three raters before continuing our analyses. The average of all 20 intraclass correlation ICC values was .59 with a standard deviation of .14. Additionally, all of the ICC values were significant at the .05 level.

Accordingly, we averaged the ratings for each category across the three raters. We then conducted T-test analyses to determine whether there were significant differences in the communication styles used by individuals from certain cultures and also in various dyad composition types (e.g., do Russians use a more sociocentric communication style when interacting with Americans?). We also looked to see if there were group differences in the two outcome variables (i.e., influencing another crew member or changing one's own behavior).

Table 2 summarizes the results of these analyses. As shown here, there were no significant differences between the crew members in the videos where two American astronauts were interacting. These results suggest that with regards to idiocentric, sociocentric, and outcome behaviors, Americans interacting with one another were roughly equivalent. In the videos where a Russian and American interacted, we

expected to see significant differences in all of the categories. Specifically, we hypothesized the collectivistic and high-contact orientation of the Russian cosmonauts would cause them to be lower in idiocentric behavior, higher in sociocentric behavior, and more easily influenced in terms of behavioral outcomes.

The results indicated partial support for this hypothesis. There were several types of idiocentric behaviors that were significantly different and in the predicted direction when comparing Americans and Russians. For example, Americans were more likely to be dominant, regulate the flow of the conversation, and express strong opinions when interacting with a Russian counterpart. In addition, many other categories of idiocentric behavior also were higher for Americans, albeit not significantly so. However, contrary to expectations, Russians scored significantly higher in one aspect of idiocentric behavior: focusing on the task. Also contrary to expectations, no significant differences were found between Russians and Americans in the various sociocentric categories. Despite this fact, the average frequency counts for the sociocentric indicators were in the hypothesized direction. Finally, the behavioral outcomes were consistent with predictions (i.e., Russians changed their behavior in response to American crew member influence more frequently than the reverse).

Table 1: ICC and Alpha Values for the Ratings of each of the 20 Videos

Video Number	Type of Interaction	ICC
1	Cross-Cultural	.87
2	American-American	.51
3	Cross-Cultural	.48
4	Cross-Cultural	.55
5	Cross-Cultural	.66
6	American-American	.48
7	American-American	.73
8	Cross-Cultural	.70
9	American-American	.67
10	Cross-Cultural	.40
11	Cross-Cultural	.66
12	American-American	.53
13	American-American	.43
14	American-American	.41
15	Cross-Cultural	.49
16	Cross-Cultural	.60
17	American-American	.71
18	Cross-Cultural	.83
19	American-American	.42
20	American-American	.68

Table 2: American-Russian Behavioral Comparisons Across All 20 Videos

<i>Individual Behavior</i>	<i>Condition</i>			
	<u>Intracultural</u>		<u>Intercultural</u>	
	(A) American	(B) American	(A) Russian	(B) American
<u>Idiocentric</u>				
Expressiveness	4.73	5.20	5.93	5.37
Dominance	0.70	1.37	0.33*	0.70*
Initiate Action	3.97	4.90	2.93	3.13
Aggressiveness	0.33	0.37	0.03	0.13
Logical / Systematic	0.37	0.70	0.07	0.07
Regulate Flow	1.10	1.10	1.30**	2.80**
Focus on Task	0.57	0.70	0.37*	0.13*
Strong Opinion	0.97	0.87	0.30*	0.73*
<u>Sociocentric</u>				
Agreeable	2.37	2.00	1.00	0.80
Avoid Argument	0.10	0.20	0.10	0.00
Shift Opinion	0.03	0.13	0.00	0.00
Eye Contact	1.73	1.30	2.07	1.60
<u>Outcomes</u>				
Changed Behavior	1.90	1.97	2.13*	1.63*
Influenced Other Crewmember	2.17	2.20	1.67	2.03

NOTE: Chi-square for bold cell counts by condition significant at ** $p < .05$; * $p < .10$.

Conclusions & Implications

Based on their differing standings in terms of high- and low-context communication (Hall, 1990), we expected American and Russian crew members to demonstrate different ways of communicating. To ensure that we were not simply capturing individual differences in extraversion, we included a control group of 10 videos that featured two Americans conversing with one another. Consistent with our expectations, there were no significant differences in any of the communication behaviors or outcome variables in the American-American videos.

Among the videos featuring Russians and Americans interacting, however, there were some significant differences. These results provide some evidence that there are in fact differences in the way Russian and American crew members communicate. In general, Americans tended to be much more straightforward, direct, opinionated, and dominant when interacting with their Russian counterparts. The Russians, in turn, tended to fall on the low end of these categories and also were higher (although not significantly so) in sociocentric tendencies such as being agreeable and making eye contact.

Should these findings generalize to the astronaut population at large, they will have serious implications for the longer-duration space flight expected in the future. On missions where the crew has greater autonomy, crew members with more direct communication styles (i.e., Americans) may exert a greater influence on the order of tasks or manner in which work is performed. Alternatively, those with greater sociocentric tendencies (i.e., Russians), may forge valuable relationships with others and foster heightened levels of cooperation given their more relationship-oriented communication style. Simply the fact that there are differences between the two may hamper efficiency, at least in the beginning as the two parties get accustomed to the alternative ways of communicating.

One unexpected finding was that the Russians were actually significantly higher on being concerned with finishing the task (an idiocentric indicator). In our post-hoc thinking, we reasoned that this may not be so surprising when one considers the joint effects of the post-Soviet Union culture shift as well as current compensation practices of the Russian space agency. In the Soviet Union, there were no differences in terms of pay or recognition. In Russia today, however, there is a sharp contrast and people are able to recognize that there is a clear and transparent link between working hard and gaining intrinsic and extrinsic rewards. This is further underscored by the Russian Space Agency's policy of paying cosmonauts for quality of performance and the number of goals that were met. Astronauts, in contrast, are paid a set amount regardless of mission outcomes. This policy is likely to underlie the significant and unexpected finding that Russians are more focused than Americans on the task.

We must also address the fact that several of the categories failed to show differences between Russians and Americans. One potential explanation for the null findings may be that such a diverse and isolated team as the mission crews on ISS may find themselves forming an emergent team culture rather than conforming or clashing based on country culture. Because multicultural team members have so little in common from a national culture perspective, new norms, rules, and expectations are sometimes created for a specific team that do not align with either Russian or American cultures per se (Earley & Mosakowski, 2000). In this way, the creation of a strong emergent culture may cause new norms to be adopted, increased trust, and more efficient performance. Alternatively, it also may be that these astronauts are not representative of their average cultural norms. Just as astronauts in general are exceptional in terms of ability and motivation, they may not be representative in terms of natural preferences and may be more culturally savvy and open to experience than their average national counterpart. In general, however, we believe these results highlight that at least modest differences in communication style do occur. Furthermore, because astronauts have the ability to turn the on-board cameras on and off, cross-cultural issues negatively impacting communication may actually be more prevalent than this sample of videos would suggest.

Study 3

Objective

The objective of this last study was to see whether recent work in politeness analysis (e.g., Miller, Wu & Funk, 2008; Miller, Galunder & Rye, 2010, building on Brown and Levinson, 1987) could predict and explain cultural communication behaviors at a finer level of granularity than prior studies. Similar to the

above studies, we again utilized video footage that included interactions between astronauts and cosmonauts.

