Development and Validation of a Serious Game Measuring Communication Styles

By

Eva Hendrika Margaretha Maria (E.H.M.M.) Verweij
445412

Master of Science Thesis, Work & Organizational Psychology

July 2022

ERASMUS UNIVERSITY OF ROTTERDAM

ERASMUS SCHOOL OF SOCIAL AND BEHAVIORAL SCIENCES

Master of Science, Work & Organizational Psychology

DEVELOPMENT AND VALIDATION OF A SERIOUS GAME MEASURING COMMUNICATION STYLES

ABSTRACT

Objective: To develop a comprehensive instrument - a Serious Game – assessing communication styles and Versatility by determining the reliability and construct, congruent, and face validity of the new measurement, as well as examining the relationship between communication styles measured in the Serious Game and personality.

Prior studies have shown the significance of effective communication within the workplace since it is crucial for organizations to function optimally and obtain set goals. There are several measurements of communication, however, existing literature has provided criticism and recommendations for the measurements of communication competence, indicating that the existing measurements include potential drawbacks. Moreover, we believe there is a greater demand for more challenging and engaging measurement. As a result, this study provides a novel approach to conquer the shortcomings for predicting and measuring communication styles: the Serious Game *CommOn!*, to assess workplace communication styles, drawing on the Social Styles Model (Merill & Reid, 1981) as a basis. The Serious Game was inspired by previous research and investigation on communication and its measures. Assertiveness, Responsiveness, and Versatility recognized four different quadrants of communication: Driver, Expressive, Amiable, and Analytical. To qualify the Serious Game as a scientifically

established measurement, this study shows its validation and reliability with 97 participants playing the Serious Game. The validation of the Serious Game simulation consists of examining its construct validity, together with its congruent validity in the prediction of communication styles compared to self- and other reports (360 degrees) and face validity.

CommOn! has been proven to be an effective learning game for partially evaluating communication skills and forecasting work success and job performance. Four moments of measurement were conducted to study the validity of the Serious Game. (1) A self-report scale on communication styles, (2) a self-report scale on personality, (3) The Serious Game (including perceived validity), (4) 360-degrees feedback tool/report. Using a sample of 97 players, hierarchical and stepwise regression analyses were conducted to test the study's hypotheses. The results indicate significant effects; Findings show that Responsiveness is correctly measured in the Serious Game, however future research should investigate the definition of Assertiveness and Versatility and the way it is being scored and measured in the Serious Game.

Index Terms: *Index Terms*: Serious Games, Communication Styles, Responsiveness, Assertiveness, Versatility, Personality

1.   Introduction

Communication is described as the process of transmitting meaningful thoughts, information, or feelings from one entity to the other to create a shared understanding, either in a written or oral form (Fano, 1949; Michels, 2010). Communicating can be done intentionally and unintentionally, verbally and nonverbally, and can involve signals, (bodily) gestures, writing, and/or speech (Michels, 2010; Velentzas et al., 2010; Velentzas & Broni, 2014). This transmission of information is considered as effective when the information conveyed is correctly understood by the receiver in the way the sender anticipated it (Velentzas & Broni, 2014). Fundamentally, communication is a crucial part of our daily lives, both on personal and professional levels (Hogard & Ellis, 2006; Waldherr & Muck, 2011). Especially within an organizational context, effective communication is important as all facets within an organization need to communicate with each other to achieve their common goals (Greenbaum et al., 1988). For example, when cooperating within a team, effective communication is needed irrespective of what position one is fulfilling to reach goals most efficiently (Grover, 2005; Leonard et al., 2004; Pratidina Susilo et al., 2013; Suter et al., 2009).

Communication is a multifactorial construct, with the majority of existing literature determining communication by the measurement of different communication styles (Bolton & Bolton, 2009; Darling & Walker, 2001; Eck, 2006; Oostrom et al., 2014). A communication style can be defined as an observable, recognizable, and stable pattern of behavior that characterizes the way an individual behaves in social situations (Eck, 2006; Ivanov & Werner, 2010; Leary, 1957; Merrill & Reid, 1981; Norton, 1978; Oostrom et al., 2014; Van Dijk, 2000). It is important and of added personal value to understand one's own communication style, since the way one interacts with another person influences how that person responds (Ivanov & Werner, 2010; Leary, 1957; Merrill & Reid, 1981; Oostrom et al., 2014). The most widely used communication styles model in practice is the Social Styles Model by Merrill and Reid (1981),

which is empirically supported by proving its relationship with personality (Bolton & Bolton, 2009; Darling & Walker, 2001; Oostrom et al., 2014; Wilson, 2004).

A considerable amount of research has been conducted into effective organizational communication and its significant favorable consequences (Bakar & Mustaffa, 2013; Hogard & Ellis, 2006). First, it is important to stress that communication and collaboration are inextricably linked; to collaborate successfully and constructively, one must first know how to effectively communicate with one another (Suter et al., 2009). When an organization can communicate effectively with employees at all levels, a fruitful cooperation is realized, which can then lead to subsequent employee satisfaction (Grover, 2005; Hargie, 2016; Hofstede et al., 2010; Husain, 2013). Additionally, effective communication results in more clarity in objectives, desires, and anticipations, which is necessary for achieving desired goals (Hargie, 2016; Merrill & Reid, 1981; Oostrom et al., 2014; Suter et al., 2009; Van Dijk, 2000). Moreover, organizations that implement effective communication procedures foster a more compelling work environment, which leads to increased job satisfaction among employees (Hargie, 2016). Additionally, effective communication encourages employee productivity and creativity and improves workplace relationships. Furthermore, it leads to a stronger sense of belonging, higher levels of trust and engagement, and improved relationships between employees and their direct supervisors (Hargie, 2016; Husain, 2013; Suter et al., 2009; Velentzas & Broni, 2014). To summarize, it can be stated that effective communication is the most crucial component for attaining intended objectives and necessary for fruitful collaboration and subsequent employee satisfaction (Grover, 2005; Hofstede et al., 2010). Due to the numerous benefits of effective communication stated above, organizations have been increasingly involved with this subject. As a result of this growing interest and significance, training and coaching programs concentrating on how to communicate effectively have emerged, intending to enhance organizational performance (Oostrom et al., 2014).

The importance of communication within the organizational context has been acknowledged and there are several measurements of communication that appear to be attractive and show significant outcomes. However, existing literature has provided criticism and recommendations for the measurements of communication competence, indicating that the existing measurements include potential drawbacks (Bakar & Mustaffa, 2013). The most frequently used methods to measure communication are self-reports and 360-degrees feedback reports (Hargie, 2016; Hargie & Tourish, 2009; McCroskey & McCroskey, 1988). Self-report allows respondents to use any constructs they wish in describing themselves (Paulhus & Vazire, 2007), whereas 360-degrees feedback reports aim to generate a 'full circle 'of information of one's performance, by indicating how one is perceived by others, such as colleagues, managers (Robertson, 2008). Self-report scales are limited as a tool for evaluating communication skills since they have minimal validity as indicators of competent communicative performances and are constrained by social desirability considerations (Holtgraves, 2004; McCroskey & McCroskey, 1988). The likelihood of the fundamental attribution error exists on 360-degree feedback scales, implying that the observer does not attribute other people its behavior to situational circumstances (Jones & Nisbett, 1971). Furthermore, the observer is most likely to only report the actions that directly influence him or her and has limited possibilities to observe the behavior.

To conquer the shortcomings associated with existing measurements and assessments of communication, this study introduces and developed a new way of measurement: a Serious Game predicting communication styles called *CommOn!.* A Serious Game is a form of a simulation, which is a digital replica of real-life work settings, used to measure and predict job behaviors and performance levels (Lievens & De Soete, 2012; Lievens & Patterson, 2011; Oostrom et al., 2010). The abilities, skills, knowledge, and performance within the Serious Game represent actual performance on the job, based on the assumption that behavior is

consistent throughout different situations (Dubbelt et al., 2015; Wernimont & Campbell, 1968).

Simulations in general are proven to be substantially more incrementally predictive in job behaviors than cognitive ability tests and traditional measurements. Next to that, they can measure a wider variety of constructs (Koczwara et al., 2012; Lievens & Coetsier, 2002). Moreover, it is found that players like to contribute to simulations, resulting in higher face validity and motivation (Hausknecht et al., 2004; Lievens & De Soete, 2012; Lievens & Sackett, 2006).

The aim of the current study is to establish construct, congruent, and face validity of the Serious Game *CommOn!*, as well as examining the relationship between communication styles measured in the Serious Game and personality. First, the construct validity of the Serious Game will be evaluated. This type of validity can be defined as whether the measurement, in this study the Serious Game, measures the correct constructs. Additionally, the scores of the Serious Game will be outlined and compared to the scores and judgment of the feedbackers, which is called the congruent validity. Furthermore, since studies have shown that being more prone to contribute and being motivated and entertained during the assessment are important arguments for the implementation of Serious Games (Hausknecht et al., 2004; Koczwara et al., 2012; Lievens & De Soete, 2012; Lievens & Sackett, 2006), this study examines whether the Serious Game resulted in high scores on face validity. This type of validity can be explained as the level to which participants feel like the Serious Game fairly measures communication styles and represents their actual abilities and skills. Lastly, this study intents to cross-validate empirical evidence for the structure of the communication styles within the Social Styles Model by exploring the relationship with personality. To realize this, part of the research conducted by Oostrom et al., (2014) will be retested, which supports that communication seems to be determined by personality. Before turning to the validity assessments and the replication study, a more detailed explanation of communication styles and Serious Games are offered.

2.   BACKGROUND

2.1   CHOICE OF MODEL / SOCIAL STYLES MODEL

Next to the Social Styles Model (1981) mentioned in the introduction of this study, there are several different models which measure communication styles. A well-known model that involves improvement of communication are Leary's Interpersonal Circumplex, also called Leary's Rose (Leary, 1957). In this paragraph, both the Social Styles Model and Leary's Rose will be discussed and compared. Furthermore, it will be explained why the Social Styles Model is the best fit for the Serious Game developed throughout this study. After highlighting the justification for this choice, the different communication styles including their characteristics are described in detail.

Leary's Rose is a commonly used circumplex model of inter-personal interaction (Leary, 1957; Van Dijk, 2000). The model provides understanding into the positions people take whilst negotiating with others during collaboration. Additionally, the model focuses on enhancing communication in hierarchical and unequal relationships. In such relationships, there are power differences between those considered to be 'subordinate 'and 'superior 'in the ranking order (Hofstede et al., 2010). The key supposition that Leary's Rose positioned is that the statements or reactions we give intuitively, are not always the most effective ones and can result in unproductive collaboration (Leonard et al., 2004; Pratidina Susilo et al., 2013). Just as proposed in Merrill and Reid's (1981) Social Styles Model, Leary's Rose also states that becoming alert of one's own ineffective answer makes it possible to react in a more effective manner (Leary, 1957; Pratidina Susilo et al., 2013; Van Dijk, 2000).

