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Human Factors Module Interpersonal Communication

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Abstract

This document is, within the Human Resources Domain, one of the Human Factors Modules. These modules deal with Human Performance. This module explains the complexity of interpersonal communication.

It describes process and functions of interpersonal communications and introduces the reader to the influences of typical human factors on verbal and non-verbal human communication. Aviation communication is in many aspects influenced by these human factors.

Keywords

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Non-verbal communication	Levels of communication	Phraseology	

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EXECUTIVE SUMMARY

The EATCHIP Human Resources Domain develops several human factors modules that deal with the management of human performance. This module is about interpersonal communication. The aim of this module is to present the reader an overview of that hugely important and fundamentally thought-twisting phenomenon called interpersonal communication.

Chapter 1 defines scope and purpose of the document.

Chapter 2 shows the difference between skillful and unskilled communicators and includes the basic rules for successful communication.

Chapter 3 describes the process of communication - from sender, through channel, to receiver - underlining the coding processes that take place in this process. Many factors influence the communication process, feedback is necessary to check whether the received information is correct.

Chapter 4 explains how the brain processes information digitally and analog to come to a picture of what we perceive. These brain processes influence our communication enormously.

Chapter 5 shows that people communicate at two levels, a rational level - on which we exchange information - and an emotional level - on which we exchange our findings. These levels influence each other and especially the emotional level determines what we hear and what we say.

Chapter 6 introduces the reader to non-verbal communication. When we try to read gestures and other non-verbal signals, there are two important things to look for: clusters and incongruence.

Chapter 7 is an introduction to the theory of transactional analysis. People use their personalities when they communicate, analysis of the different transactions gives us the best change of successful communication. This chapter includes an analysis of typical R/T communication.

Chapter 8 describes human factors in the coded airspeak messages between controllers and pilots, phraseology in ATC communication.

References and a list of recommended reading can be found at the end of the document.

*I know you believe you understood what you think I said, but I'm not sure
you realise that what you heard is not what I meant to say...*

Anonymous

1. INTRODUCTION

Human communication has two immutable laws:

1. You are communicating all the time, in your words, tone of voice, actions, dress, your presence and even your absence.
2. You cannot not communicate.

Interpersonal communication is not just a process of sending and receiving messages, but also a process of negotiating meanings, and the meaning you intend is not necessarily the one the audience takes away with them. Furthermore, communication is always complicated by an almost infinite number of factors such as expectations, attitude, prejudice, history, values and beliefs, moods, likes and dislikes, etc.

1.1 Scope

Within the EATCHIP Human Resources Domain the Human Factors Modules seek to provide a better understanding of the factors that influence human performance. Interpersonal communication is such a factor. A better understanding of the complexity of human communication will lead to improved communication. Effective communication contributes directly to improved interpersonal relationships, higher motivation and thus to the efficiency of the team.

1.2 Purpose

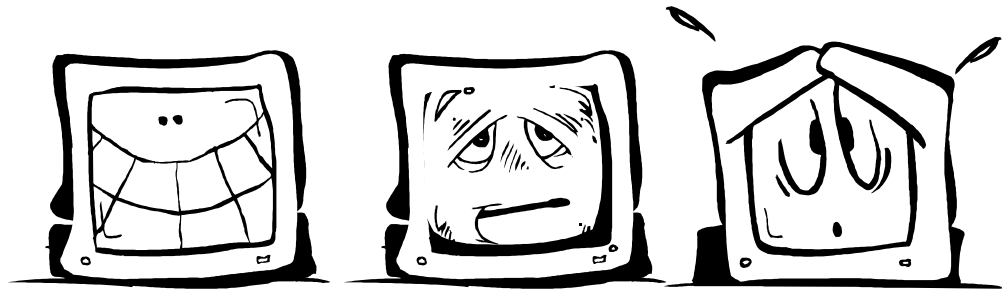
The aim of this module is to present an overview, which will better enable the reader to understand the complexity of interpersonal communication. This document is intentionally written in a style which is easy to read and understand. It should address operational staff in the execution of their job, trainers in the preparation of course content and documentation, and supervisors in managing their teams.

The reference material at the end of the document provides the interested reader with further detailed documentation.

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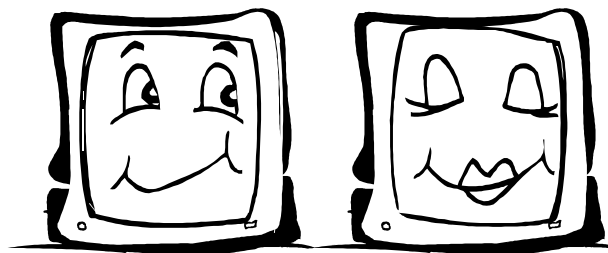
2. HUMAN INTERACTION

One way of understanding how we interact with other people is to imagine that people are television sets. The various broadcasting channels then represent the different communication channels, or personal styles, that people have. Each person seems to select the channels that suit them best. So, one person may choose a comedy, another a serious drama, another a musical channel, and so on.



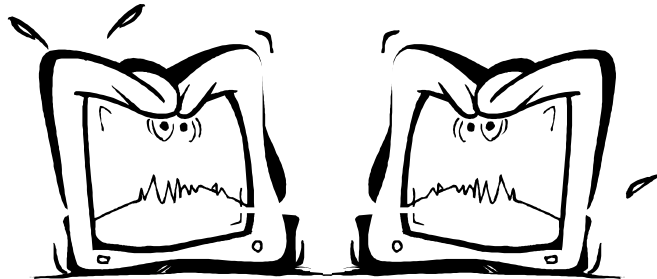
When we meet someone, we respond to these personal styles in the same way we might to the TV programme. If we like their particular communication channel, we will expect to get on with them. For example, if both of us prefer a channel that plays old movies, then we will feel we have a lot in common. However, if we adopt different styles, we may not want to interact much. Someone who likes documentaries may not feel comfortable with a colleague who adopts a less serious approach. Someone who selects a comedy channel may think anyone who prefers the news channel is boring.

Skilful communicators are the people who have the greatest range of channels available to them. They are quick to identify the channel that someone else is tuned to, and flexible enough to switch quickly to a corresponding channel themselves. In this way, other people find them easier to interact with.



Unskilled communicators tend to stay within a restricted range of channels. They may even be stuck in just one style. They make little attempt to match other people. Instead, they expect other people to change to suit them. This inflexibility limits their effectiveness when dealing with others.