Method

To examine how Brown and Levinson's theory of politeness could inform cross-cultural interactions of astronauts aboard the ISS, a cross-cultural video was selected that included both American and Russian counterparts. This video was selected based on its content of cross-cultural interactions and its richness in exemplifying how interactions may be explained and even quantified by this theory of politeness. As with the other studies in this report, this video was pulled from the VAMS online film repository.

"Politeness" is frequently regarded as having little applicability in the work place, but in socio-linguistics, politeness refers to the range of indirect communicative behaviors used to convey, signal, and manipulate a wide range of social parameters. Brown and Levinson's (1987) politeness theory claims that each encounter between individuals has the potential to "threaten the face" of those involved—and that the goal of most participants is generally to maintain the social status quo within the interaction. Their theory provides an understanding of interactions between people based on different levels of imposition, familiarity, and power/authority, as well as other differences including status, gender, age, and socio-economic status. When interacting with someone for the first time, certain cultural cues provide information to both parties as to which communication style and level of politeness is required. These cues are very important and many represent ideologies that are engrained within a culture. However, when considering interactions across different cultures, Brown & Levinson's theory of politeness provides insight as to how communications between individuals that understand little of each other's culture may experience difficulty during an interaction. In this instance, the rules of politeness are still relevant (i.e., preserving face); however, the appropriate communication styles, mannerisms, and behaviors that are required are less clear as cultural variations may be great—and misinterpretations are entirely possible. Even long-established relationships may be subject to subtle but persistent misunderstandings about the intended social cues which each side conveys. Thus, Brown and Levinson's theory provides a model to understand how cross-cultural interactions may lead to greater imbalance as perceived by each party that is participating in the interaction.

To review, Brown and Levinson's politeness model comprises two main components: face threat and redressive strategies (Brown & Levinson, 1987). All social actors have "face," which is "the positive social value a person effectively claims for himself" (Goffman, 1967, p.5). Face can be "saved" or lost, and it can be threatened or conserved in interactions. Face threat results from any behavior and/or act that thwart one's will or sense of self-determination or self-worth or, loosely, that threaten one's ego. Face represents the public self image that one portrays to the external world and what every adult tries to project (Brown & Levinson, 1987). Thus, a face-threatening act damages the face of the addressee by acting in opposition to the wants and desires of the other. The degree of face threat in an interaction, in Brown and Levinson's model, is a function of power difference (level of authority), social distance (level of familiarity), and imposition (level of interference the requester's goal interferes with the hearer's goal).

Redressive strategies are what we normally think of as explicit "politeness" behaviors—techniques such as "please" and "thank you" used to reduce the negative face threat that is perceived by an individual. There are two type of redressive strategies: positive, in which one seeks to minimize the threat (e.g., offer

or promise = “I’ll wash the dishes, if you’ll vacuum the floor” or include both speaker and hearer = “If we help each other...”), and negative, in which one emphasizes avoidance of imposition on the hearer (e.g., minimize the imposition, “If it’s not too much out of your way...” or apologize, “I’m sorry; I know it’s a lot to ask...”). In Brown and Levinson, every interaction has a face threat potential, but these are perhaps most salient in requests or directives. Miller and colleagues (e.g., Miller, Galunder, & Rye, 2010) have advocated computing the net “imbalance” in interactions (approximately, the perceived politeness) by comparing the amount or value of the face threat present to the value of the redress used. The equation is as follows:

$$\text{Imbalance} = \text{Redressive Strategy} - \text{Face Threat}^*$$

*where Face Threat = Power Difference + Social Distance + Imposition

Thus, for an interaction, the type and value of redressive strategies used may balance the face threat that is perceived by both parties, resulting in perception of a “nominal” or just normally polite interaction. Alternatively, if substantially more redress is used than there was face threat, the interactions will be perceived as overly polite, while if substantially less redress is used, it will be perceived as rude. Again, each individual’s perception of the amount of face threat present and redress used may differ (especially likely in cross-cultural interactions), resulting in differing perceptions of whether the interaction was polite, rude, or nominal.

Finally, Brown and Levinson imply that, in interaction, people may have a wide range of motives for employing politeness or rudeness (meaning, more or less redressive value than they perceive as necessary). In general, though, with all other things being equal, we strive to maintain the social status quo—which means using an amount of redress that in context (that is, given the power, familiarity/social distance and imposition relationships present) will be perceived as nominal. In fact, whenever deviations from nominal interactions are perceived, the observers can be expected to seek explanations in the context, which will explain away the deviation by making it balance. For example, rudeness may be perceived as urgency (that is, justified by reduced imposition) or by increased familiarity (reduced social distance), etc.—each of which would necessitate less redressive behavior than the observer may have otherwise expected.

In this specific case study, a quantitative version of the above model was applied to the selected video interaction. Each stage of the communication was charted from both the Russian and American counterpart’s perspectives. Thus, we can see how the imbalance equation, as demonstrative of Brown and Levinson’s theory of politeness, accounts for differences in perceptions of an interaction between two individuals and may explain their subsequent behaviors over time (Miller et al., 2010).

In terms of scaling for each of the components of face threat and redressive strategies, the following ranges were used:

- Redressive Strategy (negative and positive redress are viewed on a continuum):
 - Positive Redress: (lowest category, received 2 points)
 - Negative Redress: (highest category, received 11 points; please refer to Brown and Levinson, 1987, for a complete listing of the redress categories).



Redress

2

11

- Face Threat
 - Power Difference
 - Commander talking to subordinate = 1
 - Two crew members talking to each other = 5
 - Subordinate talking to commander = 11
 - Social Distance
 - Mission duration/10 = (where clip falls will be representative of phase of mission- most direct indicator of familiarity)
 - Imposition
 - Working together toward same goal = 1
 - Request to meet personal goal that doesn't interfere with receiver's goal = 5
 - Request to meet personal goal that interferes with receiver's goals = 11

Results

To provide some background information about this specific clip, the American astronaut is exercising on a bike aboard the ISS. He is about 20 minutes into his exercise (we assume that the standard exercise is 1 hour at a time) when the Russian cosmonaut (and it is worth noting, he is also the commander of this Expedition) comes to him to make a request about labeling some food containers (a request, as it turns out, that originated from mission control).

Utterance 1:

Russian Cosmonaut (B), “[Astronaut’s Name]?”