Leary's Rose distinguishes four types of basic behaviors that humans can take whilst discussing: above, below, together, and opposed behavior (see Figure 1). These behaviors are

based on two axes, representing the position in hierarchy and how the interaction is interpreted by the individuals involved. The first two opposites on the vertical axis include 'above', implying superior in hierarchy and dominance, and 'below', indicating subordinate in hierarchy and submission. The other two extremities on the horizontal axis are interacting 'together 'and acting 'opposed 'one another. An essential result of Leary's (1957) research is that behavior either provokes the same behavior or the exact opposite behavior (Leary, 1957; Van Dijk, 2000).

Within these four basic behaviors, additional distinctions are classified. These four positions can be classified into eight quadrants or communication styles: offensive/aggressive, competitive, leading, helping, cooperative, following/dependent, withdrawn, and defiant behavior. The theory states that a way to stimulate effective communication is by using more 'together 'behavior instead of 'opposed', since this leads to generating a mutual and shared purpose by both parties (Pratidina Susilo et al., 2013).
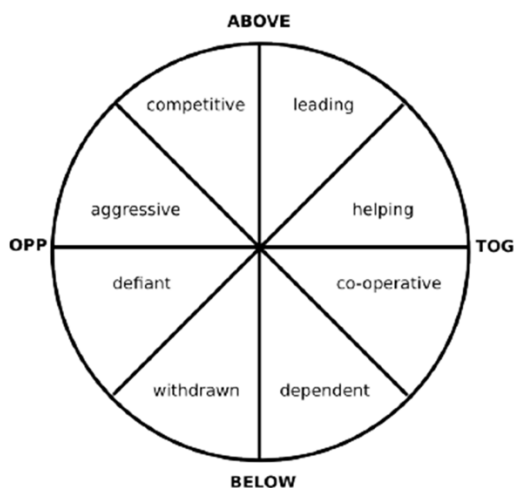
Figure 1. Leary's Rose Diagram (OPP is Opposed; TOG is Together)

Leary's Interpersonal Circumplex (Leary, 1957) is quite similar to the Social Styles Model since there is considerable overlap between the two; nevertheless, both models are

unique in several ways. There are three primary reasons why Leary's Rose was not used as theoretical basis in this study, and the Social Styles Model was used instead. To begin, Leary's Rose lists eight communication styles, although not all of them are considered equally successful. According to the theory, when a communication style is employed too strongly or intensely, communication becomes more difficult, and discussion participants may see the encounter as oppressive. This also applies in the opposite direction; if a style is utilized too 'softly', the relationship may appear reliant rather than initiatory. Therefore, Leary's Rose suggests that one way or mode of communication is superior to the other. However, every possible response in the Social Styles Model is neither right nor incorrect, if we are flexible enough to identify different communication styles in others and are conscious of our own (Merrill & Reid, 1981; Wilson, 2004). This is one of the reasons why Leary's Rose was left out of this study, but the Social Styles Model was included due to its equal view of efficacy across all communication styles. Second, the social styles model, which does not assign weightings to the different styles, is favored in a Serious Game since positive psychology is more intriguing and quantifiable. Finally, rather with Leary's Rose framing good communication attaining objectives and realizing poor communication causing annoyance, the Social Styles Model emphasizes more on (self)development and improvement of one's communication.

To decide what model is the best fit for this study, existing theory, measurability, validity, and model practicality have been considered. The latter is included, since the model should be able to be built into a two-dimensional Serious Game, model practicality is considered. Weighing all options, the Social Styles Model (Merrill & Reid, 1981) will be used as theoretical framework for this study and as the basis in order to create the game. It has been scientifically proven to be the best model for predicting communication styles in practice. Accordingly, the Social Styles Model (Merrill & Reid, 1981) is the greatest fit for our Serious

Game since it can be implemented and used as a practical training and developmental theory to detect and enhance individuals' communication skills.

2.2   COMMUNICATION STYLES

According to the Social Styles Model, we communicate with others in the way we want to be communicated with, yet this does not always result in effective conversations (Merrill & Reid, 1981). This happens since whilst communicating, we are satisfying our own communication requirements, instead of those of others. To address the communication needs of someone else, we should interact with others in the way they like to communicate. By slightly adapting our own communication style to the style of the other, we are able to satisfy the communication needs of the other person. In turn, effective communication is more likely to occur if one is aware of one's own communication style together with that of the other, as well as being able to distinguish these different styles (Leary, 1957; Merrill & Reid, 1981; Oostrom et al., 2014). It is important to stress out that even though a person can adjust one's own communication style in order communicate effectively with the other person, the initial and prevailing communication style will always be the dominant one (Ivanov & Werner, 2010; Leary, 1957; Merrill & Reid, 1981; Oostrom et al., 2014; Van Dijk, 2000).

The Social Styles Model is divided into two main behavioral dimensions: a horizontal axis for *Assertiveness* and a vertical axis that represents *Responsiveness* (Merrill & Reid, 1981). In order to influence the behavior and actions of one's conversational partner, one can vary between the levels of Assertiveness and Responsiveness. *Assertiveness* refers to the degree in which one takes up or gives up space in terms of speaking. This construct also refers to the level in which an individual communicates in a dominant and confident manner. The more dominant one communicates and the more space one takes up, the more assertive that individual is (Merrill & Reid, 1981; Waldherr & Muck, 2011). In terms of how we occupy

space, there are two extremes on the spectrum: *Asking* (less assertive) and *Telling* (more assertive). Demonstrating empathy, being cooperative, Asking questions, carefully listening to the other person, and using the words 'we 'or 'us 'are all examples of communication through *Asking*. Adjectives such as reserved, unaggressive, and easygoing can describe less assertive individuals. Regarding nonverbal cues, less assertive types speak slower and softer not making many statements, with their hand usage being relaxed. On the other side, communicating in a *Telling* manner entails talking a lot, taking initiative, utilizing loudness, making a position clear to others, and speaking in the 'I' form. Words that describe a more assertive individual are active, demanding, ambitious, and forceful. Concerning nonverbal cues, less assertive types speak faster and louder making a lot of statements, with making direct eye contact and pointing at others.

Responsiveness is defined as the degree to which one is open or closed about displaying feelings and emotional responses during a conversation (Merrill & Reid, 1981; Waldherr & Muck, 2011). There are two extremes on the spectrum in how we communicate our feelings towards others: *Controlling* (less responsive) and *Emoting* (more responsive). A *Controlling* person is characterized by being critical, precise, and wanting to get things done efficiently. Nonverbal cues for a less responsive person are a quiet monotone voice, calm body posture, and restricted arm motions characterize controlled communication. Adjectives used to describe these individuals are cautious, intellectual, and serious. They are viewed as people who are unconcerned with other people's feelings and make judgments based on data, logic, and processes. They like to concentrate on activities rather than people, and they seek acceptance via accomplishment. On the other hand, an *Emoting* person is characterized as attention-seeking, impulsive, and playful. Behavioral nonverbal cues of being more responsive includes a wide range of facial expressions, talking about feelings, and making various bodily movements. The more Emoting one is, the more one shows their feelings. Adjectives used to

describe these individuals are warm, emotional, and lighthearted. They are often involved with the feelings of others and care about relationships with others and seek acceptance via social acceptance.

The level of degree of Assertiveness and Responsiveness can be used to describe four different patterns of behavior, or called communication style: *Driver* (high Assertiveness, low Responsiveness), *Expressive* (high Assertiveness, high Responsiveness), *Analytical* (low Assertiveness, low Responsiveness), *Amiable* (low Assertiveness, high Responsiveness), visualized in Figure 2. It is important to stress out that none of the four quadrants is better in communication than the other; with all styles one can complete effective conversations. The same accounts for whether one communicates in an Asking, Telling, controlled, or Emoting way (Merrill & Reid, 1981). The *Driver* style is a combination of a *Controlled* and *Telling* way of communicating. One who has a Driver style can quickly take the lead, is efficient and results-oriented, is concise and to-the-point, and displays minimal personal emotion. Characteristics of the *Expressive* style are motivating others, speaking fluently and in an enthusiastic manner, being driven, and expressing emotions straightforwardly. This is a combination of *Telling* and *Emoting*. The *Amiable* style is a mixture of *Asking* and *Emoting*; this individual listens actively, passes the initiative to the other person, and enjoys collaborating. Lastly, working in an organized and exact manner, delivering quality, and seeking clarity before giving an opinion are all characteristics of the *Analytical* style. This is a combination between a *Controlling* and *Asking* way of communication.

```
                          Emotes
                            ↑
                            │
                      HIGH RESPONSIVENESS
                            │
        ┌──────────┐        │        ┌──────────┐
        │ Amiable  │        │        │Expressive│
        └──────────┘        │        └──────────┘
                            │
 Asks ←────LOW ASSERTIVENESS─┼─HIGH ASSERTIVENESS────→ Tells
                            │
        ┌──────────┐        │        ┌──────────┐
        │Analytical│        │        │  Driver  │
        └──────────┘        │        └──────────┘
                            │
                      LOW REPSONSIVENESS
                            │
                            ↓
                        Controls
```
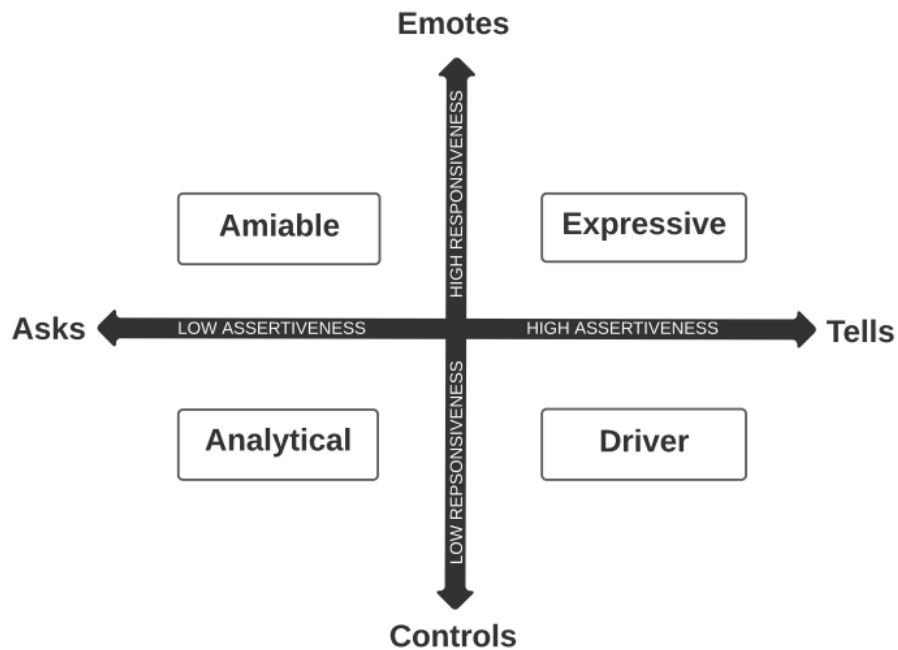
Figure 2. Visualization of the Social Styles Model by Merrill and Reid (1981)

The Social Styles Model also proposes that the more aware one is of their own behavior and communication and its effects, the more flexibly one can respond to the other person (Leary, 1957; Merrill & Reid, 1981; Snavely, 1981). This third dimension of human behavior is introduced as the concept *Versatility* (Merrill & Reid, 1981; Wilson, 2004). Versatility is the willingness to understand and be open to the communication style of others and the degree to which a person makes an effort to meet the others' expectations without deviating from own views (Bolton & Bolton, 2009; Darling & Walker, 2001; Dubbelt et al., 2015; Merrill & Reid, 1981; Oostrom et al., 2014; Snavely, 1981; Wilson, 2004). It is the capacity to adapt to different styles and effectively manage relationships. The more versatile a person is, the more likely they are to be found across the whole spectrum of Assertiveness and Responsiveness scales, and the more endorsement – or approval – one receives from others irrespective of the style (Dubbelt et al., 2015; Merrill & Reid, 1981; Oostrom et al., 2014; Suter et al., 2009). It is believed that Versatility can be learned and developed, and that Versatility is situation specific (Heldeweg et al., 2010). However, according to Waldherr and Muck (2011), Versatility is not an additional

dimension within the model, but rather an indicator of the way in which the various social styles are used. Choosing the best suitable communication style that is most effective and appropriate depending on the person one is communicating with, is a vital factor of effective communication skills.