Occasionally we meet someone who does not seem to tune in to a channel properly. We pick up conflicting signals, just as when a TV is not properly adjusted. We then find it difficult to know which programme to pay attention to. Or it feels as if there is a lot of interference within the communication.



3. THE PROCESS OF COMMUNICATION

Communication starts with an idea, a thought or an emotion. The process that takes place when somebody wants to communicate an idea is as follows: the sender translates an idea into symbols and sends a message to the receiver, who decodes the message into information. A very simple process, but in interpersonal communication many things can go wrong. For example: there is little chance that the decoded information corresponds to the original idea if the sender decides to use the Chinese language as symbol for his idea and the receiver does not understand Chinese. Communication can lead to transfer of information when the symbols can be translated, and even then it is still uncertain whether the information corresponds to the original idea. Feedback is necessary to check whether the information is right.

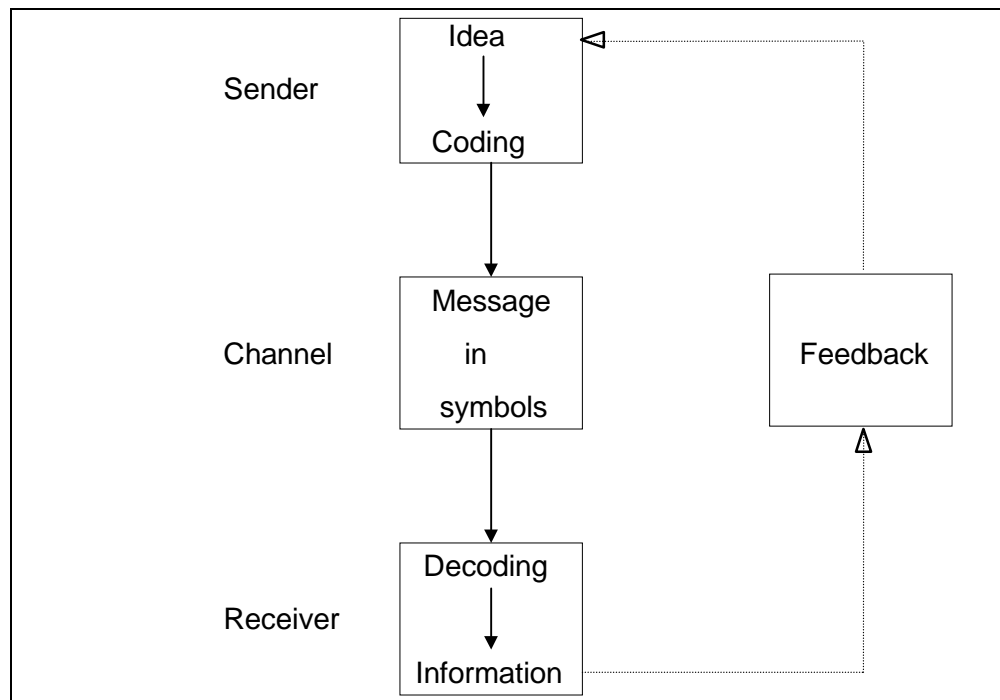


Figure 1: The communication process

An enormous number of factors influence interpersonal communication. All players in the process have their own particular characteristics like expectations, attitudes, prejudices, history, values and beliefs, moods, likes and dislikes, abilities, etc. This module deals with these factors in more detail in the different chapters to follow. In our normal daily conversations we tend to forget about all these influences. The feedback principle, for example, is seldomly used, which all too often leads to misunderstandings or conflicts. The readback/hearback loop is a compulsory feedback mechanism in Air Traffic Control and in interpersonal communication often simply forgotten! *Do I make myself clear?* (Baker, 1996).

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4. BRAIN FRIENDLY COMMUNICATION

4.1 Brains are like walnuts...

If we could look into our skull we would see our brain as a giant wrinkled walnut, which is split lengthwise down the middle by a deep rift. This valley divides the brain into two almost identical parts, united only deep down, near the centre of the brain. In other words we can clearly identify a left and a right side. The left side helps us to pay attention to things which can be translated into words, while the right side helps us to concentrate on visual images.

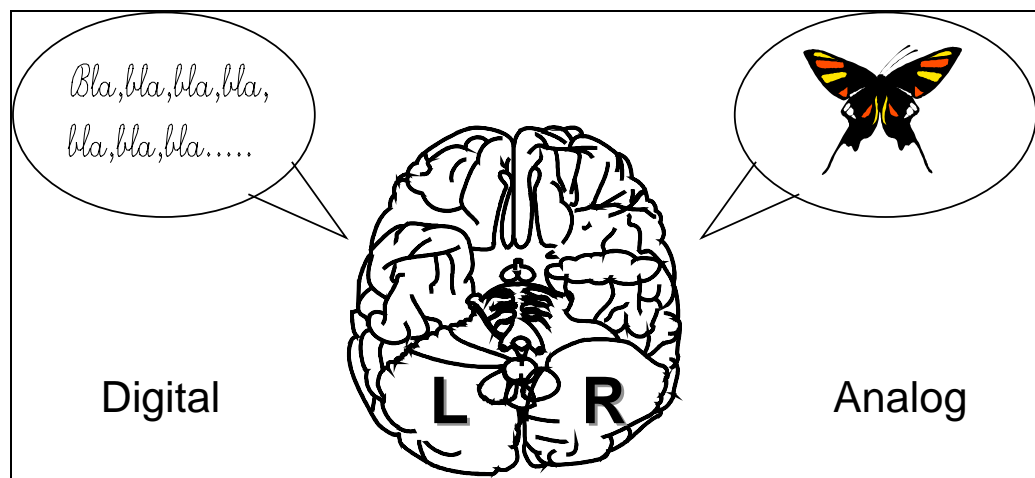


Figure 2: Anatomy of the brain

It is important to know that digital information only can be understood when it is “under-stood”; in other words, it is information that we have learned (Birkenbihl,1991). An example explains how this influences our communication: if I ask you **not** to think of a white kangaroo, the left side of your brain scans colours and animals, and translates the colour white and the animal kangaroo into a picture in the right side of your brain. It is in fact impossible **not** to think of a white kangaroo because the information is processed left *and* right, digital *and* analog, in words *and* in pictures. It is far easier when I ask you **not** to think of a thalamus, because most of you probably don’t know the word, and the right side of your brain doesn’t create a picture. The left side keeps on scanning and is unable to inform the right side. This scanning only stops when you learn what a thalamus is.