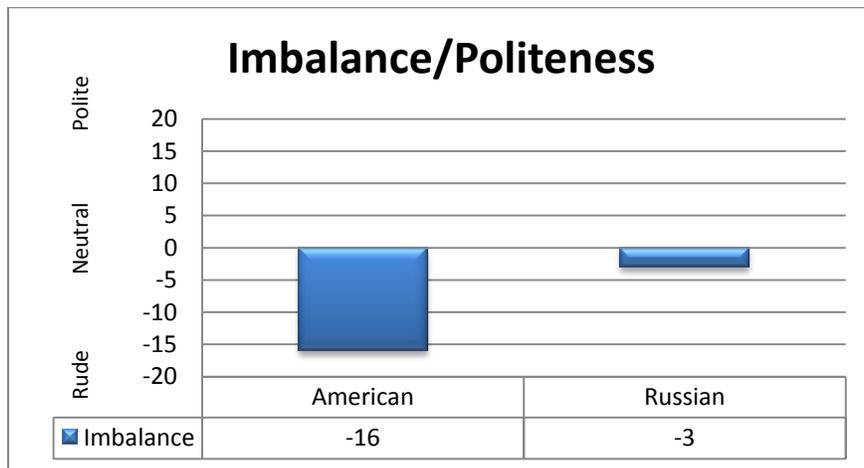
American Astronaut (A), “Yes, [Cosmonaut’s Name]”

B, “Can you check... uh... the numbers on the containers... food containers?”

From the Russian’s perspective, we assume he believes that he (B) is making a pretty standard request, not a large imposition; B used an in-group identity marker by calling A by name, and asked A an indirect question (noted with the hesitancy... “uh...”). However, from A’s perspective, the imposition was substantially larger (as expressed later in A’s explanation, this is a task he has been fighting to avoid doing, as well as coming at a time where it interrupts his cycling), and the redressive strategies that were used by the cosmonaut were either not perceived as such (the hesitant “...uh”) and/or were inadequate to compensate for the face threat resulting from the increased imposition stemming from interfering with A’s personal goal of completing his exercises on the bike.

Table 3: Utterance 1

	Redressive Strategy	Power Difference	Social Distance	Imposition	Face Threat	Redressive – Face Threat	Imbalance/ Politeness
American	0	1	4	11	16	-16	-16
Russian	7	1	4	5	10	-3	-3



Graph1: Imbalance 1

Utterance 2a:

Astronaut: “No... I’m not going to do that.”

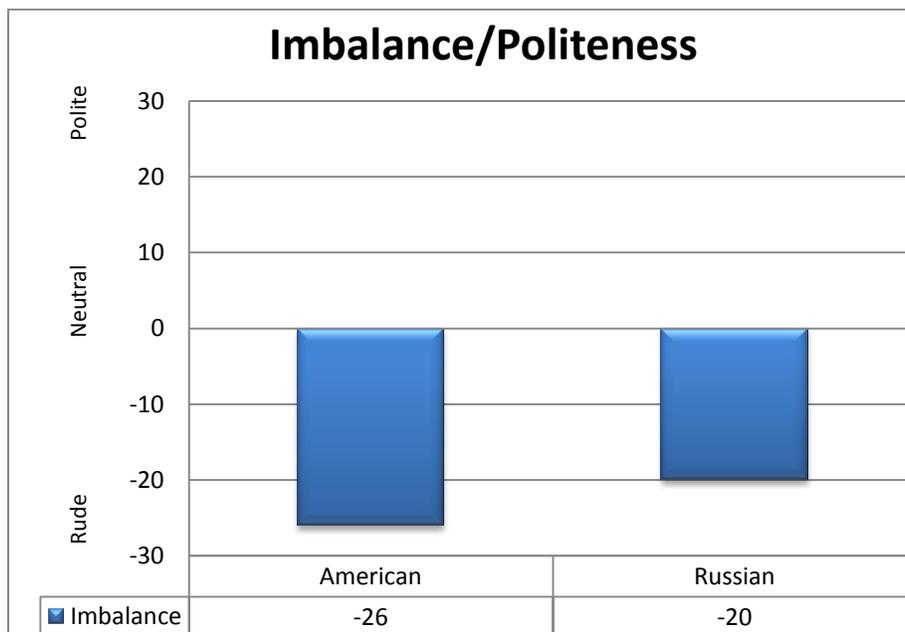
[Slight pause]

The American’s initial response was perceived rude by both parties; the American was responding to the Russian (as a subordinate to a commander) using no redressive strategy—as bluntly as possible. Coming

after a request from a commander, this blunt refusal without explanation might even be taken as having “negative redress”—that is, adding to the face threat of the fact of the rejection—though we haven’t scored it that way. Note also the lack of any in-group identity strategy (A says “I’m not going to do that” not “We don’t have to do that”). In this instance, the power difference, social distance, and imposition of the initial request have not changed—though note that since the subordinate is now addressing his commander, the power difference value changes. We will have more to say about this below, but note too the differences in perceptions of the two individuals. Since A perceived B as being rude to him in the initial interaction, his rudeness here is at least somewhat justified as a response, but since B perceived (and presumably intended) no rudeness in his initial interaction, A’s rudeness here is unexpected and extreme—perhaps signaled by the pause and B’s “being at a loss for words” to respond.

Table 4: Utterance 2a

	Redressive Strategy	Power Difference	Social Distance	Imposition	Face Threat	Redressive – Face Threat	Imbalance
American	0	11	4	11	26	-26	-26
Russian	0	11	4	5	20	-20	-20



Graph2a: Imbalance

Utterance 2b:

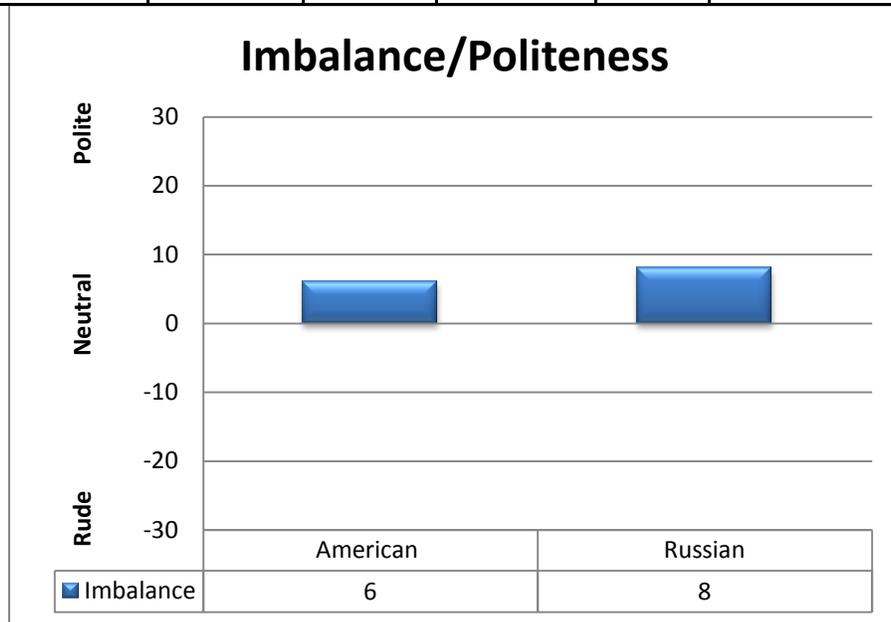
[After slight pause]

A: “My commander said we weren’t going to waste our time on that.”

Perhaps realizing that he has overstepped the polite boundaries of their relationship, A takes a conversational step out of turn and begins a redressive process by offering an explanation. Note too the use of the in-group identity marker “we.” Finally, the reference to “my commander” is odd. It is an example of the negative redressive strategy to impersonalize or shift the blame for an action onto a third party or general rule—though that may be a problematic strategy here. By “my commander” A is in fact referring to B, hence we’ve given it less than full value (it is also possible that A is referring to a previous mission commander). Note also that the topic of conversation remains the initial request to check the food containers, so we have retained the initial imposition value.