2.3   SERIOUS GAMES

There is a high need for technical advancements and new assessment techniques in the sphere of training, learning, and coaching (Eck, 2006; Lievens et al., 2002; Lievens & Sackett, 2006). A real-life simulation, also called a Serious Game, is one example of such a new measurement. As demonstrated by the literature, Serious Games are of rising importance in the game development industry and are employed as selection or learning aids by human resources organizations (De Freitas, 2006; Dubbelt et al., 2015). Serious Games have piqued the interest of the gaming industry and academic literature for more than a decade, and they are quickly expanding (Bente & Breuer, 2010; Girard et al., 2013; Laamarti et al., 2014). They can be used as assessment and measurement tools are constantly becoming more of a contribution to the worldwide learning and training market (Bente & Breuer, 2010; Corti, 2006; Eck, 2006; Girard et al., 2013; Lievens et al., 2008; Ratan & Ritterfeld, 2009). The games market is taken over by such Serious Games and simulations, since they are proven to be effective tools for improving learning and therefore becoming more popular (Bente & Breuer, 2010; Eck, 2006; Girard et al., 2013). Furthermore, the digital world's development and the advent of social networks are projected to create substantial growth prospects for the Serious Games business in the future years (Eck, 2006). Thus, it is critical to continue to create methods for conducting evaluations not just offline but also online, taking into consideration the limitations imposed by COVID-19, which has resulted in a reduction in face-to-face assessments (Rijsdijk et al., 2021).

Serious Games are digital games, or virtual worlds, that allow players to participate in activities through a responsive storyline, gameplay, or interactions in order to instruct, influence, or communicate meaning (Marsh, 2011). They are innovative ways to assess knowledge, skills, and capabilities that are required in actual work context but can be predicted in an online environment (Bente & Breuer, 2010; Corti, 2006; Eck, 2006; Lievens & De Soete, 2012). They offer users with virtual situations in which they must utilize certain skills and tactics to achieve specific objectives (Bente & Breuer, 2010; Corti, 2006; Eck, 2006; Lievens & Patterson, 2011). The games are designed to assess a player's judgment in a work environment by Asking them to answer questions about viable solutions to various work-related events (McDaniel et al., 2001; McDaniel & Nguyen, 2001). Individuals' knowledge and abilities are then evaluated based on the decisions they make in the game and how they deal with the repercussions of their decisions (De Freitas, 2006). These decisions made will be a reliable mirror of actual work behavior, according to the idea of behavioral consistency (Wernimont & Campbell, 1968). In this way, Serious Games can be characterized as simulations of the real world that can predict work success, therefore are also called replicas of the real work context (Dubbelt et al., 2015; Lievens & De Soete, 2012). When completing a Serious Game, it can have constructive effects on the learners 'development of skills focused at in the game (Corti, 2006; Eck, 2006; Lievens & De Soete, 2012; Lievens & Sackett, 2006; Susi et al., 2007).

A substantial number of studies have been performed focusing on Serious Games and its significant favorable benefits compared to the traditional measurement of knowledge, skills, and capabilities. First, Serious Games are perceived as more enjoyable and valid by players compared to their pen-and-paper counterparts, and candidates' reactions to simulations are frequently more favorable than their responses to cognitive ability tests (Koczwara et al., 2012). It is also found that players like to contribute to Serious Games, resulting in higher face validity

and motivation (Hausknecht et al., 2004; Lievens & De Soete, 2012; Lievens & Sackett, 2006). Furthermore, simulations in general are proven to be substantially more incrementally predictive in job behaviors than cognitive ability tests and traditional personality measurements. Next to that, they can measure a wider variety of constructs (Koczwara et al., 2012; Lievens & Coetsier, 2002). Moreover, a Serious Game is less fakable since Serious Games are intellectually more challenging compared to personality tests and self-reports (Lievens & De Soete, 2012; Nguyen et al., 2005). In addition, results show that Serious Games show low adverse impact rates (McDaniel & Whetzel, 2007). Regarding practicality, it is found that Serious Games are easily accessible and can be distributed easily on the Internet (Lievens et al., 2008; Lievens & De Soete, 2012). Next to that, Serious Games can simulate real-life scenarios that are impossible to replicate in the physical world owing to high prices, time restrictions, logistics, and safety concerns. Additionally, there is also the option of including photo, video, and audio fragments in a Serious Game, making the game more true-to-life and interactive (McDaniel & Whetzel, 2007; Shute et al., 2009). However certainly, there are drawbacks to Serious Games. Because of the intricacy of the simulations and the fact that questions are presented in context, validating the game can be difficult (Funke, 1998). They are also more expensive to create than their non-digital equivalents (Lievens & Sackett, 2006). This study aimed to establish the construct validity, congruent validity, face validity and replicate the relation between communication and personality of a Serious Game.

3. CURRENT STUDY

The general aim of this research is to examine the effectiveness of the serious *CommOn!*. This general aim can be broken down in four specific objectives. The construct, congruent, and face validity of our Serious Game, together with replicating the findings of the relation between personality and communication styles are examined. First, the construct validity of the Serious Game that was created to measure one's communication style will be determined. The scores

of the Serious Game on the four different styles, together with the three dimensions Assertiveness, Responsiveness, and Versatility are compared to the scores of a recognized self-report measurement of these components together with personality, such as the Communication Style Questionnaire and the Big Five model-based personality questionnaire (Goldberg, 1992). The latter is translated into a 360 degrees feedback report as well in order to examine the congruent validity. The theories' theoretical bases are provided below.

3.1   COMMUNICATION STYLES AND PERSONALITY

The relationship between Communication Styles and personality (the Big Five model-based personality questionnaire) is studied to further evaluate the Serious Game's construct validity. Personality characteristics are recurring patterns of thoughts, feelings, and behavior that correspond to a person's motivation, objectives, and social roles (Dweck, 2017; R. R. McCrae & Costa, 1995). Waldherr and Muck (2011) stress out that it is found that personality traits are genetically determined (Galton, 1949; McCrae & Costa, 1989). Individuals act in manners that are compatible with their genetic predispositions, resulting in distinctive adaptations. These adaptations are strongly related to an individual's motives and social roles, and involve patterns of thoughts, feelings, attitudes, and behavior. These adaptations are influenced by external (situational) stimuli such as upbringing, childhood, culture, and social conventions (Goldberg, 1993; McAdams & Pals, 2006; McCrae & Costa, 1989). Individual adaptations affect one's behavior and, as a result, the communication styles used or Versatility expressed (McCrae & Costa, 1989; Merrill & Reid, 1981). However, according to Merrill and Reid (1981), communication styles are learnt and therefore unrelated to personality. On the contrary, several other studies state that personality is an important underlying predictor of communication styles (McCrae & Costa, 1989; Oostrom et al., 2014; Sims, 2017; Trapnell & Wiggins, 1990). The existing study focuses on communication styles within the Social Styles Model (Merrill & Reid, 1981) in the organizational context and its relationship with personality. In total, seven

personality traits are measured in this study. First, the Big Five personality traits are measured: Extraversion (e.g., talkative, adventurous, energetic), Agreeableness (e.g., honest, loyal, patient), Conscientiousness (e.g., persistent, orderly, controlled), Stability (e.g., confident, coping with stress, resilient), Openness to Experience (e.g., insightful, alert, intellectual) (Goldberg, 1990; McCrae & Costa, 1989). Next to these Big Five personality traits, two other traits are measured: Core Self-Evaluations (e.g., adjusts easily, optimistic, self-assured, productive and believes in one's own agency) and Honesty-Humility (e.g., sincere, fair versus greedy and pretentious) (Ashton & Lee, 2005; Judge et al., 1998). Self-esteem, generalized self-efficacy, locus of control and non-neuroticism are four well-established traits that together make up the higher-order characteristic known as Core Self-Evaluations (Judge et al., 1998). Honesty-Humility is proposed as the sixth factor of personality, where other literature also refers to it as "modesty" (Ashton & Lee, 2005). Lastly, Self-Presentation is examined in this study in addition to these seven personality qualities. A person's Self-Presentation reflects their capacity, aspirations, and level of self-assurance (Van der Linden et al., 2011). This personality trait is conceptualized as being eager to be dominant, active, goal-oriented, and self-assured (van de Ven et al., 2017). Since high levels of self-esteem and well-being are related to the General Factor of Personality (GFP) and this construct represents general social effectiveness, studies state that the GFP is linked to Self-Presentation (Dunkel & Van der Linden, 2014; Musek, 2007).

3.1.1 EXTRAVERSION

It has been discovered that Extraversion is the most important predictor of high levels of Responsiveness, from now on referred to as Emoting. This implies that an extravert is more open about one's personal sentiments and emotional responses to communication compared to one who is introvert (McCrae & Costa, 1989; Oostrom et al., 2014; Trapnell & Wiggins, 1990). An individual who is amusing and talkative, who easily establishes contact with others and

enjoys meeting new people, is more likely to express the show in a discussion, speaks with passion, uses non-verbal gestures and uses a lot of words (Heldeweg et al., 2010; Karadağ & Kaya, 2019; Kottawatta, 2019; Oostrom et al., 2014). In addition, Extraversion also predicts higher levels of Assertiveness, from now on called Telling. This indicates that the greater the level of Extraversion, the more one occupies space in the way of communication (Heldeweg et al., 2010; McCrae & Costa, 1989; Oostrom et al., 2014; Sims, 2017). This means that an individual who easily takes the initiative in conversations, takes a clear position in a discussion, and speaks in a forceful and direct way tends to be more extravert (Heldeweg et al., 2010; Kottawatta, 2019; Oostrom et al., 2014). Since there is little literature available on the relationship between Extraversion and the four communication styles Expressive, Driver, Analytical, and Amiable, this is further investigated through exploratory research. Looking at the dimensions of Responsiveness and Assertiveness, Extraversion is expected to have positive relationship with the Expressive communication style measured in the Serious Game.