To help you: a thalamus is the butterfly-shaped part in the centre of the brain (see [Figure 2](#)) - the left side helps us to concentrate on words and the right side helps us to concentrate on visual images. (You knew it, but you didn’t have the full picture yet!)

4.1.1 **Left: digital, detail and analysis**

Information in the left side of the brain is what we think (in words), say, write, read, calculate and analyse. Left brain is analytical, logic, rational, linear, detailed, sequential (step by step) and time oriented. We easily recognise that we learned to develop left brain processes at school. This side concentrates on what we hear.

4.1.2 **Right: analog, overview and synthesis**

The right side of the brain provides us with overview, it recognises shapes and structures. Right is synthesis, creativity, perception of melody, intuition, etc. Synthetic thinking puts the details from the left side together into the entire picture. Right is visually oriented and in terms of understanding and memory much more effective than the left side. This side concentrates on what we see.

4.1.3 **Left and right: teamwork**

Characteristics of the left side are often attributed as typical male and right side characteristics as typical female. Our orientation shows in our communication, typical macho or macha behaviour proves limited use of the full potential of the brain, good teamwork between left and right is needed for good communication. The good communicator can convince and listen, sees the detail and the big picture, is analytical and synthetic at the same time.

We normally have little difficulties in finding the right words when we have a clear picture of what we want, digital (left) and analog (right) information are in balance. On the other hand is it difficult to believe the salesman who rubs his nose while informing you about the quality of his product. What we see - we often rub our nose when we tell a lie - is not in balance with what we hear - "believe me, the quality is excellent!"

Most people have better developed their left brain processes, because most school and training methods are based on development of logical and rational abilities. But remember, left recognises the trees and right sees the forest, only together they create the whole picture. A way to improve right brain communication is based on a very simple pattern: as children we learned by listening to fairy tales, as adults we adopt by listening to analogies. Improving interpersonal communication is done by improving the ability to communicate in analogies and pictures.

4.2 **Reptile Communication**

In the 'Stress' Module (EATCHIP, 1996) the principle of the fight-flight response - or the functioning of our stress hormones - was explained. For those who have forgotten about the detail, a quick review: *When we find ourselves in a threatening situation our so-called reptile brain quickly decides*

whether we should fight or flee. The amount of stress hormones in our bloodcirculation increases and prepares the body for muscular action, necessary to win or to run. These stress hormones also influence our communication. An example to illustrate this: Fred is late - again. His colleague asks: 'Fred, what time is it?', and Fred punches his colleague on the nose!

You don't need much psychological background to recognise Fred's reptile reaction as the fight-response. Very straight forward communication, Fred wasn't in the mood and didn't like the question! It is more difficult to recognise the so-called flight-responses, because almost everybody spends a lifetime developing very intelligent flight-communication. Let us take a closer look at late-comer Fred to illustrate the influence of this flight principle on his communication.

Fred is a notorious late-comer, and every time that a supervisor or a colleague points him on the effects of this behaviour he seems to have a 'good reason' for being late this time: the wife was sick, he helped the victims of a car accident, traffic jams and traffic lights, wild animals bumping into his car, the security officer didn't let him pass....., an endless list of events, all against Fred. Under four eyes and under serious threat of disciplinary action Fred admits and promises improvement. He seems to keep up for a while but falls back to his old behaviour after two or three weeks.

What exactly happens in this example? Fred is addressed at the moments of being late, Fred knows he is late and on the way to work he already 'prepared' himself by an adequate increase of stress hormones. His reactions to the threatening remarks of colleagues or supervisor are very much influenced by his reptile brain: fight or flight. Fighting is socially unacceptable, flight is the only way out, and we often 'flee' by making up excuses. It would be better to raise the issue with Fred when he is in time, his reactions are at that moment not influenced by fight or flight signals and his communication will be rational.

We all have developed very intelligent flight-communication, this reptile communication has however little impact on our rational and should therefore be recognised and avoided at important moments.

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5. THE TWO LEVELS IN COMMUNICATION

5.1 Bosses should learn about listening

Few people these days would deny that communication has a vital role to play in all aspects of leadership, motivation, commitment, willingness, ability to change, etcetera. Yet it appears that many bosses still have an over-reliance on outmoded “top-down employee communication”- techniques. Too often communication is seen as a way of transmitting information rather than a means of getting people’s commitment. Small fortunes are spent on employee newsletters, which push positive messages about how well the organisation is doing in its struggle to survive. This is of course important and necessary, but it only covers a small part of what human communication is about.

Human communication takes place at two levels (Watzlawick, 1967). At level one we exchange information, the content of our words. ‘Exchange’ means that we give and receive information, only giving or only receiving is incomplete communication and sorts limited effect. On level two we give meaning to the information that we give and receive, our perception of the whole situation takes place on level two - and information is only a small part of the whole picture. This level is called the emotional level and it has an enormous influence on what we hear and say. People communicate in fact like ice-bergs. When icebergs meet they first bump into each other under water, because 7/8 of their volume is under the water surface.

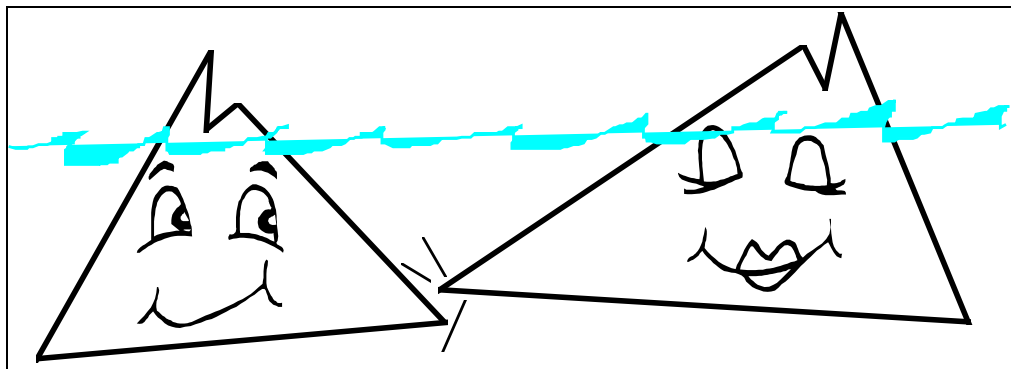


Figure 3: People communicate like icebergs

The same is true for human beings, when people meet they first ‘bump’ into each other at emotional level. The emotional level informs in a constant dialogue the rational level about its findings such as likes or dislikes, danger or safety, high or low expectations, etc. The influence of the emotional level on the willingness to listen or to talk is enormous and determines far more the outcome of communication than the actual exchange of words.