Table 5: Utterance 2b

	Redressive Strategy	Power Difference	Social Distance	Imposition	Face Threat	Redressive – Face Threat	Imbalance
American	10	11	4	11	26	-16	-16
Russian	10	11	4	5	20	-10	-10



Graph2b: Imbalance

Utterance 2c:

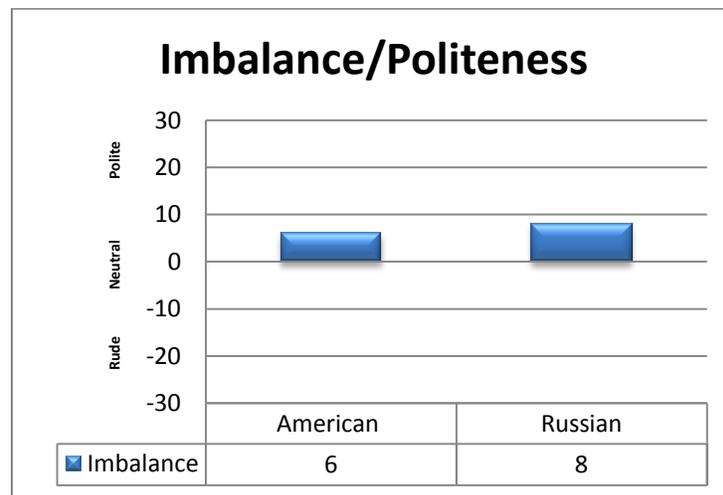
R: “Yeah, yeah, yeah.... They have some disagreement, the Russian and Americans.”

B agrees with A here and picks up on the theme of some external source for the order (probably ground control)—thereby also impersonalizing the imposition. Also, the reference to “the Russian and Americans” as a group other than “us” can be seen as an in-group identity assertion. Finally, the topic of

conversation is beginning to shift here from the initial request to check the food containers to a discussion of the disagreement. There is no inherent request here and they both share the goal to mitigate this disagreement, so we have dropped the imposition value for this utterance accordingly.

Table 6: Utterance 2c

	Redressive Strategy	Power Difference	Social Distance	Imposition	Face Threat	Redressive – Face Threat	Imbalance
American	13	1	4	1	6	7	7
Russian	13	1	4	1	6	7	7



Graph2c: Imbalance

Utterance 3:

Astronaut B: “[The mission control] does not understand... [unclear]

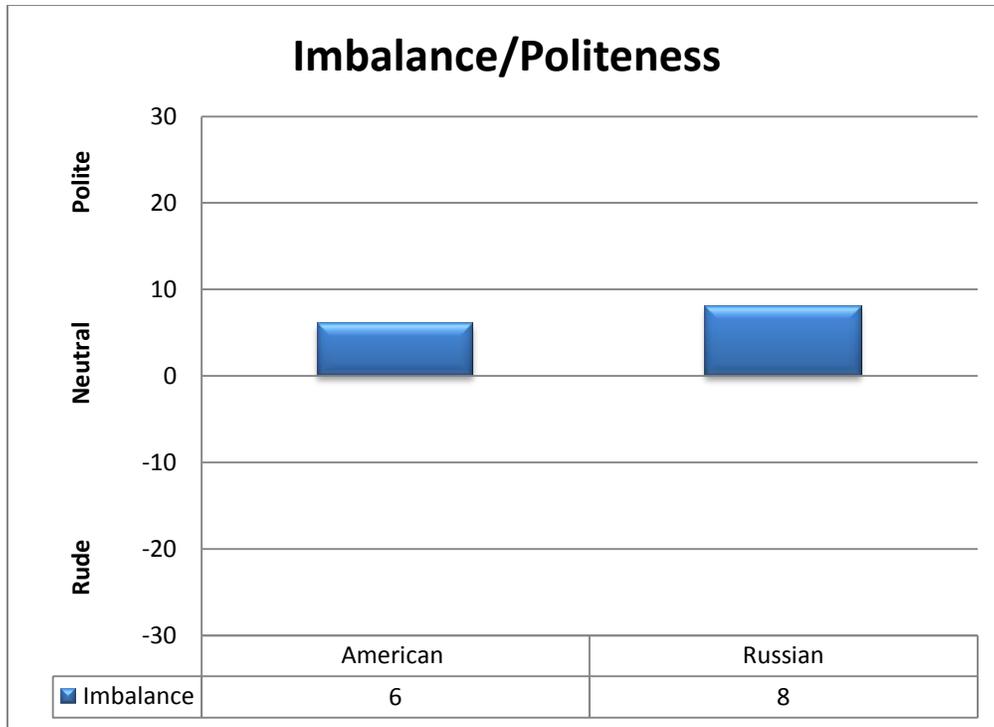
Astronaut A: Switches to Russian to further explain his side of the story (translation included below).

Astronaut A	They know. I counted and told them. I wrote a letter stating exactly what we have. 144. (Unclear)
	When I counted all of them, I said how many containers we have that are not opened and how many we have that we had opened, and I estimated how much is in each bag. And I said 74 or 72 are shared bags.. eh.. containers.
Astronaut B	We have 72 containers total.
Astronaut A	Yes. If we count what we have now in Node
Astronaut B	Yes yes yes. Yes
Astronaut A	But each ... They said they want to know the exact serial number of each bag. Remember we spoke about it.
Astronaut B	Yes yes
Astronaut A	I said, it's not necessary. I said we don't normally do that because food is food. Doesn't matter if it's box 1 or 10. I said: "I won't do that. If you want to speak to the Commander... You can speak to the Commander."
Astronaut C	Unclear. We'll have to speak to them again
Astronaut B	They probably have a problem with whether it's one or the other. That's why they want...
Astronaut B	Yes. It's not our problem. It's the problem they have on the ground
Astronaut A	Unclear (sounds like: "Their problem is to figure out")... how much we need and how to deliver it up here. After that - no.
Astronaut B	But you know there are VERY many people who are very involved with us here

At this point in the interaction, it is very clear that the American perceives his own rudeness in talking to the cosmonaut; thus, he goes into a 2-minute plus explanation about why he is not willing to label the food containers. In addition, he also switches to speaking to Russian, a sign of deference (these actions increase the redressive strategy score in this extended utterance, which we have collapsed into a single value for ease). Furthermore, since this interaction is all about the degree of imposition associated with the requested action, along with whose imposition it should be and how important it is, it seems reasonable that their difference in perception of the request should be mitigated—and we have reflected that fact in the imposition value (while preserving some difference to reflect what we perceive to be a continued preference on B's part for satisfying ground control's request vs. a preference for avoiding it on A's part).