Hypothesis 1: Extraversion will be positively related to high levels of Responsiveness (Emoting; H1a), high levels of Assertiveness (Telling; H1b) and the Expressive communication style (H1c)

3.1.2 AGREEABLENESS

It has been shown that high levels of Agreeableness have a significant negative relation with Telling, or high levels of Assertiveness (Oostrom et al., 2014). This indicated that the more agreeable one is, the less assertive one appears to communicate. It is possible that individuals with high Assertiveness scores are more domineering, which lowers their Agreeableness scores (Norton & Warnick, 1976). In addition, high levels of Agreeableness predict active-empathic listening, which is in line with the finding that the more agreeable one is, the more space one

gives to others and shows empathy in conversations (Magalhães et al., 2012; Sims, 2017). Furthermore, a person with a high degree of Agreeableness is more willing to meet the other persons 'expectations and shows attentiveness whilst communicating (Leung & Bond, 2001; McCrae & Costa, 1989; Oostrom et al., 2014). In other words, it can be expected that high levels of Agreeableness have a significant positive relation with low levels of Assertiveness, which is referred to as Asking. Agreeableness is found to be positively related to Versatility, which can be explained by the fact that a cooperative mindset and the preparedness to help others (Agreeableness) make a person more flexible in communication (Oostrom et al., 2014). Next to that, since there is little literature available on the relationship between Agreeableness and the four communication styles Expressive, Driver, Analytical, and Amiable, this is further investigated through exploratory research. Looking at the literature available regarding the dimensions of Responsiveness and Assertiveness and the relationship with Agreeableness, it is anticipated to have a favorable association with the Amiable communication style and a detrimental relationship with the Driver style as measured in the Serious Game.

Hypothesis 2: Agreeableness will be negatively related to high levels of Assertiveness (Telling; H2a) and the Driver communication style (H2b), and positively related to Versatility (H2c) and the Amiable communication style (H2d)

3.1.3 CONSCIENTIOUSNESS

People with high Conscientiousness scores are perceived as goal-oriented and have strong self-efficacy for achieving their objectives (McCrae & Costa, 1995). Next to that, people that are high in Conscientiousness are ambitious, active, and strong-willed. Therefore, conscientious individuals are prone to employ assertive communication to attain their objectives (Bouchard et al., 1988; Kirst, 2011). According to several studies, there has been found a significant

positive relationship between Conscientiousness and Telling, or high levels of Assertiveness (Sims, 2017). Next to that, Conscientiousness is the highest predictor of high levels of Assertiveness compared to the other Big Five personality traits (Bagherian & Mojambari, 2016). Furthermore, the association between mean Conscientiousness and team performance is revealed to be favorably mediated by communication (Macht & Nembhard, 2015). Based on the literature existing around the Driver communication style, it is expected that this style correlates with Conscientiousness due to the similarity of characteristics, such as goal-orientation and being strong-willed and not afraid to share one's opinion.

Hypothesis 3: Conscientiousness will be positively related to high levels of Assertiveness (Telling; H3a) and to the Driver communication style (H3b)

3.1.4 STABILITY

Someone who scores high on Stability can be described as confident and resilient, including that one can cope with stress easily (McCrae & Costa, 1995). It is important to note that Stability is the opposite pole of Neuroticism, however, the term "Stability" is employed in further stages of this study including the measurements used. Findings of the research conducted by Riggio and Riggio (2002) demonstrated that self-reported measures of emotional expressiveness – which is the nonverbal expression of emotions - are positively associated with neuroticism. Since Responsiveness is defined as the degree to which one is open or closed about displaying feelings and emotional responses during a conversation (Merrill & Reid, 1981; Waldherr & Muck, 2011), the definition of 'emotional expressiveness 'is interpreted as Responsiveness. If it is expected that the relation between neuroticism and high levels of Responsiveness is positive, then in turn, the relationship between Stability and high levels of Responsiveness, thus Emoting, is expected to be negative. Furthermore, Stability is expected

to be positively related to Versatility, since someone who is steady, comfortable, and carefree is less obsessed with themselves and more engaged with the other person in the discussion (McCrae & Costa, 1989).

Hypothesis 4: Stability will be negatively related to high levels of Responsiveness (Emoting; H4a) and positively to Versatility (H4b)

3.1.5 OPENNESS TO EXPERIENCE

Openness to Experience is a domain that describes a person's curiosity and liberal or conservative outlook on life. Therefore, it is plausible that Openness to Experience is positively related to Versatility given that when one is open to the views and perspectives of other, one will also be open to other communication styles (Cassandro & Simonton, 2010; Goldberg, 1990; McCrae & Costa, 1989). However, Oostrom et al., (2014) found a negative relationship between Versatility and Openness to Experience. The study explains this on the basis that openness can be divided into two parts, also called facets: openness to both internal and external experiences. It is found that the facets autonomy and imagination were negatively related to Versatility, whereas the facet open-mindedness was positively related to Versatility. This seems reasonable to assume considering that individuals who score high on autonomy are resistant to conforming to others 'opinion (Negatu, 2009). Thus, based on the literature available, this study still expects high levels of Versatility to be favorably correlated with Openness to Experience.

Hypothesis 5: Openness to Experience will be positively related to Versatility

3.1.6 CORE SELF-EVALUATIONS

Self-esteem, generalized self-efficacy, locus of control, and non-neuroticism are four well-established traits that together make up the higher-order characteristic known as Core Self-Evaluations (Judge et al., 1998). Characteristics of one who scores high on Core Self-Evaluations are having a positive mindset, self-confidence, efficacious, and believing in oneself. As explained in Judge and Kammeyer-Mueller (2011), people with high Core Self-Evaluations levels can be portrayed as having the certainty and assertiveness to adjust modern organizations and generate positive change. Furthermore, it has been found that CEOs that employ higher levels of core self-evaluation have a greater confidence in their ability to generate impact when being challenged and do not avoid risk-taking behavior (Carnahan et al., 2010). This may further substantiate the positive relationship between Core Self-Evaluations and Assertiveness, as the ability to express oneself and defending it is an important part of the definition of Assertiveness (Bagherian & Mojambari, 2016). Therefore, it is expected that Core Self-Evaluations will be favorably associated with Telling, or high levels of Assertiveness.

Hypothesis 6: Core Self-Evaluations will be positively related to high levels of Assertiveness (Telling)

3.1.7 HONESTY-HUMILITY

If one has high levels on the Honesty-Humility scale, this can be interpreted the same as having high levels of modesty or being humble. The relationship between modesty and Assertiveness has been investigated in several studies, which have shown that Assertiveness is directly opposed to humility and modesty (Omura et al., 2018), defined as a counterbalance to Assertiveness (Means et al., 1990), or conceptualized as "a lack of assertiveness" (Van Tongeren et al., 2014). Building on these findings, it is expected there will be another negative

relationship: between Honesty-Humility and the Driver communication style. This is because high levels of Assertiveness (Telling) are tied to the characteristics of the Driver communication style, such as taking the lead and being concise. Furthermore, since a lot of characteristics of the Amiable communication style overlap with being modest and humble, it is expected that Honesty-Humility will be positively related to this communication style.

Hypothesis 7: Honesty-Humility will be negatively related to high levels of Assertiveness (Telling; H7a) and the Driver communication style (H7b), and positively to the Amiable communication style (H7c)

3.1.8 SELF-PRESENTATION

Self-Presentation, how self-confident one portrays him or herself to the outside world (Hiemstra et al., 2011; Serlie, 2011), is found to have a favorable relationship with high levels of Assertiveness, or Telling (Oostrom et al., 2014). This can be explained by the virtue of when having a dominating attitude and strong self-confidence, this can contribute to an assertive attitude at work and result in taking up a lot of space in a conversation (Hiemstra et al., 2011; Merrill & Reid, 1981). Since there is little literature available on the relationship between Self-Presentation and the four communication styles Expressive, Driver, Analytical, and Amiable, this is further investigated through exploratory research. Looking at the literature available regarding the dimensions of Responsiveness and Assertiveness and the relationship with Self-Presentation, it is expected to have positive relationship with the Expressive communication style measured and a negative relationship with the Amiable style in the Serious Game.

Hypothesis 8: Self-Presentation will be positively related to high levels Assertiveness (Telling; H8a) and the Expressive communication Style (H8b), and negatively with the Amiable communication style (H8c)

Given the relationships found, communication styles seem to be determined by personality. Consequently, it is interesting to investigate what exactly the connection is between personality and one's communication style measured in a Serious Game, which is why this is also included in the current study. This paper aims to replicate the findings described above and to cross-validate empirical support for the structure of the communication styles measured with a Serious Game by relating them to personality.

3.2 CONSTRUCT VALIDITY

The majority of measurements for assessing overall communication were initiated in the 1970s and were focused on western organizational environments (Bakar & Mustaffa, 2013; Greenbaum et al., 1988). The Organizational Communication Questionnaire (OCQ), which measures communication within organizations, is an example of such an instrument (Roberts & O'Reilly, 1974). Another illustration is the Wiio and Helsila (1974) LTT communication audit questionnaire, which gauges general communication satisfaction. In addition, the Communication Audit Survey Questionnaire was created by Goldhaber and Rogers in 1979. (CAS), which was used to assess the accessibility of information and the communicational relationship. The correct use of validated methodologies for measuring and monitoring communications is of high importance for business success (Hargie & Tourish, 2009). However, despite the fact that these measurements appear to show significant outcomes, they received criticism (Bakar & Mustaffa, 2013). The most important recommendation for improvement is regarding the fact that in general self-reports frequently involve a gap between

what a person's beliefs and thoughts versus a person's actual knowledge on their own communication skills. This gap reduces the predictive validity of this type of measurement (McCroskey & McCroskey, 1988). Therefore, this study intents to broaden the spectrum of communication measurements, based on the assumption that solely relying on self-reports as indicators of the ability to communicate is considered to be insufficient. Since the aim of this study is to develop a measurement which can predict actual communication performance in the workplace, the Serious Game would be an improved measurement tool for measuring communication styles. It is expected that the construct validity of the Serious Game will be high, inclining that the feedback report and the self-report measure the same constructs as the Serious Game. Next to that, based on existing literature, it is assumed that the four communication styles correlate with the corresponding levels of Responsiveness and Assertiveness as visualized in Figure 2.

Hypothesis 9: As measured with the Serious Game, low levels of Responsiveness (Controlling) have a negative relation with the Expressive (H9a) and Amiable communication style (H9b), and a positive relation with the Driver (H9c) and Analytical communication style (H9d)

Hypothesis 10: As measured with the Serious Game, low levels of Assertiveness (Asking) have a negative relation with the Expressive (H10a) and Driver communication style (H10b), and a positive relation with the Amiable (H10c), and Analytical style (H10d)

Hypothesis 11: There are significant relations between Responsiveness (H11a), Assertiveness (H11b), and Versatility (H11c) as measured with the Serious Game and as measured with the self-report and feedback-report, indicating high construct validity

3.3 CONGRUENT VALIDITY

To examine the congruent validity, the relation between the Serious Game and the 360 feedback reports is studied. It is explored whether the 360 report produces similar results as the Serious Game. The Big Five model-based personality questionnaire (Goldberg, 1990) is translated into the 360 degrees feedback report for this examination. The 360 reports will be used to investigate whether participants in the game have a respectable self-image of their own way of communicating and whether this corresponds with the image of the feedback-givers. The congruent validity of a Serious Game measuring communication styles has not been studied before. It seems plausible that both the self-report and the 360-degrees report will share overlap, and the scores of both measures will be examined to determine congruent validity. Because self-evaluations may be fulfilled in an exaggerated manner compared to ratings supplied by others (Mabe & West, 1982), there may be a difference between the scores on self and 360-reports. Some feedback may be more negative than their own perceptions, a phenomenon known as overestimation. However, it is found that when the self-report or feedback report allows people to answer in a fully anonymous or confidential way, this will lead to increased honesty and less social desirability.