Commitment is not only a function of information, it is also and even mainly a function of attitudes and people usually communicate their attitudes non-verbal. Bosses should therefore learn to listen at both levels, and good listeners have excellent eyes. The chapters about body language tell - or should I say 'show' - more about recognising non-verbal communication.

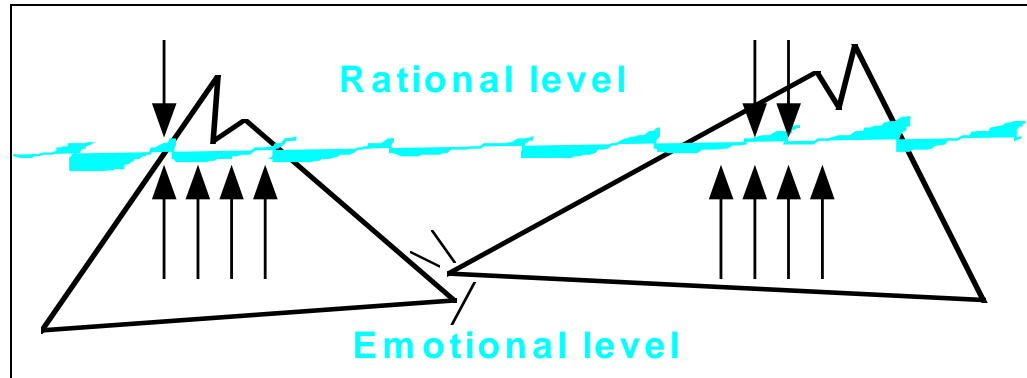


Figure 4: Levels of communication

Rational and emotional level were defined in more detail for Crew Resource Management (Kanki & Palmer, 1993), this definition is also used in the concepts for Team Resource Management in the world of Air Traffic Control:

1. Communication provides information.
2. Communication establishes interpersonal relationships.
3. Communication establishes predictable behaviour patterns.
4. Communication maintains attention to task and monitoring.
5. Communication is a management tool.

Although each of these communication functions can be looked at as a topic in its own right, in reality, most communications fulfill several functions at the same time. For example, if a supervisor makes it a point to bring the new shift together for a briefing, his/her communications serve several functions simultaneously. First, they provide important operational information for all team members. Second, they provide a means for the supervisor to establish an interpersonal tone with the rest of the team. Third, they help to establish predictability, because the team members now know something about the supervisor's style and expectations of them and are provided a preview of how they will work together.

5.2 Employees should learn about followership

Communication is often referred to in the context of good leadership. Little is said about what a good follower is, although good followership is not a given. Good communication is as much a responsibility for employees as it is for bosses. Employees add value to the team by using followership skills to ensure that their potential becomes an active contribution. Assertive communication is such a skill.

Assertive communication is essential in good teamwork, it is a means of getting attention and respect from other people without being submissive or aggressive. Submissiveness leads to the 'door-mat effect' - people walk over you too easily. Aggressiveness may look successful in the short term, in the longer term, however, you make enemies - people turn their back on you. Assertive communication is adult to adult communication as will be explained in chapter 7 of this module, open and fair communication including honesty about norms, values and emotions. In other words, assertive communication is communication on both levels: the rational level (the content of our words) and the emotional level (how we feel about it).

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6. BODY LANGUAGE

6.1 We listen through our eyes

We have already seen that human communication is not simply talking and listening. Other messages, many of which we are unaware of, are passing to and from us at the same time.

The two major elements in human communication are verbal communication or speech, and non-verbal communication or body language. In fact, although we often believe it is the persuasive, verbal power of what we are saying to someone that wins them over to us, it is more likely to be the body language that has had more influence.

Research shows that our verbal communication is responsible for only 10 to 20 per cent of our message getting through to the other person, whereas 70 to 80 per cent of the impact is produced by our body language (Morris, 1938). In other words: we best listen through our eyes! So body language is very important because of this strong impact, whether we recognise it or not. If we were more aware of the meaning of body language, we could better understand or influence the situations we encounter. But body language is also a difficult medium since it is more open to abuse and misinterpretation than verbal communication.

We send and receive body signals all the time, whether we are aware of it or not. A typical example of a body language signal is the smile. When you smile at someone, you are usually telling that you want to be friendly and that you would like the other person to be friendly in return.

Body language can have more than one meaning and not all body language is positive. In fact the negative gestures are usually the easier ones to identify. If I walk up to Fred, and, without saying a word, punch him hard on the nose, he gets the message. He may not know *why* I did it, but he is certainly aware that I am angry with him.

It is important to know that body signals rarely stand alone. Body language has - like spoken language - words, sentences, punctuations, etc., and we must link words and signals to make a complete message. When we try to read body language, there are two important things to look for: clusters and incongruence (Pease, 1984).

6.2 Clusters

Much can be made of people's attitude and feelings by observing their body language. But don't be too quick to judge. Body language is open to misinterpretation, particularly if you try to pin a meaning on to a single gesture or signal.

Look for groups of gestures. These groups or *clusters* will give clear indication of the way people feel. For example, suppose you are talking to some people when they suddenly fold their arms. The folding of arms is one of the negative or defensive gestures. You might conclude from this that they are not being

receptive to what you have to say, or that they may disagree with you. On the other hand, they may simply be assuming that position because they feel more comfortable. Then you notice them pulling at their ear-lobe; another negative gesture meaning *I've had enough*. Now things aren't looking too hopeful, and your worst fears are confirmed when you notice them doing up their jacket - another form of negative or defensive gesture. Three gestures - which on their own could have had different meanings - have been clustered together to leave you in no doubt that the persons did not agree with, or where not interested in what you had to say.

You could have acted on the first gesture, the arm fold, and you would have been right; this time! You won't always be, so wait for confirmation. Watch for those clusters!

6.3 Incongruence

Many of our gestures and signals are ingrained. Nodding and shaking of the head are two of the gestures we learn very early in life and because of this we would find it almost impossible to unlearn them. Here then lies the secret of body language. If we say yes and mean it, our head will nod back and forth. On the other hand, if we say yes but we really mean no our head movement will contradict our words by shaking from side to side. It's almost as if the body is saying: *You can lie if you want to, but I can't*. Perceptive people can pick up this difference and immediately recognise that something is not quite right. Furthermore, when they encounter incongruence perceptive people will ignore what is being said and act on what they see.