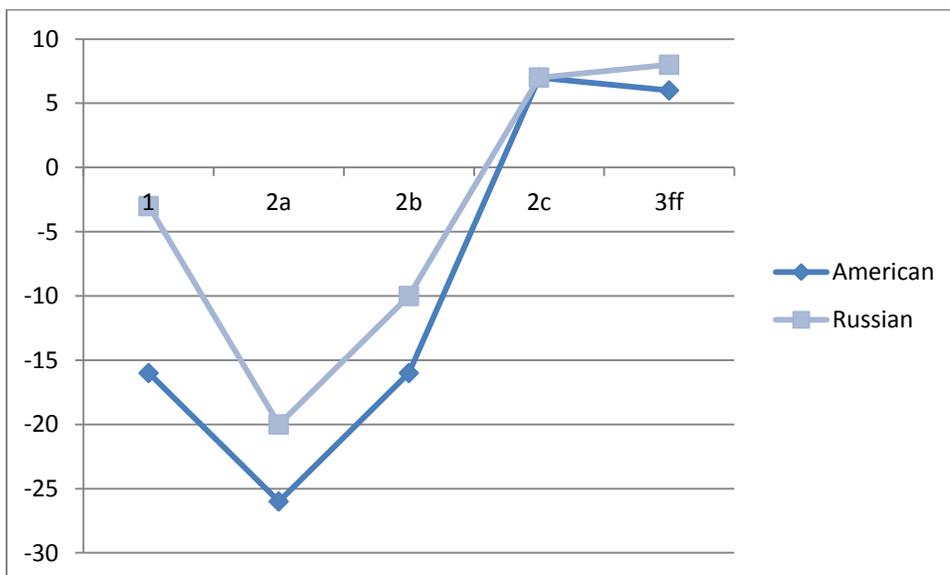
Table 7: Utterance 3

	Redressive Strategy	Power Difference	Social Distance	Imposition	Face Threat	Redressive – Face Threat	Imbalance
American	30	11	4	9	24	7	6
Russian	30	11	4	7	22	7	8



Graph3: Imbalance

Thus, we see how imbalance/politeness can change over time and may differ among the parties involved, especially when those individuals are from different cultures. The graph below depicts how imbalance did change over time from each individual perspective:



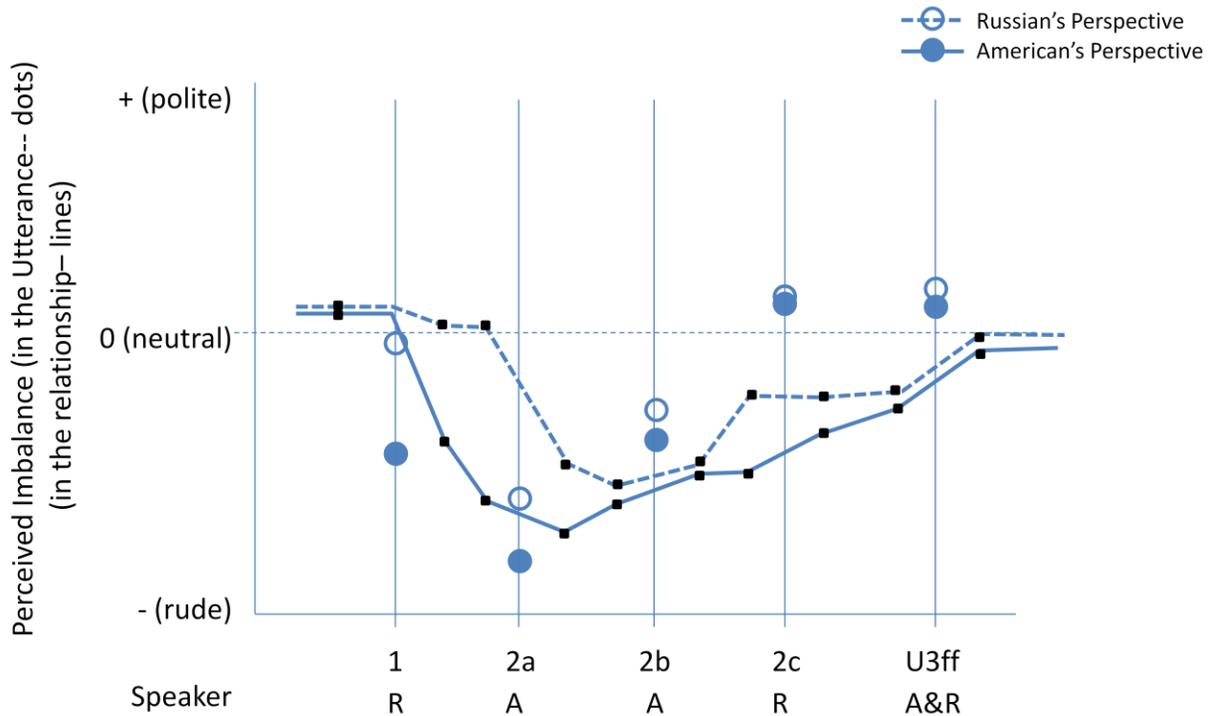
Graph 4: Imbalance over Time

Note that this graph depicts only a quantification of the imbalance in politeness that each participant perceived in their conversation over time. Numbers below zero convey relative perceived rudeness, while those above zero convey increased politeness. While this graph is not meant to convey their overall attitude toward each other, much less a notion of team cohesion on an utterance by utterance basis, it is likely that sustained interactions of this sort will impact those parameters. Instead, we see here that R began the conversation intending (and perceiving) only a mild imbalance—consistent with a routine request, adequately redressed, especially given his role as commander. By contrast, A perceived substantial rudeness—and then responded with a statement that was even ruder. This unexpected (from R’s perspective) rudeness at utterance 2a, was extremely sharp. Thereafter, we see consistent attempts to repair the situation by increased levels of politeness and a narrowing of the gap in perceptions between A and R.

Maintaining the Relationship

While the graph above depicts perceived imbalance over time is not meant to depict the impact of the politeness actions on the relationship between the two participants, in principle, both participants are likely concerned about the relationship and doing things to shape and repair it. In keeping with Brown and Levinson, the graph depicts the perceived imbalance at each utterance by each party, probably more important for long-term relationships is the “residual imbalance” or cumulative effect of multiple perceived polite and impolite interactions. This is, quite possibly, why A changes course at utterance 2b and into utterance 3ff from increasing the level of rudeness to one of offering increased (even, in the moment in 3ff, over-) politeness. But this is a step beyond what Brown and Levinson define and would necessitate substantial future work to model and quantify.

Nevertheless, we can convey our intuitions about what is going on in the interaction by overlaying the impact of the various utterances on the individuals’ perceptions of their “relationship.” We might approach greater concreteness (and a more nearly testable model) if we were to substitute more concrete attributes such as affect, trust, perceived cohesion, etc. for “relationship,” but it is likely that the graphs would be similar.



Graph 5: Perceived Imbalance

This figure depicts the hypothesized effect that the utterances have on “their relationship” as each of them perceives it. To depict this, we have constructed a different graph than the one presented above. Here, perceived imbalance (taken from the tables above) is graphed for each utterance via the hollow and filled circles for A and B respectively. Connecting these points directly would produce the same figure as graphed above—their perceived imbalance of each utterance. The solid and dashed lines, however, depict the perception that we believe each individual would have about the effects of the utterance on their relationship. We have placed an inflection point (in the form of a small black square) both before and after each utterance point to reflect the intent (or expected intent) of the utterance (before) and the perceived effect of it (after). Also, just like the perceived imbalance of the utterances themselves, perceptions of the relationship can differ between people. Also, while utterances influence (or “pull on”) the relationship (the lines), relationships have a momentum of their own and it is difficult for a single utterance to completely change that momentum. Thus, while the force of an utterance pulls a relationship in its direction, it must contend with the prior momentum of the relationship.