Hypothesis 12: There is a positive relation between Responsiveness (H12a), Assertiveness (H12b), Versatility (H12c), Analytical (H12d), Amiable (H12e), Driver (H12f), and Expressive (H12g) as measured the Serious Game and as measured with the 360-degrees feedback-report, indicating high congruent validity

3.4 FACE VALIDITY

The main purpose of simulations in general is to incorporate education and joyful learning into several facets of an organization (Bente & Breuer, 2010). Despite their learning and developmental focus, players enjoy participating in Serious Games, according to existing

evidence (Hausknecht et al., 2004; Lievens & De Soete, 2012; Lievens & Sackett, 2006). It is

"a game in which education (in its various forms) is the primary goal, rather than entertainment"

(Michael & Chen, 2006). The basic concept of a Serious Game in this study is a learning tool

that uses gaming technology to achieve learning objectives other than pure entertainment,

where the term "serious" goes beyond just playing games for enjoyment (Alvarez & Michaud,

2008; Bente & Breuer, 2010; De Freitas, 2006; Eck, 2006; Stapleton, 2004). However,

perceiving Serious Games as entertaining is intuitively conflicting since learning is often

associated with working (or unpleasantness) and not with playing (or fun; Bente & Breuer,

2010). However, the playing and learning do share some characteristics: both often take a long

time to complete, are difficult to understand, and hard to be an expert in. Playing and learning

are interactive processes and challenge the learner or player. Nevertheless, people do like to

play games, but rather avoid learning complex concepts (Bente & Breuer, 2010; Mitgutch,

2009). The fact that Serious Games are experiences as enjoyable is even more contradictory

given that playing a Serious Game necessitates learning, determination, and motivation to

devote time and resources which is experienced as unlikeable in other context (Bente & Breuer,

2010).

Serious Games are entertaining despite their learning-form, due to their high levels of

interactivity. Games that continuously call for input, effort, and interaction from the learner or

player are considered engaging and fun (Bente & Breuer, 2010; Corti, 2006; Eck, 2006;

Lievens & De Soete, 2012; Ratan & Ritterfeld, 2009). Next to interactivity, the growing

positive reputation and acceptance of Serious Games is based on three main reasons: (1) the

scientific proven power of learning games, (2) the consumer who has lost interest in

traditional learning, and (3) the amplified popularity and reputation of games (Bente & Breuer,

2010; Corti, 2006; Eck, 2006; Stapleton, 2004). Serious learning games are recognized as

effective and appealing valid learning tools to maximize one's performance, broadening the

vision that games are solely for entertainment purposes (Eck, 2006). They can be regarded as providing real, meaningful, and impactful learning environments (Stapleton, 2004). Serious Games trigger curiosity, competition, individual challenge, and collaboration in players, and when combined with media such as videos and other images via 2D or 3D immersion, participants are more motivated to accomplish complex or sometimes even mind-numbing activities (Lobel, 2016).

To summarize, participants like contributing to Serious Games, which leads to increased face validity and motivation (Hausknecht et al., 2004; Lievens & De Soete, 2012; Lievens & Sackett, 2006). Players find Serious Games to be more entertaining and legitimate than their paper-and-pencil equivalents, and candidates' reactions to Serious Games are typically more favorable than their replies to cognitive ability tests (Koczwara et al., 2012). Next to that, participants may not always regard communication surveys to be work-related, and face validity and test-retest reliability are generally low (Greenbaum et al., 1988; Lievens & De Soete, 2012). The following hypothesis is conducted based on existing literature:

Hypothesis 13: it is expected that on average the face validity scores of the Serious Game will be higher than a three on a five-point Likert scale

4. DEVELOPMENT OF THE SERIOUS GAME: *COMMON!*

Our Serious Game created for this study shares the most characteristics with a situational judgment test (SJT). The main objective of an SJT is the same as the goal of Serious Games; predict how well an individual may perform on a job depends on how a person performs during a job simulation (McDaniel et al., 2001; McDaniel & Nguyen, 2001). SJTs measure an applicant's judgment concerning presented hypothetical job-related based scenarios, who evaluated potential replies after making judgments about them and scored them using a specified scoring key (Lievens et al., 2008). Test fidelity, which is the degree to which the

scenarios accurately mimic real-life work circumstances, varies amongst SJTs (McDaniel & Whetzel, 2007). We distinguish between two types of fidelity: high and low fidelity simulations, with the latter being employed in this work. SJTs are adaptive and versatile in their presentation; in low-fidelity simulations, scenarios and scenes are provided in writing with photo-based graphics, whereas in high-fidelity testing, the situation is conveyed through videos (Lievens & De Soete, 2012). Low-fidelity evaluations offer the participant with a variety of work-related scenarios in which they must make several decisions (McDaniel & Whetzel, 2007). The players 'task is to indicate the most appropriate fictive answer option that best matches their real-life reaction (Lievens & De Soete, 2012; McDaniel & Nguyen, 2001). In turn, the items selected decide the simulation's future scenarios, thus, participants encounter the effects of their decisions (Lievens & De Soete, 2012). These behavioral intents obtained in low-fidelity simulations are said to be predictors of actual workplace behavior, with studies indicating that they have meaningful levels of validity (Lievens & De Soete, 2012). However, low-fidelity Serious Games have a lower response fidelity than high-fidelity Serious Games because of the closed-ended option design, which requires players to pick from a restricted number of predefined answer items (Lievens & De Soete, 2012). Because developing a high-fidelity game is more expensive, and this is a Serious Game trial, it was decided to develop a low-fidelity game instead.

4.1 CHARACTER CHOICE AND THEME

The choice of characters in the team has been extensively considered. To represent a real-life situation and due to increased importance of team diversity in the workplace, the four models (team-members) featured in the game are diverse in terms of gender and ethnicity (Martin, 2014). Furthermore, the combination of communication style and model has been chosen to counter the stereotypes associated with the gender or ethnicity of the model. For example, the

most significant distinction between men and women in terms of their communication style is the difference in perspectives on the goal of communication. The main goal for women whilst using communication is to improve connections and sustain relationships (Expressive and Amiable), whereas men use communication to achieve tangible goals (Analytical and Driver). Therefore in the game the roles are reversed; the two male models have an Expressive and friendly communication style, whereas the female models an Analytical and Driver style (Merchant, 2012).

Next to that, the game is agnostic to any cultural preferences in communication. Discussing ethnic differences in communication styles, it is found that national cultures can be differentiated in terms of prevailing communication styles. Individuals' tendencies to agree or disagree in different nations with another person can best be explained by different perspectives on the individualism-collectivism idea (Smith, 2011). These main differences mostly lie in conversational non-verbal cues (Gumperz & Cook-Gumperz, 1981). In our Serious Game, there is one female East Asian model (Driver), two Hispanic models (male Expressive; female Analytical), and one male Western model (Amiable). Individuals of East Asian ancestry, according to extant literature, avoid hurting others' feelings and do not force themselves on one another (Kim, 1994). The way of communicating of East Asian individuals thus tends to be more ambivalent and moderate, and they are more inclined to agree rather than disagree with others (Hamamura et al., 2008; Kim et al., 1996). This could be conceptualized as 'thoughtful ' and 'constrained 'in our Communication Styles Model, or in other words, scoring low on Responsiveness and low on Assertiveness. On the other hand, Western societies carry out more individualist ideals and communicate in ways that assure clarity. This may lead to more disagreement and extreme responding to others (Kim, 1994). This may be equivalent to a high level of Assertiveness while speaking and a determinant response style in our Communication Styles Model. Lastly, Hispanics come from an extremity culture, where disagreeing with one

another is recurrent. This may imply that Hispanics in turn respond more extreme in their expression to their communication partner compared to their East Asian counterparts (Hamamura et al., 2008; Lee & Green, 1991; Marin et al., 1992). This corresponds to an Expressive communication style or scoring high on Responsiveness and speaking exuberantly in our Communication Styles Model. These stereotypes are a mixed up in the game, and communication styles are not related to the model where the style is anticipated. For example, the East Asian model is a Driver instead of an analyst, the Hispanic female is Analytical rather than Expressive, and so on.

The theme in which the game is constructed is flexible, allowing the game to be used in a variety of settings and organizations. The theme can be tailored to an organization's unique environment, norms, values, or culture. The foundation of the game is communication and collaboration in a five-person team, but the genre may be changed as preferred. Our 'original' game's theme revolves around sustainability, which became a major globe issue in the recent years and is a popular and important topic of interest for organizations (Wales, 2013). Looking at organizations, a growing number of organizations are going green, owing to customer demand for environmentally friendly and sustainable products. Organizations should prioritize environmental interests within their business, for example making the development in organizational operations more sustainable (Al Khidir & Zailani, 2009). More precisely, we picked ocean pollution as our main topic since this is the least well-known and poorly regulated aspect of global pollution (Landrigan et al., 2020). Based on this, we have chosen sustainability as the game's major theme because we feel it is universally recognized and highly appreciated in many organizations.

5.   HOW TO PLAY?

CommOn! is a Serious Game that has been developed and designed to assess communication styles of participants, with an emphasis on measuring Versatility between the styles. The aim of this game is to predict communication styles and making the measurement more engaging. The intention of the game is to help players become more aware of their own communication style and their Versatility. By identifying and recognizing their own style, participants may make the most of their own strengths while actively avoiding their weaknesses. With this knowledge, one can concentrate on improving conversational flexibility, learning to collaborate more successfully, and achieving goals more swiftly and efficiently (Hargie & Tourish, 2009; Husain, 2013; Merrill & Reid, 1981; Oostrom et al., 2014; Wilson, 2004).