Some people instinctively read body language, others ignore even the plainest of transmitted messages. Either way, understanding and awareness can be increased and from that you can begin to make body language work for you. Whatever the situation, be it an on the job training or a discussion with colleagues or friends, recognising and interpreting body language will give you a greater insight into what people really think and feel.

7. TRANSACTIONAL ANALYSIS

7.1 Ego States

The introduction of this module mentioned that skilful communicators have a greater range of communication channels available to them. The technical term for these communication channels is ego states, these ego states were first introduced in the theory called Transactional Analysis (Berne, 1967).

An ego state is simply a way of being. We really have many ego states, just as there are many different programmes on television. However, we can cluster them in different groups, rather like the way some television channels specialise in particular types of programmes. It is the clusters which result in people having their own personal styles.



Figure 5: Skilful and unskilled communicators

Our ego states develop as we are growing up. We start as babies with Child ego state, which becomes a cluster of our needs and feelings, and our responses to what happens to us. Later, we add Parent ego state, which is made up of copies of the behaviour of the big people around us. We often practice these when we are young, and then replay them almost exactly when we are older. We also develop an Adult ego state, which consists of our ability to process information, understand what is going on, and make decisions about appropriate ways to act.

We have three main clusters, known as Parent, Adult and Child ego states. Parent and Child each subdivide because they contain two styles each: Controlling Parent and Nurturing Parent; and Adapted Child and Natural Child. This gives us a total of five personal styles, each of which in turn may have a positive and negative function.

Child ego state

As a grown-up we still have our child characteristics available to us. We may not always display them, but they are still within us. The natural child contains our natural friendliness, our enthusiasm, our curiosity and creativity, but includes the risk of seeming over-emotional and immature. The adapted child contains all the ways we are polite and fit in well with others, including the danger of submissiveness, rebelliousness or simply being withdrawn.

Adult ego state

The functional adult is internally the monitor of our emotions so that we maintain a reasonable and reasoning attitude. Externally, this ego state adopts a rational, problem-solving approach, but can be considered coldly analytical.

Parent ego state

The parent ego state contains our norms and values. The nurturing parent in us cares for others, reassures and encourages them to tackle new things, but this parent can also smother others and not allow them to develop. The controlling parent is firm, sets boundaries, and is specific about requirements, versus being autocratic and rule-bound so that initiative is stifled.

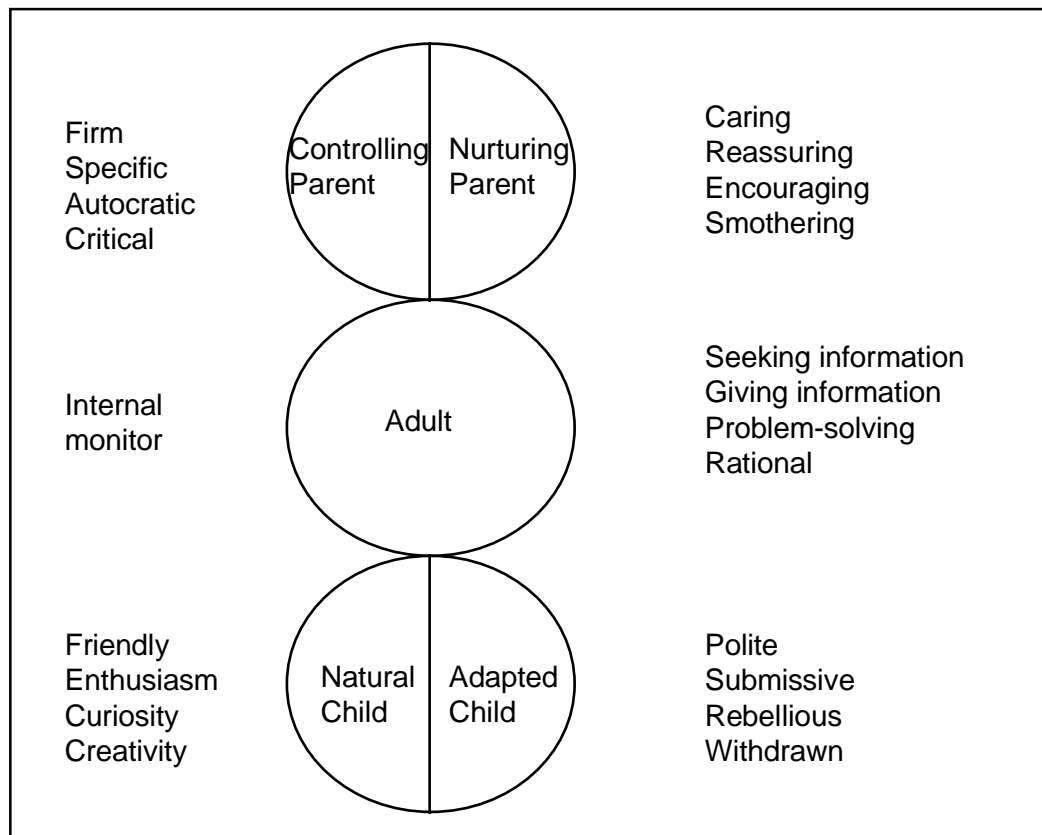


Figure 6: Ego states

In summary, we have 5 personal styles, or ego state clusters, available to us, each with effective applications and some potential drawbacks. A controlling parent and a nurturing parent, an adult and two children, natural or adapted.

7.2 Ego States and Body Language

Our ego states, or personal styles, often show most in our body language and other non-verbal signals. Indeed, it is estimated that the words we use count only a small portion of the messages that we transmit to others.

The tone of voice we use can be fairly easily associated with our ego states. Nurturing parent will speak in caring, concerned way. Controlling parent will sound firm, or even very critical. Functional adult will sound fairly neutral but interested and responsive. Adapted child may be very polite, or timid, or sulky, or rebellious. Natural child is likely to sound friendly, excited or curious.

Our movements and gestures also provide ego state clues. Nurturing parent may give encouraging nods, or pat someone on the arm or shoulder. Controlling parent may point accusingly, or cross their arms across their chest, or tap with a finger on the table as they make a point. Functioning adult can often be distinguished by the lack of distracting movements or gestures. Adapted child is accompanied by a lot of fidgeting, as if the person can not get comfortable. Natural child will involve movement that is likely to look more like excitement or enthusiasm.