To illustrate, let’s consider the conversation in conjunction with the information provided above. Prior to the first utterance in this sequence, it can be assumed that A and B have a reasonably good relationship and that the expectation of any new communication would be to retain and further that relationship. Hence, both parties’ expectations of the first utterance were that it remains in keeping with their neutral-to-good feelings toward each other. Instead, after U1, A has perceived a very rude comment (an inconvenient request without any significant redress) and his sense of their relationship is greatly

decreased. By contrast, B thinks that he, at most, made a minor imposition on his friend A and the relationship should not be greatly affected.

Before utterance 2a, therefore, A intends a response on par with the rudeness he just perceived, perhaps conveying his affront at the rudeness he received and, therefore, the fact that this request from B was much more imposing than B intended it to be. On the other hand, B also expects an utterance in keeping with his perception of no significant change to their positive relationship.

Instead, A makes the utterance 2a and it is much ruder than B was expecting—hence the precipitate drop in his perception of the relationship. Astronaut A perceives maybe a bit more of a drop than he intended—perhaps due to B’s pause and “loss for words.” For that reason, he then decides that things ought not to stay at this low level and takes a step “out of turn” to begin attempts to repair them. Before utterance 2b, he intends to improve the situation, while B may expect continued declines.

Astronaut A makes utterance 2b, with an increase in politeness, and perceives that it has helped things somewhat. Astronaut B, too, sees this as an attempt to repair the situation and his perception of the relationship improves as well—though both are aware that it has taken a blow. Astronaut B then intends utterance 2c as a further attempt to repair, expecting it improve things further. Astronaut A, though, is unsure how his utterance 2b has gone over and unsure what B’s next response will be and what impact it will have on the relationship.

With B’s comparatively polite utterance 2c, though, Astronaut A is reassured and the perceptions of both A and B is that the relationship is being repaired. Both parties then enter into continued repair actions (with A bearing the brunt of the work) in utterances 3ff, as their perception of their relationship slowly returns back toward where it was before (perhaps a bit suppressed) and back toward synchronization with each other.

Though hypothetical, this exercise represents the kinds of implications that might eventually be drawn from politeness variations to their implication on aspects of team relationships and cohesion. These differences in perception arise both from individual differences (in both personality and current attitude and knowledge) and from cultural differences. The ability to track such differences in interpretation would, of course, be very valuable in managing, diffusing, and even perhaps predicting mismatches during long-duration missions.

Conclusions & Implications

Although preliminary and of limited scope, this case study exemplifies how cross-cultural differences may be influenced by expectations of politeness and, in turn, may influence the outcome of an interaction. In addition, this case study also supports the use and application of Brown and Levinson’s model of politeness when examining interactions among individuals. The importance of understanding how cross-cultural differences may influence interactions is especially important when considering long-duration missions. Indeed, effective communication is a major component of teamwork and will be vital to the success and completion of a long-duration mission. Thus, it is essential that countermeasures (including selection and training) incorporate, as requirements of training opportunities, acquiring a thorough understanding and knowledge base about each other for optimal teamwork to be achieved. It is important

to note however, that this application spans more than mere ethnic cultures. Cultures can encompass many different levels including job role, education, or organization and need to be included when considering effective teamwork and team performance as well.

As with any study, this case study has many limitations that need to be discussed. First, while we applied a quantification metric, this was in no way a systematic examination of cross-cultural interactions and thus does not provide quantitative, statistical evidence of the findings that were described. Secondly, the video was selected with the intention of exemplifying a difficult interaction between crew members; this in no way is representative of a crew's entire experience and/or all of their interactions aboard the ISS. However, if warranted, a more thorough examination of more cross-cultural interactions could provide insight into the frequency in which these types of interactions do occur. Thirdly, these results may not be generalizable to the astronaut population as a whole. Brown and Levinson's model was utilized to exemplify that the components of the framework could be applicable to interactions aboard the ISS, but do not relate to a pattern of behaviors, communication styles, and reactions to the astronaut population on a larger scale.

While maintaining the limitations outlined above, the evidence presented by this case study still provides support for the importance of cross-cultural interactions. To ensure effective teamwork and team performance among crew members for a long period of time (as will be necessary for a long-duration mission), it is essential that the crew members can work effectively with each other and can communicate, behave, and react in ways that support the team dynamic. As one possibility, future investigations should consider a quantitative approach of applying Brown and Levinson's (1987) model to the examination of cross-cultural interactions to determine how selection and training processes can be improved to ensure optimal team performance and effective teamwork.

General Discussion

These three studies collectively suggest that differing cultural backgrounds do, at a minimum, impact the way that crew members communicate with one another and also result in different verbal and nonverbal behaviors. In the first study, we saw several examples of instances where factors such as power distance, individualism and collectivism, and culture-specific knowledge impact how people interact with one another aboard the space station and also impact whether one's true meaning is conveyed. In the second study, we saw that empirical differences emerged in communication style, such that Russians were more indirect and agreeable (i.e., less idiocentric), whereas Americans were viewed as somewhat more domineering and opinionated. Finally, in the third study, we examined how differing cultural preferences regarding positive and negative politeness can impact communication.

There are several ways that selection and training can be augmented to create better functioning cross-cultural long-duration crews in light of these findings. For example, Davison (1994) discussed the creation of a high-performing multicultural team beginning at the selection stage. She stated that such teams can be created by (a) choosing the right mix of people (with regards to cultural background as well as personality, skills, and knowledge); (b) removing constraints of strict rules or bureaucracy; (c) sharing the goals and objectives with the team and involving them in the management process; (d) appreciating the influence of nationality and the unique perspectives it can bring (offer training to augment or highlight

this if necessary); and (e) choosing the right leader and making all members accountable for outcomes (and assuring that no one is excluded; Davison, 1994).

Another approach organizations can take is to increase the cross-cultural communication competency of team members to ensure better verbal and nonverbal cross-cultural communication (Spitzberg, 1983). Previous research suggests that this competency requires sufficient knowledge of other cultures as well as ample inquisitiveness and patience with multicultural team members (Kealey & Protheroe, 1996; Spitzberg, 1991). Others also emphasize the use of skills such as empathy, charisma, and the ability to manage anxiety in the face of ambiguity (e.g., Gudykunst, 1998). It is important to foster this aptitude as it can have a direct impact on multicultural team performance. Specifically, team members high in cross-cultural communication competency can express themselves more clearly and efficiently with members of other cultures when engaged in work tasks (Matveev & Nelson, 2004).