When logging in to the platform, the participants first chose their language of preference, after which they were directed to the research portal (Figure 3). In the research portal, five activities are displayed: background questionnaire, personality questionnaire, communication styles questionnaire, the Serious Game, and the game evaluation questionnaire. The predicted duration time of each activity is provided, and to start the next activity in the sequence, the previous activity must first be completed.
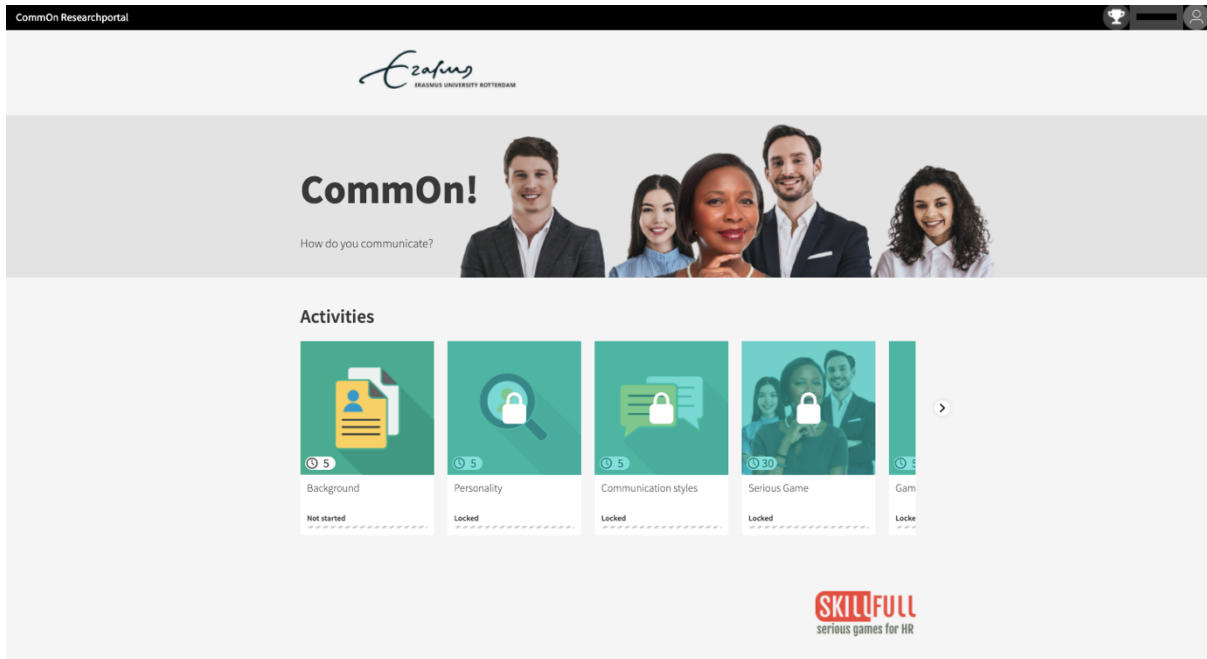
Figure 3. The E-Learning Platform, Research Portal

Content is crucial to the success of game since it engages gamers and keeps them engaged (Watt et al., 2016). The Serious Game takes place in an interactive and virtual world, where the participant acts as the protagonist throughout the game. When starting the game, the player is introduced to a digital E-coach, who explains how the platform works, and gives the player tips and updates throughout the game (Figure 4). After that, the player is introduced to the manager of the team, and to the four colleagues (Figure 5). The team members are introduced with a quote that summarizes their way of working and goal orientation. For example, Martina (Analytical) is introduced with an individual photo and a quote that summarizes her dominant communication style in one sentence (Figure 6). Then the player receives information about the situation he/she is in including the goal of the Serious Game, called the kick-off (Figure 7). This information entails that the player is assigned to the role of chairman and is held responsible for organizing an event together with the four other team members. Additionally, the player recently started a new job with the responsibility of

organizing an event to generate brand awareness of the organization and simultaneously generate fundraising. After these introductory scenes, with this knowledge, the player can officially start the game.
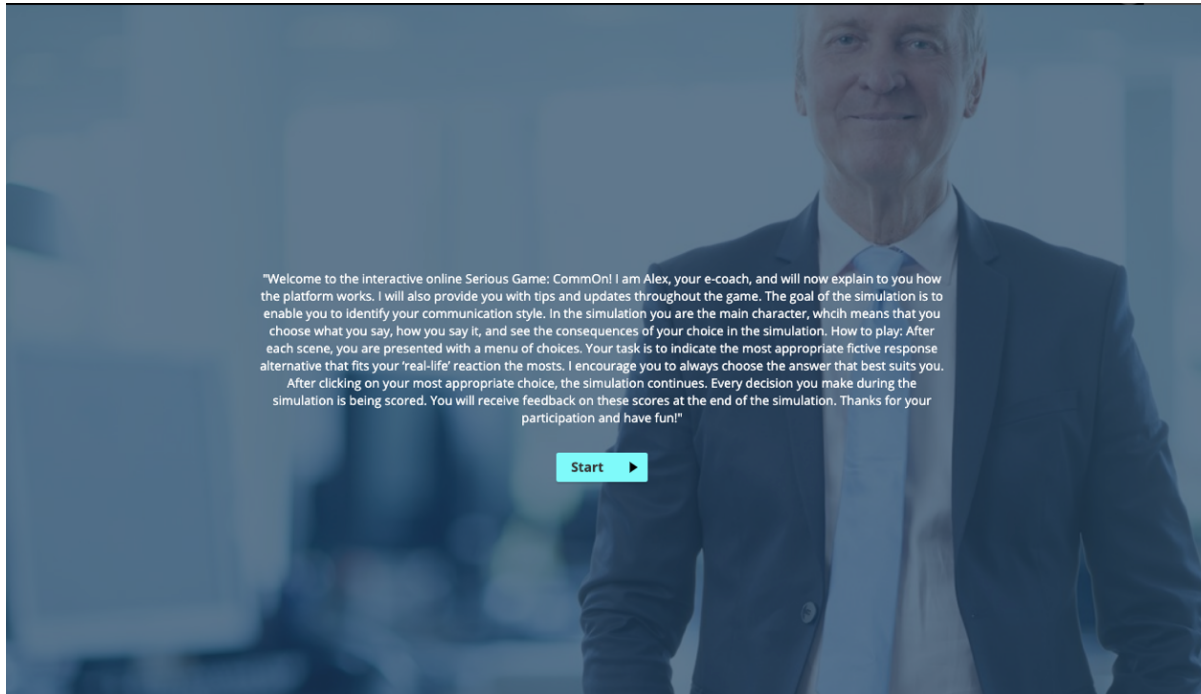
Figure 4. Screenshot of the Introduction to the E-Coach
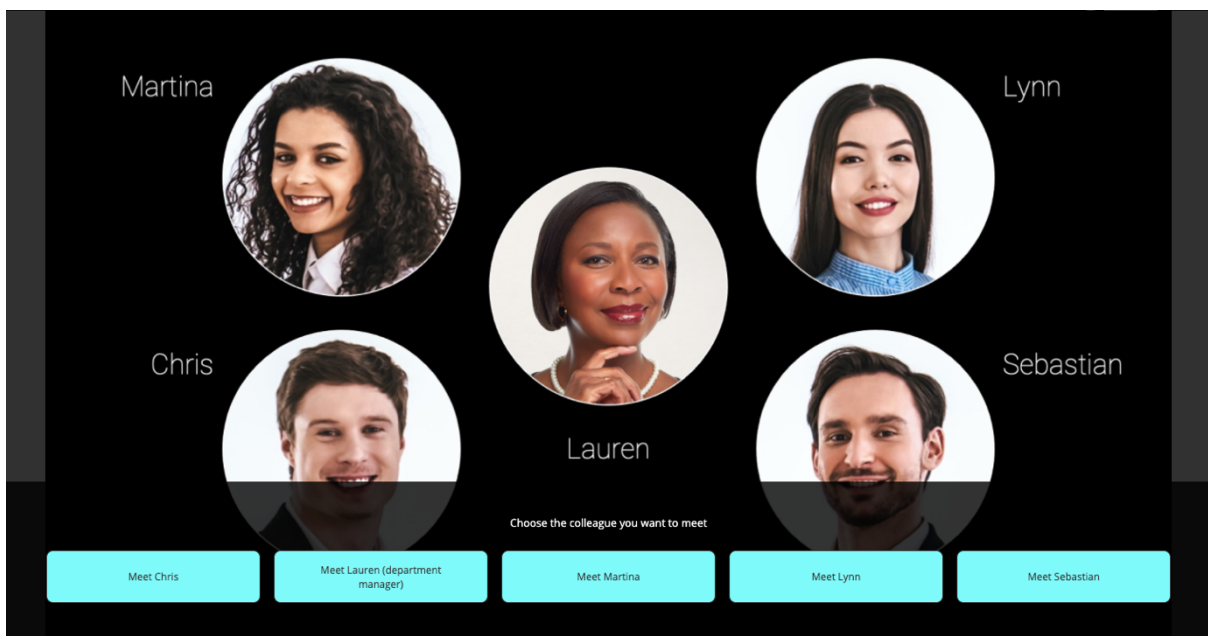
Figure 5. Screenshot of meeting the four team-members and the department manager
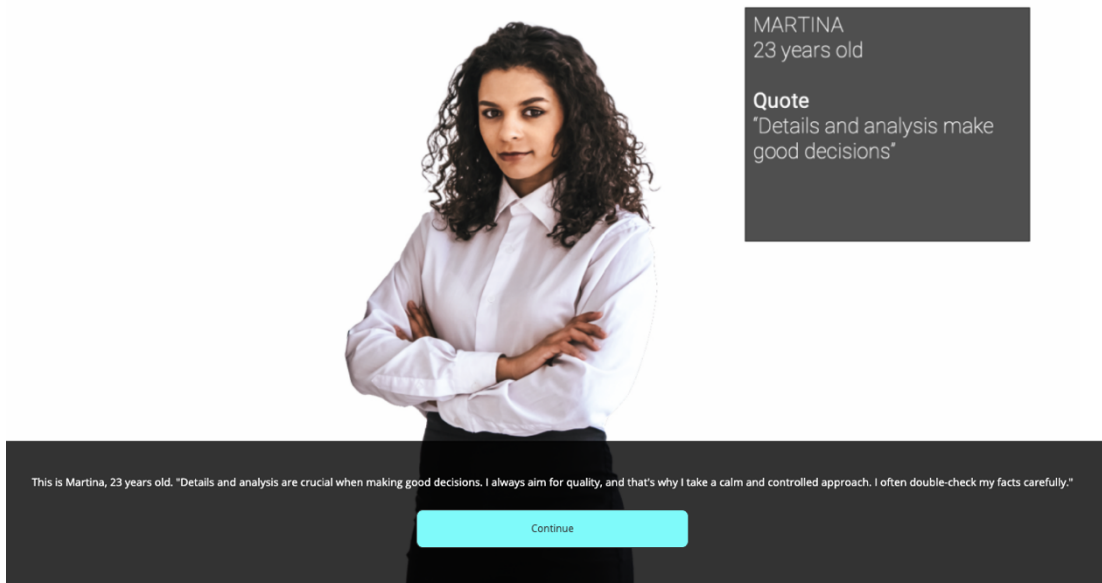
Figure 6. Screenshot of the introduction to one of the four characters
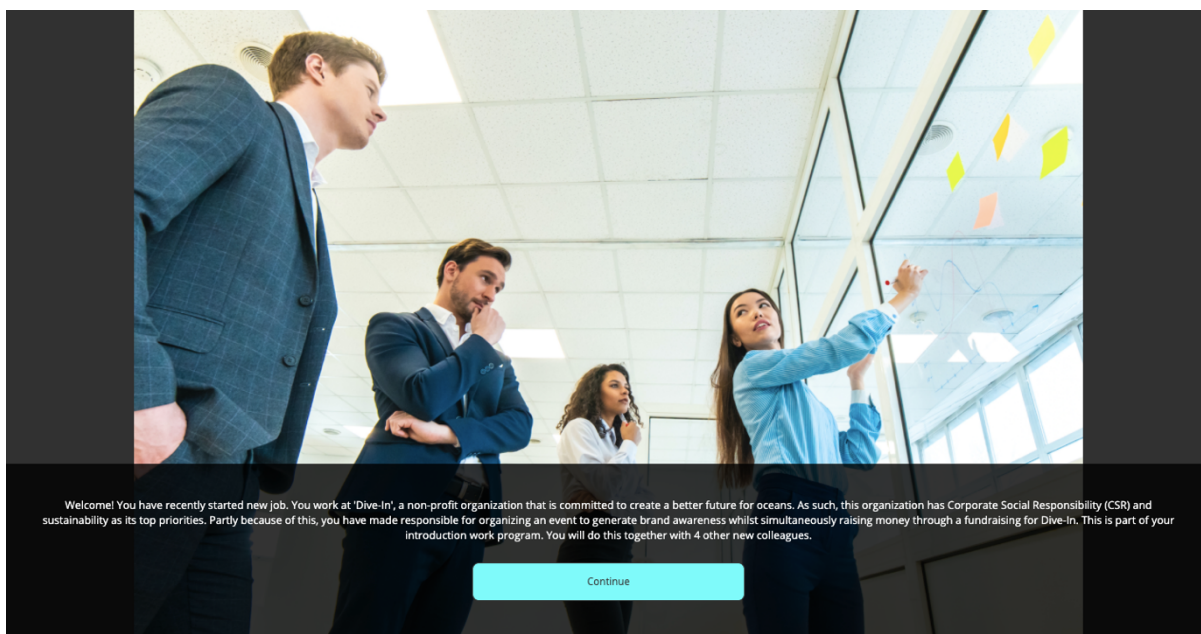
Figure 7. Screenshot of the kick-off introductory scene