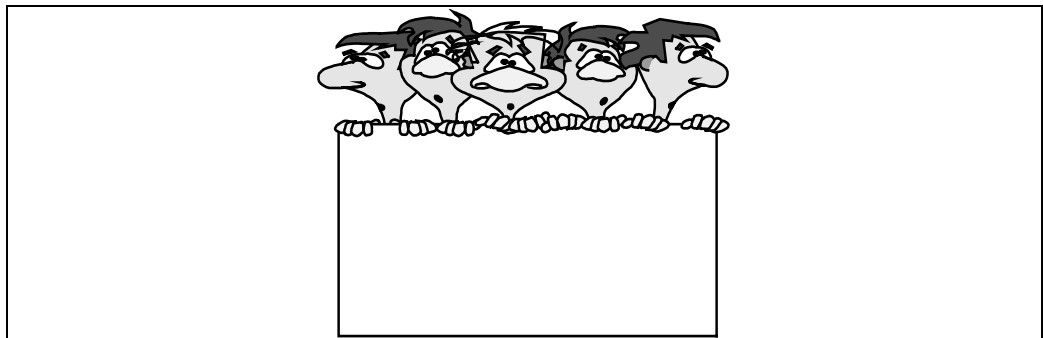


Figure 7: Body language shows personal styles

Finally, the position of our bodies can convey powerful ego state signals. Standing so that other people have to look up at us is likely to transmit parent ego state even when we have no intention of doing so. This is why taller people often responded to as if they are in charge, and why short people sometimes over-compensate by becoming extra-parental when they feel they have been overlooked.

Where and how we stand will differentiate between nurturing and controlling. If we are in nurturing parent, we are more likely to stand alongside but slightly angled toward the other person. We may also stoop slightly so that we are leaning over them. In controlling parent, we may face them directly; the closer we stand the more confrontational we will appear.

Sitting so that people look down at us will often signal that we are in child ego state. Adapted child may be associated with sitting in a very proper manner,

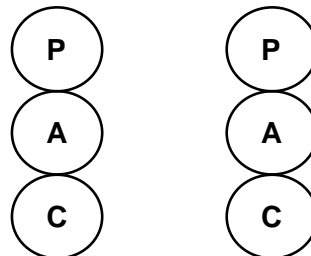
or with slumping if we are bored. Natural child is more likely to curl up, perhaps even raising our feet to the chair if we get really captivated. Sitting while others stand, or using a lower chair, may convey an invitation to others to act like a parent to us.

The most appropriate body position for adult ego state is to be level with the other person. This might be facing them, when we can have eye contact. It might be alongside them, when we both look at the same screen or document. It may be standing or sitting, providing both of us are doing so. Sitting is often a useful technique if we are taller or shorter than them.

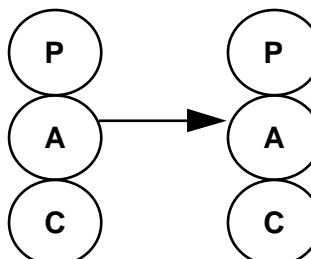
Finally, muscle tone is part of the overall picture. Parent ego state tends to have a controlled muscle tone, as if we are conscious of being a big person and mindful of our physical impact on others. It may of course also come over as threatening. In adult ego state, we will appear relaxed yet alert. We will seem to be comfortable in our body. In child ego state we will give an impression of being ready to move at any moment. We may seem a lively person who wants to be active in stead of sitting still.

7.3 Analysing Transactions

We can use the concept of ego states to analyse communication, or transactions, between people. This enables us to consider alternative responses when our interactions are not as successful as we wish. To visualise our analysis, it helps to imagine that our ego states are stacked one above the other in sets of 3 circles, like this:



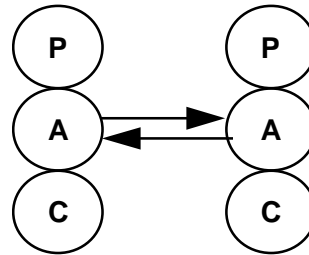
We can then add arrows to indicate our communication. If, for example, I would ask you “*what time is it?*” (I seek information, which I do from my adult ego state), the visualisation would be as follows:



This will help us see whether we have a match or clash of ego states. It also prompts us to consider what other options we have.

7.3.1 Uncrossed transactions

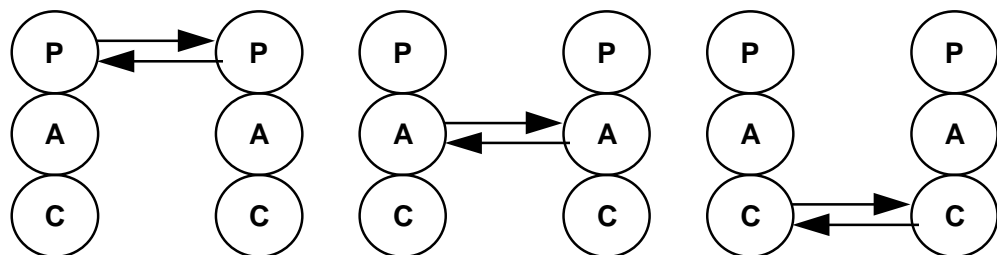
Uncrossed transactions occur when the ego states involved in an interaction fit together. When this happens, the lines on the diagram will appear as parallel:



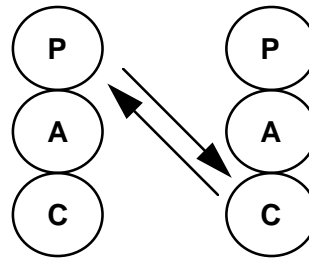
“What time is it?”

“It is two o’clock”.

Not all ego states will connect in this way. For parent and child ego states the successful connections will be between the same clusters. Even more importantly, parent and child ego states do not successfully connect to adult (normative or submissive communication irritates). We can only interact directly with our own adult channel if the other person is willing to do the same.



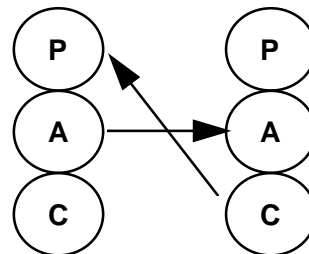
With uncrossed transactions, the communication can continue until it is completed. This will generally be useful, as we will be able to bring our conversation to a satisfactory conclusion. However, there are times when an uncrossed transaction is decidedly unhelpful. This occurs when the content of the communication is negative.