The Cross Cultural Communication Competency model builds on previous conceptual work (Abe & Wiseman, 1983; Cui & Awa, 1992) to provide a theoretical framework of this competency. This model distinguishes between four facets: interpersonal skills, team effectiveness, cultural uncertainty, and cultural empathy (Matveev, 2002; Matveev & Nelson, 2004). The interpersonal skills dimension reflects both an understanding and comfort when interacting with people who have different communication styles as well as when resolving disputes. The team effectiveness facet reflects the ability to clearly communicate team goals and roles to other team members. Cultural uncertainty is primarily demonstrating patience with other team members and with unfamiliar customs. Finally, cultural empathy involves seeing things from the perspective of another culture and behaving accordingly. This final dimension also reflects attitudes about working on a multicultural team, such as refraining from value judgments like good or bad and right or wrong (Matveev & Nelson, 2004). It is important to facilitate the development of each of these facets in crew members to ensure effective communication and conflict resolution on multicultural long-duration missions.

In conclusion, we believe that these three studies jointly suggest that cross-cultural communication issues, in fact, do occur on board the ISS and have the ability to impact teamwork and task effectiveness. Because all three studies used the same data source, replication and extension of these findings is warranted. Future work should include interviews with past, current, and future astronauts from a variety of cultures to ascertain their perspective on how these issues impact crew effectiveness and how they might best be mitigated. Further studies could be conducted by using content analysis techniques on astronaut biographies, journals, and other historical documents. Finally, an actual study aboard the ISS that records conversations on a continuous basis would be most helpful for ensuring that valuable data points are not being edited out. Future work also should explore the feasibility and effectiveness of implementing cross-cultural competency training as part of the Astronaut Candidate or mission training flow.

References

- Abe, H, Wiseman, R. (1983). A crosscultural confirmation of the dimensions of intercultural effectiveness, *International Journal of Intercultural Relations*, 7, 53–67.
- Bantz, CR. (1993). Cultural diversity and group cross-cultural team research. *Journal of Applied Communication Research*, February, 1–20.
- Berdiaev, N. (1990). *Knowing yourself*. Moscow: DEM.
- Betancourt, H, Wiener, B. (1982). Attributions for achievement-related events, expectancy, and sentiments: A study of success and failure in Chile and the United States. *Journal of Cross-Cultural Psychology*, 13, 362–374.
- Bollinger, D. (1994). The four cornerstones and three pillars in the "House of Russia" management system. *Journal of Management Development*, 13, 49-54.
- Boyd, J. (2005). Cultural factors and the International Space Station. *Aviation, Space, and Environmental Medicine*, 76, B135-B144.
- Boyd, JE, Kanas, N, Gushin, VI, Saylor, S. (2007). Cultural differences in patterns of mood states on board the International Space Station. *Acta Astronautica*, 61, 668-671.
- Brett, JM, Adair, W, Lempereur, A, Okumura, T, Shikhirev, P, Tinsley, C, Lytle, A. (1998). Culture and joint gains in negotiation. *Negotiation Journal*, 14, 61-86.
- Brown, P, Levinson, SC. (1987). *Politeness: Some universals in language usage*. Cambridge: Cambridge University Press.
- Camiah, N, Hollinshead, G. (2003). Assessing the potential for effective cross-cultural working between 'new' Russian managers and western expatriates. *Journal of World Business*, 38, 245-261.
- Cui, G, Awa NE. (1992). Measuring intercultural effectiveness: An integrative approach. *International Journal of Intercultural Relations*, 16, 311–28.
- Davison, CS. (1994). Creating a high performance international team. *Journal of Management Development*, 13, 81-90.
- Earley, PC, Mosakowski, E. (2000). Creating hybrid team cultures: An empirical test of transnational team functioning. *Academy of Management Journal*, 43, 26-49.
- Fiske, A, Kitayama, S, Markus, H, Nisbett, R. (1998). The cultural matrix of social psychology. *The handbook of social psychology*, Vols. 1 and 2 (4th ed.) (pp. 915-981). New York, NY US: McGraw-Hill.
- Goffman, E. (1967). *Interactional Ritual*. Chicago: Aldine.
- Gudykunst, WB. (1998). Applying Anxiety/Uncertainty Management (AUM) theory to intercultural adjustment training. *International Journal of Intercultural Relations*, 22, 227–50.
- Hall, E, Hall. M. (1990). *Understanding cultural differences*. Yarmouth, Maine: Intercultural Press.
- Hofstede, G. (1980) *Culture consequences: International differences in work-related values*. Beverly Hills, CA: Sage.
- Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations* (2nd ed.). Thousand Oaks, CA: Sage.
- Hofstede, G, McCrae, R. (2004). Personality and culture revisited: Linking traits and dimensions of culture. *Cross-Cultural Research: The Journal of Comparative Social Science*, 38, 52-88.

- Jandt, FE. (2006). Dimensions of culture. In F. E. Jandt, *An introduction to intercultural communication: Identities in a global community* (5th ed., pp. 159-181). Thousand Oaks, CA: Sage Publications.
- Kanas, N, Sandal, G, Boyd, J, Gushin, V, Manzey, D, North, R, Leon, G, Suedfeld, P, Bishop, S, Fiedler, E, Inoue, N, Johannes, B, Kealey, D, Kraft, N, Matsuzaki, I, Musson, D, Palinkas, L, Salnitskiy, V, Sipes, W, Stuster, J, Wang, J. (2009). Psychology and culture during long-duration space missions. *Acta Astronautica*, 64, 659-677.
- Kanter, MR, Corn, R. (1994). Do cultural differences make a business difference?. *Journal of Management Development*, 13, 5-23.
- Kealey, DJ, Protheroe, DR. (1996). The effectiveness of cross-cultural training for expatriates: An assessment of the literature on the issue. *International Journal of Intercultural Relations*, 20, 141-65.
- Kirby, L, Barger, N. (2009). Negotiating group dynamics. *Diversity Executive*. Retrieved from <http://www.diversity-executive.com/article.php?article=473>
- Kowner, R, Wiseman, R. (2003). Culture and status-related behavior: Japanese and American perceptions of interaction in asymmetric dyads. *Cross-Cultural Research: The Journal of Comparative Social Science*, 37, 178-210.
- Landis, JR, Koch, GG. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 33, 159-174.
- Lewis, RD. (1996). *When cultures collide: Managing successfully across cultures*. London: Nicholas Brearley Publishing.
- Matveev, AV. (2002). *The perception of intercultural communication competence by American and Russian managers with experience on multicultural teams* (Doctoral dissertation). Ohio University, Ann Arbor, MI.
- Matveev, A, Nelson, P. (2004). Cross cultural communication competence and multicultural team performance: Perceptions of American and Russian managers. *International Journal of Cross Cultural Management*, 4, 253-270.
- Maznevski, ML. (1994). Understanding our differences: Performance in decision-making groups with diverse members. *Human Relations*, 47, 531-52.
- McSweeney, B. (2002) Hofstede's model of national cultural differences and their consequences: A triumph of faith—a failure of analysis. *Human Relations*, 55(1), 89-118
- Miller, JG. (1984). Culture and the development of everyday social explanation. *Journal of Personality and Social Psychology*, 46, 961-978.
- Miller, C, Wu, P, Funk, H. (2008). A Computational Approach to Etiquette: Operationalizing Brown and Levinson's Politeness Model. *IEEE Intelligent Systems*, 23(4), 28-35.
- Miller, C, Galunder, S, Rye, J. (2010). Politeness in social networks: Using verbal behaviors to assess socially-accorded regard. In *Proceedings of IEEE Social-COM 2010*. Minneapolis, MN; August 20-22.
- Molinsky, A. (2005). Language fluency and the evaluation of cultural faux pas: Russians interviewing for jobs in the United States. *Social Psychology Quarterly*, 68, 103-120.
- Morris, MW, Peng, K. (1994). Culture and cause: American and Chinese attributions for social and physical events. *Journal of Personality and Social Psychology*, 67, 949-971.
- Morrison, T, Conaway, WA, Borden, GA. (1994). *Kiss, bow or shake hands*. Holbrook, Massachusetts: Adams Media Corp.