During the process of organizing the event, the player must overcome difficulties and obstacles, and motivate his or her teammates to work as effectively as possible. An example of an obstacle is the budget of the event being cut in half. It is up to the participant how to react to this and how to motivate the team. Each player's decisions can change the story's flow,

lowering or raising the level of tension and conflict, and influencing subsequent discussions and events. The player has power and control over how motivated the team will be and how (in)efficiently the shared goal will be reached in the end. This suggests that the Serious Game is structured like a typical video game, where participants can choose between different options in terms of response that change the plot and alter the storyline. This means that the choices made are used as the input for the Serious Game's narrative. The final scene will, however, be the same for all participants. 'Fluff' was also added throughout the Serious Game's development, which has the function of solely providing more illustration and indication in the plot but has no fundamental influence on how the Serious Game is played and how communication is measured. Text messages, voicemails, and emails with additional or secret information sent by either team members or the manager are examples of such fluff that are added in the Serious Game with the goal to make the experience more fun and engaging. Another proven way in which the players are being motivated and engaged, is by providing a reward (Reiners & Wood, 2015). The research platform does this by providing points to the player when an activity is completed. For each activity, the player also is rewarded with a compliment, such as "That's a good start, keep up the good work!". The player can view one's personal scores, achievement, and the total progress in the research portal.

6. METHODOLOGY

6.1 PARTICIPANTS AND PROCEDURE

Participants were approached using the offline researchers' network together with online social platforms, where the majority was via LinkedIn. Participants all agreed to play the Serious Game anonymously and to voluntarily engage in this study, understanding that they have the right to withdraw at any moment. All participants received an email with a detailed description of what the Serious Game entails together with information about the study its aim.

Additionally, the duration of filling out the questionnaires together with playing the Serious Game was specified, which was expected to be 45 to 60 minutes. By using the unique code in their email, participants gained access to FLOWSPARKS - the interactive e-Learning platform, also called research portal, used for the development of *CommOn!*. Via this online platform, all participants were able to complete all questionnaires and take part in the Serious Game. The total final sample consisted of 97 participants, where 66 participants were female (68%) and 31 were male (32%). The majority was under 25 years old, namely 85 participants (87.6%), three participants were 25 – 34 years old (3.1%), eight were 45 – 55 years old (6.2%), and three were 55 or older (3.1%). Examining the level of education of all participants currently following, the majority of 62 indicated a bachelor's degree (63.9%), six a Highschool Degree (6.2%), 27 stated master's degree (27.8%), and one stated Vocational School (1%). One participant preferred not to indicate his or her education level (1%). All the participants provided their consent for anonymous processing of results.

The decision was made to employ both self-reports and 360-degree feedback reports to investigate the communication patterns of participants. The self-report will be used to gather information around the self-image of the participants, and whether this is consistent with the communication style measured in the Serious Game. On the other hand, the 360-degrees feedback report will be used to investigate whether the participants 'own perspective on one's communication style matches the feedbacker's view on the communication style of the participant. This feedback is inventoried in the last stage of the research portal, after the participants completed all other activities presented. All participants are asked to leave the email address of at least one person with whom the player has worked together with before, or a peer that knows the participant well (close friends or relatives). These peers will receive a link to a short questionnaire in which they are asked to share their perspective on the

participants 'communication style. This way, consistency is checked between the self-report, and how others see and experience the players' communication style. This questionnaire will be the exact same as the one filled out by the participants, the Communication Styles Questionnaire, however translated into third person. It is important to note that all responses will be kept confidential.

After a participant has completed the game, he or she does not yet have immediate insight into one's own results. This is because the results regarding the validity and reliability of this Serious Game are unknown yet. It has been communicated to the participants that they will eventually receive a report with insight into one's own communication style, including tips on how to use this style optimally. The final report with results of the game will not be visible to the participants after they completed the game. This is because it is unknown whether the Serious Games correctly measure communication styles and Versatility, therefore statements regarding this cannot be provided yet. If it turns out that the Serious Game is a valid instrument, in the final report the player can see the results of the Serious Game, including the scores on the four different quadrants in combination with the degree of Responsiveness (Emoting versus Controlling), Assertiveness (Telling versus Asking), and Versatility. Additionally, potential pitfalls and qualities within communication with others are discussed, therefore providing insight for the player to develop one's communication style.

6.2   MEASURES

In the research portal, the participant is presented with five activities. These include a background inventory concerning participants 'descriptive information, three questionnaires, and the Serious Game conducted for this study. In total, it was expected to take around 45 minutes to finish all activities in the research portal. The expected time needed to complete the questionnaires was 15 minutes, and to complete the Serious Game was 30 minutes. Participants

can play the Serious Game in their own time via their own laptops or phones. The questionnaires used in this study were: the Communication Styles Questionnaire, the Big Five model-based Personality Questionnaire (Goldberg, 1990), and the Game Evaluation Questionnaire. After completing all activities, participants invited family, friends, or colleagues to fill out the Communication Styles Questionnaire about the participant. All questionnaires used 5-point Likert-type scales (1 = *NO!*, 2 = *no*, 3 =?, 4 = *yes*, 5 = *YES!*). All questions were mandatory to fill in, unless specified otherwise.

6.2.2 PERSONALITY QUESTIONNAIRE (SELF-REPORT)

The personality questionnaire (Hiemstra et al., 2011; also used in different studies such as Oostrom, Born, Serlie, & Van der Molen, 2011) is based on the Big Five-Factor Model by Goldberg (1992) and McCrae and Costa (1987). The questionnaire consists out of 51 items and measures eight characteristics and Self-Presentation. Extraversion consists out of six items, where an example item is: 'Easily establishes contact with others. '(α=.80). Agreeableness consist out of 6 items, where an example item is: 'Believes that others are well-intentioned. ' (α=.72). Conscientiousness consists out of 6 items, where an example item is: 'Likes order and regularity '(α=.72). Stability consists out of 6 items, where an example item is: 'Remains calm in all circumstances '(α=.82). Openness to Experience consists out of 6 items, where an example item is: 'Looks at issues from a variety of perspectives. '(α=.52). Core Self-Evaluations consists out of 6 items, where an example item is: 'I feel that I am in control of my success in life. '(α=.67). Honesty-Humility, consisted out of 9 items, where an example item is: 'Sees oneself as just an ordinary person. '(α=.79). Lastly, Self-Presentation consists out of 6 items, where an example item is: 'Is willing to go to great lengths to achieve success. '(α=.71) (Hiemstra et al., 2011). The reason for including the personality questionnaire in the study is

to retest existing research which suggests that certain personality factors correlate with communication.

6.2.2 COMMUNICATION STYLES QUESTIONNAIRE (SELF-REPORT AND FEEDBACK REPORT)

The Communication Styles Questionnaire (available in Rijke & Oostrom, Individuele Verschillen, 2010) was deployed as a self-report measure and a 360-feedback report measure. In the current study, the Communication Styles Questionnaire consisted of 42 items, measuring Responsiveness (Emoting and Controlling), Assertiveness (Asking and Telling), and Versatility. By measuring these three constructs, the extent to which a participant exercises a quadrant (Expressive, Amiable, Analytical, Driver) can be indicated. The questionnaire is deployed as both a self-report (filled in by the participant), and as a feedback report (filled in by the participants 'peer). Both self-and-feedback reports used the exact same questionnaire, where the feedback report was translated into the third person. The feedback report was distributed by the participant to one to three peers. On average, one peer per participant had completed the communication styles questionnaire. In cases where a participant had received two or more feedback reports, it was decided to calculate the average of the ratings and use this in further stages of the study.

The items used in this questionnaire were based on a database factor analysis of an existing set of items measuring communication styles including their score-weight. Several items were decided to not be included in the new questionnaire based on the Corrected Item-Total Correlation, which was lower than $r < .50$. Additionally, the items collected from the existing database were completely reformulated for this study. Conducted from this, a new item-list was created consisting out of 42 items. In order to adapt this scale for making it useable in this study, we followed he principles and procedures of scale development (Streiner et al., 2015).

The dimension Responsiveness, consisting of a spectrum ranging from Emoting on the one hand to Controlling on the other hand, was initially measured with 17 items. However, two Controlling items correlated negatively with the corrected item-total correlation. Therefore, it was concluded to remove these items from the scale, thus measuring the Responsiveness dimension with 15 items. The Emoting construct of Responsiveness is measured with 8 items (e.g., "Speaks with passion"), and the Controlling component with 7 (e.g., "Is reluctant to share personal feelings"). The Cronbach's alpha coefficient for the self-report (α=.79) was slightly higher than that for the feedback report (α=.77). Assertiveness (consisting of a spectrum ranging from Asking on the one to Telling on the other hand) is measured with 17 items in total. The Asking construct is measured with 8 items (e.g., "Gives others a lot of space"), and Telling with 9 (e.g., "Speaks as one of the first"). The Cronbach's alpha coefficient for the self-report (α=.78) was again slightly higher than that for the feedback report (α=.71). Lastly, Versatility was measured with 10 items (e.g., "Shows understanding with regard to other points of view"). The Cronbach's alpha coefficient for the self-report (α=.69) was slightly lower than that for the feedback report (α=.70). In both questionnaires, the values suggested good internal consistency reliability for the scales with these samples.