Imagine the scene when your boss is in critical parent mode and the conversation between him and you is about how useless you as subordinate are. You know by experience that it is better to use your adapted child and to respond submissive. In this case, the interaction may continue some time uncrossed, with your boss haranguing you and you responding in a depressed, submissive way. This will certainly not improve your performance! Instead, it is likely to alienate you, and your performance gets worse. Too much critical parent irritates.

7.3.2 Crossed transactions

Crossed transactions take place when the ego state that responds is not the one addressed. For example, an adult question about when a task will be completed may get an aggrieved rebellious child to parent response about being harassed. When diagrammed, the lines between the ego states will cross.



With a crossed transaction, the communication will break down or change course in some way. In our example, an argument may develop about whether the question is a form of harassment, or the conversation may escalate into a conflict about the respective rights and responsibilities. The original question may never be answered!

A crossed transaction may also be useful. The earlier example of your boss haranguing you shows this. If you want to get some constructive information about how (in his eyes) to improve your performance, you are going to need a shift in ego state from him. To get this, you need to cross the transaction. Perhaps you could use adult to adult and ask him a direct question about what should be done differently next time. With luck, your boss will then respond from adult instead of parent and give some usable feedback.

7.4 Analysis of R/T in Air Traffic Control

It is often said that ATCO's seem to change as soon as they are on the job - a bit like most people seem to behave different as soon as they drive a car. Most obvious indication is the change in the tone of voice in R/T, instructions seem to become orders, it is almost as if the tone of voice indicates that the receiver better obeys, or else....!

Analysis of some of the most important transactions of a controller on the job shows the following: At the start of his duty the controller builds up a mental picture of the traffic. From this picture he makes decisions for control actions. This is in essence the cognitive part of the controllers job. What we then see and hear is the behavioural part of the job, communication of decisions to pilots and others involved.

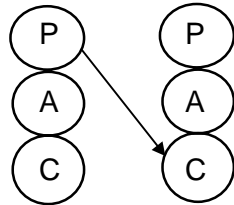
The controller is at the very moment the only one to have a picture of the traffic situation from which he controls the traffic by giving orders like climb, descend, turn left or turn right, and by passing information like weather conditions and airport information. The orders are dominant in the conduct of the R/T communication and orders are communicated through the parent ego-state - the controlling parent. And that is what we hear in the tone of voice of the controller. This communication channel is described in 7.5.1. as an effective channel, firm and decisive, and that is necessary when you are in *control*. A second reason for a controller to switch to 'controlling parent mode' lies in the concentration that is needed to maintain the mental picture. All auditive and visual communication channels are occupied, extra interference is unwanted, which is communicated non-verbally, frown eyebrows, blank gaze, controlled muscle tone and, again, a parental tone of voice. All these signals clearly say: *do not disturb, I am concentrating*.

This change in intonation is not intentional, it is an automatic switch which comes with the dominant controlling parent ego state. This automatism is often useful, because our reactions are quick. It can also be dangerous in Air Traffic Control because in controlling parent ego-state we base our decisions and communications on proven facts in the past, which may incidentally differ from actual facts. So, controller, stay alert, actual information comes in through the adult ego-state!

7.5 Effective Communication Channels

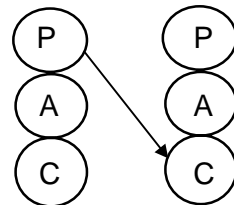
We can in fact identify the 4 main channels that give the greatest chance of successful communication. These are:

7.5.1 Controlling parent to adapted child



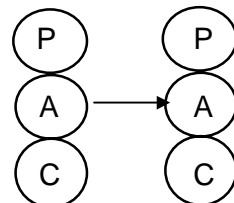
Use this when it is appropriate to be firm, to set out definite requirements or rules, to delineate boundaries - but make sure these really are justified and not just your personal preferences.

7.5.2 Nurturing parent to natural child



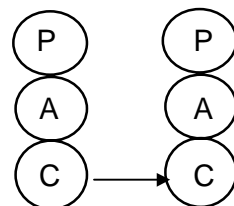
For encouraging someone to tackle new tasks, for reassuring them and for creating an atmosphere in which one feels secure enough to ask for help when encountering problems.

7.5.3 Adult to adult



This channel signals that you expect others to be able to think through problems, identify options, and discuss things in a reasonable way. It therefore invites others to ask questions, show initiative and take responsibility for their own work and the decisions they make.

7.5.4 Natural child to natural child



For being genuinely friendly, for creative brainstorming, for sharing the excitement of achievement with others and for celebrating success.

In summary: we identified 4 successful communication styles: firm, encouraging, problem solving and friendly. There are of course many more successful ways of dealing with others; we have chosen these easy-to-recognise ways to show the method of analysis of communication, transactional analysis. And as you have seen, our communication is closely linked to our personality, and knowing that is an enormous step in the understanding of the complexity of human interaction.

7.6 Application of Transactional Analysis

This introduction into Transactional Analysis doesn't mean to say that we should constantly analyse our communication, that would be practically impossible. It is a very handy tool, however, to analyse in less than a second important moments of interaction and to choose the right address to tackle the situation adequately.

Transactional Analysis is also known under the popularised title "I'm OK, you're OK"(Harris, 1975), and deals in its total presentation with much more than just communication. The reference list at the end of this document helps to find more detailed information. Most of Berne's work is published throughout the western world in more than 50 languages. Several Airlines in Europe have successfully based their Crew Resource Management programmes on the theory of Transactional Analysis.

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8. PHRASEOLOGY

8.1 Phraseology in ATC

The number of available communication channels between controllers and pilots is limited. Vast amounts of data are forwarded by automated links, but in spite of the many highly technical data networks the spoken word remains an important but unreliable carrier of information. Deficiencies and interferences in interpersonal communication have constituted a contributing factor in more than 70% of incidents in aviation (NASA, 1986).

The spoken word, and in a very restricted way the voice, are the only available carriers for interpersonal exchange of information. In controller pilot speak the natural quality of the voice is lost, and sender and receiver act in different environments with different needs and expectations. On top of that the concentration of both is shared with other tasks which have to be performed simultaneously. All effort to make spoken communication in ATC as reliable as possible should aim at making words and sentences simple and unambiguous - standard phraseology.

In aviation phraseology means the exchange of information by using words and phrases in a prescribed phonetic and grammatical way. Standard phraseology is mandatory and leaves no room for linguistic or stylistic creativity.