- Naval Historical Center. (2003). *Astronauts: Chronology of Space Missions Involving U.S. Navy and Marine Corps Crew Members, 1961- April 1981*. Department of the Navy.
- Oberg, J. (2007). International Space Station. from <http://www.worldbookonline.com/wb/Article?id=ar279523>
- Pekerti, AA. (2005). Cross-cultural perceptions in the leadership process: Theoretical perspective on the influence of culture on self-concepts and manager-worker attributions. *Thunderbird International Business Review*, 47, 711-735.
- Pekerti, AA, Thomas, DC. (2003). Communication in intercultural interaction: An empirical investigation of idiocentric and sociocentric communication styles. *Journal of Cross-Cultural Psychology*, 34, 139-154.
- Rajan, MN, Graham, JL. (1991). Nobody's father was a merchant: Understanding the Soviet negotiation style. *California Management Review*, 33, 40-57.
- Sandal, GM, Manzey, D. (2009). Cross-cultural issues in space operations: A survey study among ground personnel of the European Space Agency. *Acta Astronautica*, 65, 1520-1529.
- Schuster, B, Forsterlung, F, Weiner, B. (1989). Perceiving the causes and failure: A crosscultural examination of attributional concepts. *Journal of Cross-Cultural Psychology*, 20, 191-213.
- Schwartz, SH. (1994). Beyond individualism/collectivism: New cultural dimensions of values. In *Individualism and collectivism*, edited by U. Kim, H.C. Triandis, and G. Yoon. London: Sage.
- Shaw, ME. (1981). *Group dynamics: The psychology of small group behavior*. New York: McGraw-Hill.
- Shenkar, O, Zeira, Y. (1992). Role conflict and role ambiguity of CEOs in international joint ventures. *Journal of International Business Studies*, 23, 55-75.
- Smith, G. (2000). The Mercury, Gemini and Apollo Missions from http://apollo-society.org/merc_gem_apollo.html
- Snow, CC, Snell, SA, Davison, SC, Hambrick, C. (1996). Use transnational teams to globalize your company. *Organizational Dynamics*, 32, 20-32.
- Spitzberg, BH. (1983). Communication competence as knowledge, skill and impression. *Communication Education*, 32, 323-9.
- Spitzberg, BH. (1991). Intercultural communication competence. In L. A. Samovar and R.E. Porter (Eds), *Intercultural Communication: A Reader*, 6th edn, pp. 353-65. Belmont, CA: Wadsworth.
- Triandis, HC, McCusker, C, Betancourt, H, Iwao, S, Leung, K, Salazar, MJ, et al. (1993). An etic-emic analysis of individualism and collectivism. *Journal of Cross-Cultural Psychology*, 24, 366-383.
- Vodosek, M. (2009). The relationship between relational models and individualism and collectivism: Evidence from culturally diverse work groups. *International Journal of Psychology*, 44, 120-128.
- Watson, OM. (1970). *Proxemic behavior: A cross-cultural study*. The Hague, Netherlands: Mouton.
- Watson, WE, Kumar, K, Michaelson, LK. (1993). Cultural diversity's impact on interaction process and performance: Comparing homogeneous and diverse task groups. *Academy of Management Journal*, 36, 590-602.
- Watson, A, Monroe, E, Atterstrom, H. (1984). American and Swedish children's apprehension about communication: A comparative study. *Perceptual and Motor Skills*, 59, 917-918.

Appendix A

Communication Style Coding Scheme

Within the brief interaction, how many times was/did each of the two individuals:

1. more expressive during the interaction
2. more dominant during the interaction
3. initiate more action during the interaction
4. more aggressive during the interaction
5. more logical and systematic in his or her arguments
6. regulate the flow of the interaction
7. more concerned with finishing the task during the interaction
8. present stronger opinions during the interaction
9. more agreeable to the partner's suggestions
10. avoid arguments on specific issue(s) during the interaction
11. more readily shift opinions during the interactions
12. make or attempt to make more eye contact with his or her partner during the interaction

Additionally, to what extent (1 being not at all, 3 being somewhat, and 5 being extremely)

13. did each individual influence the other person
14. did each individual change his or her behavior during the interaction

Open-Ended Questions:

1. What verbal markers did you look for when coding for the various behaviors? Please give specific examples.
2. What visual or body-language markers did you look for when coding for the various behaviors? Please give specific examples.

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave Blank)	2. REPORT DATE November 2011	3. REPORT TYPE AND DATES COVERED NASA Technical Memorandum		
4. TITLE AND SUBTITLE An Examination of Cross-Cultural Interactions aboard the International Space Station			5. FUNDING NUMBERS	
6. AUTHOR(S) Emily M. David, M.A.; Cristina Rubino, M.A.; Kathryn E. Keeton, Ph.D.; Christopher A. Miller, Ph.D.; Holly N. Patterson				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Lyndon B. Johnson Space Center Houston, Texas 77058			8. PERFORMING ORGANIZATION REPORT NUMBERS S-1113	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) National Aeronautics and Space Administration Washington, DC 20546-0001			10. SPONSORING/MONITORING AGENCY REPORT NUMBER TM-2011-217351	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Available from the NASA Center for AeroSpace Information (CASI) 7121 Standard Hanover, MD 21076-1320 Category: 53			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The Behavioral Health & Performance Element (BHP) is one of six elements within the Human Research Program, and is tasked with designing, implementing, and managing research tasks that will develop tools, technologies, countermeasures, and other mitigation strategies to help support the crew on long-duration missions. Investigating the impact of culture within the astronaut population is a timely issue given that problems related to human interaction (including those that are culturally based) are likely to increase in prevalence as we move toward extreme long-duration space flight. Although one can cope and even ignore interpersonal conflicts and communication difficulties in the context of a 1- or 2-week mission, these factors can become a chronic stressor on long-duration missions given the heightened isolation and greater amount of downtime that crew members will experience. Further, it is likely that successfully completing a long-duration mission will require the cooperation of multiple nations and individuals with a variety of cultural backgrounds. Given these projections, the main objectives of this project were to: (a) identify, document, and describe any existing issues in communication occurring in cross-cultural teams; and (b) examine whether cultural differences in behavioral outcomes exist.				
14. SUBJECT TERMS long duration space flight; human performance, astronaut performance; astronaut training; communicating			15. NUMBER OF PAGES 44	16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT Unlimited	