8.2 Universal Grammar

In linguistic research (Chomsky, 1968) it is assumed that the brain of a child is not blank with respect to the structure of language. This enables children to speak a language without learning the grammatical rules first. The structural similarities within many different languages are merely an accident - the human brain has a universal grammar at its disposal.

Most languages are built on a basic repertoire of common grammatical structures. The relation and order of subject-verb-object, for example, has a nearly universal validity. Our brain has certain expectations of the order in which words should come in. When different, a process of reorganisation takes place before the message can be understood. It is thus easier to understand a message when the syntax of words is according to the universal grammar in our brain. This applies especially to those who communicate in a foreign language, like many controllers and pilots.

Our standard phraseology grammar should therefore be as close as possible to the universal grammar of languages.

8.3 Sounds

Speaking is a physically generated composition of sounds. Sounds of speech are commonly characterised by sonority, intensity, aspiration, quantity and frequency. Relative to the mixing ratio of these characteristics speech is felt to be deep, bright, hard, soft, thin, masculine, sweet, etc. Two important human ingredients are intensity and frequency of sounds.

8.3.1 Intensity of sounds

The objective intensity of sound is measured in decibels, but each sound also creates a subjective intensity. Closed sounds or consonants are less intense than open sounds or vowels. You can hear this phenomenon in every OPS-room - some people are heard more easily than others, without being significantly louder. This is called individual speech intensity. Languages also have this speech intensity. Languages that are mainly composed of vowels sound more melodious than languages that are mainly composed of consonants. In aviation members of different language families exchange a lot of information, and they all communicate with their own linguistic origin. The prescribed rules and methods of phraseology deal with most of the linguistic deficiencies but standard phraseology has its limitations, especially in situations outside the routine. Clearly, there is no single solution to non-routine situations, but when language influences arise: carry out that readback process correctly!

8.3.2 Frequency of sounds

Another distinctive mark of a sound is its frequency. The frequency range of the human voice and hearing is between 16 and 20000 Hertz. Normal speech covers a range of about 150 to 5000 Hertz.

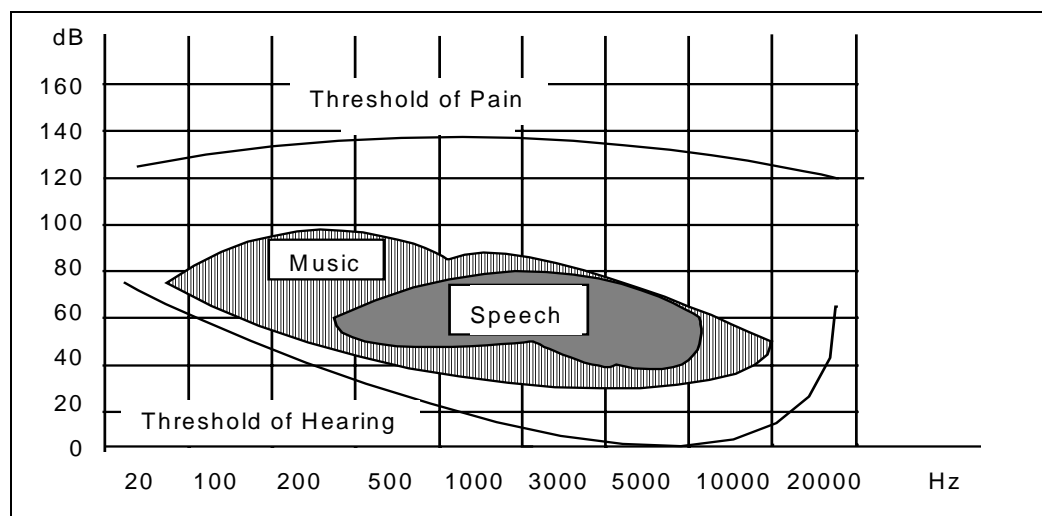


Figure 8: The Human Frequency Range

We hear less in the lower frequency band. That is why we experience a low-pitched voice to be less loud than a high voice of the same loudness. In R/T clear female voices are easier to understand than deep male voices. Open pronunciation (open your mouth widely and form the words at the tip of your tongue) does improve the quality of the dark voice.

8.4 Rate of Speech

We normally speak faster when under time pressure. This is indeed efficient in a normal conversation, when all communication channels are available, but there is nothing but the spoken word in R/T. In R/T the intelligibility of information actually decreases in direct proportion to the speed in which the information is transmitted. Quite a complicated process of coding and decoding takes place before a message is received and understood. This process is explained in chapter 3. The sender codes the information and sends a message, the receiver decodes the message into information. This process turns out to become extremely complex when the stock of signs of the sender is not compatible with the stock of signs of the receiver. In aviation this common stock of signs includes of course the list of words and phrases provided by the rules of phraseology, but it also includes the rate of speech.

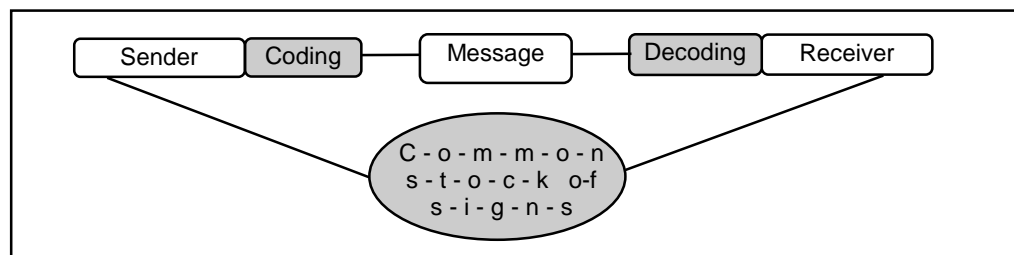


Figure 9: A common stock of signs includes the rate of speech

Deficiencies are inevitable when the rate of speech transmitted by the sender is higher than the rate at which the receiver can decode. The receiver is often unprepared or occupied with other tasks; nevertheless, many messages require immediate response or action. A slow rate of speech provides the best chance for understanding.

8.5 Training

Forced readbacks, open pronunciation, slow rate of speech, it all looks so simple. In practice, however, readbacks are time-consuming and slowly articulating wide-open mouths look pretty unnatural. The rule of 80 words per minute is a nice example. Who counts words while sitting in the hot seat? Impossible! But it is possible to train yourself in a rhythm of speech, the rhythm of 80 words per minute. Intensive training, in the ab-initio phase, but also in refresher training, should make these aspects an integral part of the professionalism in the job.

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