6.2.3 FACE VALIDITY QUESTIONNAIRE

The Game Evaluation Questionnaire consists of 23 items and measures the player's face validity, consisting out of Face Validity, Fairness Perception, Opportunity to Perform, User Experience, and Perceived Predictive Validity. The degree to which the Serious Game ostensibly measures the idea it is intended to measure is known as face validity, which in this study is predicting and measuring communication styles. This includes whether the participants think the Serious Game is fair and accurate (e.g., "Most people would say that the Game is fair"). Next to that, the usability and practicality of the Serious Game is included in the game

evaluation questionnaire, measuring the degree whether participants find the Serious Game easy to play (e.g., "The structure of the information in the Game was clear" and "This Game was easy to use"). Furthermore, the questionnaire included items which explored whether the players had the feeling to show their skills and abilities through the Serious Game (e.g., "My performance on the Game was a good indicator of my ability to do my job"). Additionally, the questionnaire measured whether players had the feeling that there was a relationship between the Serious Game and what is required in one's job (e.g., "I am confident that the outcomes on the Game can predict how well an employee will perform their job"). Lastly, the scale investigates if participants liked playing the Serious Game overall.

In this way, the impressions participants have about the Serious Game are measured and the overall experience after completing it is captured. The face validity, usability and likeability of the Serious Game are all expected to be high, according to existing literature describing that games are recognized as effective and appealing valid learning tools to maximize one's performance, broadening the vision that games are solely for entertainment purposes (Eck, 2006). Therefore, it is expected that players will perceive Serious Games as fun and interactive. Next to that, we expect that players believe that the concept 'communication style 'is measured correctly in the Serious Game. A Cronbach's alpha coefficient of .82 indicates very strong internal consistency for the face validity questionnaire.

6.2.4 SERIOUS GAME

The Serious Game was expected to take around 30 minutes to finish. If the participant did not prefer to complete the Serious Game at once, the option was provided to finish the Serious Game at another time. The Serious Game presents a simulated environment, with the participant oneself playing the main character. In each scene, the player is presented an option menu, where the task is to indicate the most appropriate fictional response alternative that fits

the players' 'real-life' reaction the most. Several work-related issues were presented to the player during the Serious Game.

It is important to state that an older version of the communication styles Serious Game was the foundation and the inspiration for the development of the Serious Game in this research. This dated version was not suitable for reliably measuring communication styles. Therefore, this outdated version has been completely transformed into another version, revolving around the literature of the Social Styles Model by Merrill and Reid (1981). The Serious Game has been rewritten and restructured and deployed into a different population. The storyline and narrative of the dated Serious Game have been used as a basis, however, were completely adapted. All items used in the current Serious Game were modernized and adapted based on the frequencies in the older Serious Game. These items were then converted into FLOWSPARKS, which translated the items into the software of the Serious Game. Each statement in the game has its own scoring – these scoring keys were predetermined by subject matter experts. Thus, the current research has taken all the limitations of the older game into consideration and created a completely new and better functioning measurement: *CommOn!*.

The development of the scenes and items in the Serious Game is based on the theory of Cialdini (2007), which outlines the psychology of why individuals answer "yes" and how to utilize these understandings to negotiate and influence others. The model is based on the six theories of persuasion, often known as weapons of influence: reciprocation, commitment and consistency, social proof, liking, authority, and scarcity. The strategies can be used to influence others by triggering unconscious cues that encourage them to behave in the way the influencer wants.

More specifically, all items in the script are conducted according to competencies classified and different anchors devised. Each of the four colleagues represent a communication style: Amiable, Analytical, Expressive, or Driver. This means that the

preferred strategy, goal-orientation, and perspective of each character on what is important to include in the final event is different. For example, one team member will be more concerned with efficiently fulfilling the end goal (more Controlling), whilst others prioritize interpersonal and team relationships (more Emoting). The player-protagonist may find him/herself in one of two situations during the Serious Game: in a team meeting setting, or in one-on-one conversations with each of the team members. Scores on the dominant communication styles (Amiable, Analytical, Driver, Expressive) and scores on Responsiveness and Assertiveness are measured in the team meetings. During the one-on-one sessions, the player's Versatility is measured together with scores on Responsiveness and Assertiveness. It is important to stress out that the reliability coefficients of this measurement were not possible to indicate, since the answer categories are not of the same kind.

7. RESULTS

7.1 DESCRIPTIVES

All descriptive statistics of all Serious Game variables are presented in Table 1. The data were subjected to Pearson correlational tests to ascertain the link between the communication styles dimensions measured with the Serious Game, the self-report, and the feedback report, and the six elements of personality (Extraversion, Openness to Experience, Conscientiousness, Stability, Agreeableness, Honesty-Humility), Self-Presentation, and core self-evaluation.

Table 1. Descriptive Statistics of all Game Variables

	N	Minimum	Maximum	Mean	Std. Deviation
Game Controlling	97	970	2030	1421.44	213.57
Game Asking	97	895	1720	1252.42	158.85
Game Versatility	97	660	1090	892.06	95.94
Game Analytical	97	0	800	372.16	182.43
Game Amiable	97	0	700	294.85	152.32
Game Driver	97	0	700	229.90	170.88
Game Expressive	97	0	900	303.09	190.10
Valid N (listwise)	97				

One-way between-groups analyses of variance were carried out to investigate and regulate the coherence of the demographic variables. These analyses were conducted to explore the impact of age and level of education on the four communication styles (Expressive, Amiable, Analytical, and Driver), Responsiveness, Assertiveness, and Versatility in the Serious Game. Additionally, to explore the impact of gender on these Game variables, an independent T-test was conducted.

Participants were separated into five groups based on their ages. For the five age groups, there was no statistically significant difference in the scores on the game factors. Next to that, focusing on the level of education, participants were divided into five groups. Based on education level, there was no statistically significant variation in the results for the five separate groups. All F-statistics and the corresponding significance levels are presented in Table 2 in Appendix A.

Concerning gender, participants were divided into two groups. For the two gender groups, there was a statistically significant difference in the Responsiveness ratings. It was indicated that the mean score for males (M = 1511.61, SD = 230.33) was significantly different from females (M =1379.09, SD = 192.82; t (95) = -1.90, $p < .0$, two-tailed), therefore showing different Responsiveness scores. The size of the mean differences (mean difference = -132.52, 95% CI: - 221.31 to -43.73) was small ($\eta^2 = .04$).

Age and education were not considered when conducting further analyses, since no significant effects were to be found – only gender was chosen to be included in further stages of the current study.

7.2. CORRELATIONAL RESEARCH

Hypotheses 1 to 10 are analyzed using correlational research on a univariate level (Table 3), where hypotheses 11 and 12 are tested by means of stepwise regression analyses. For hypothesis 1, results have shown that Extraversion is positively related to Emoting (H1a; $r = .54$, p $< .01$), Telling (H1b; $r = .45$, p $< .01$) and the Expressive communication style (H1c; $r = .22$, p $< .01$), therefore hypothesis 1 was fully supported.

It has been shown that Agreeableness is negatively related to the Driver communication style (H2b; $r = -.25$, p $< .05$), and positively related to Versatility (H2c; $r = .44$, $p < .05$). The communication styles of Agreeableness and Telling as well as Amiable were not shown to be significantly correlated. However, it has been found that Agreeableness is negatively correlated to Controlling ($r = -.18$, $p < .05$), and positively to Asking ($r = .18$, $p < .05$). This indicated that hypothesis 2 was partly supported, and thus partly rejected.

Regarding hypothesis 3, Conscientiousness was found to be negatively related to Telling (H3a; $r = -.26$, $p < .05$) and was not significantly related to the Driver communication style (H3b). Therefore, hypothesis 3 was fully rejected since positive relationships between Conscientiousness and Telling and to the Driver communication style were expected.

Stability was negatively related to Emoting in both self-report ($r = -.33$, $p < .01$), as well as feedback report ($r = -.35$, $p < .01$), supporting hypothesis 4a. No relation was found between Stability and Versatility, rejecting hypothesis 4b.

For hypothesis 5, Openness to Experience is found to be positively related to Versatility ($r = .33$, $p < .01$). This indicated that hypothesis 5 was fully supported.

It was discovered that Core self-evaluations was positively associated to Telling as measured in feedback-report ($r = .22$, $p < .05$), supporting hypothesis 6.

Honesty-Humility was found to be negatively related to Telling (H7a, $r = -.40$, $p < .01$) and the Driver communication style (H7b; $r = -.21$, p < .05), and positively to the Amiable communication style (H7c; $r = .29$, $p < .01$). Therefore, hypothesis 7 is fully supported. Additionally, Honesty-Humility was positively related to Asking ($r = .34$, $p < .01$) and Versatility ($r = .19$, p < .05) as measured in the Serious Game.

Self-Presentation related positively to Telling as measured in the self-report ($r = .28$, $p < .01$) as well as feedback-report ($r = .45$, $p < .01$). As hypothesized, there was a positive relation between Self-Presentation and the Expressive communication Style ($r = .20$, $p < .05$) and related negatively to the Amiable communication style ($r = -.26$, $p < .01$). These findings indicate that hypothesis 8 was fully supported. Additionally, it has been found that Self-Presentation related negatively with Versatility as measured in the Serious Game ($r = -.17$, $p < .05$).

It has been shown that Controlling as measured in the Serious Game has a negative relation with the Expressive ($r = -.74$, $p < .01$) and Amiable communication style ($r = -.41$, $p < .01$), and a positive relation with the Driver $(r = .51$, $p < .01)$ and Analytical communication style ($r = .64$, $p < .01$), all measured in the Serious Game. This means that hypothesis 9 is fully supported.

For hypothesis 10, Asking as measured in the Serious Game has a negative relation with the Expressive ($r = -.41$, $p < .01$), and Driver communication style ($r = -.48$, $p < .01$), and a positive relation with the Amiable ($r = .45$, $p < .01$), and Analytical style ($r = .50$, $p < .01$). These findings indicated that hypothesis 10 is fully supported.

For hypothesis 11, a significant relation between Responsiveness, Assertiveness, and Versatility as measured across the Serious Game, the self-report and the feedback-report were

expected, indicating high construct validity. Controlling as measured in the Serious Game negatively related to Emoting as measured in the self-report ($r = -.38$, $p < .01$) and to Emote as measured in the feedback-report ($r = -.24$, $p < .05$), supporting the hypothesis 11a. However, for Assertiveness and Versatility as measured in the Serious Game and in the self-report, no significant correlations were found, rejecting hypotheses 11b and 11c.

7.3 CONSTRUCT VALIDITY

Multiple hierarchical and stepwise regressions were used to assess the ability to analyze the construct and congruent validity of the game. To guarantee that the assumptions of normality, linearity, multicollinearity, and homoscedasticity were not violated, preliminary studies were carried out. Thus, to control for the relationship with all variables and to examine the unique contribution per variable, hierarchical regression analyses were conducted. In Table 4, the results of the construct validity regression analyses are presented. In total, 7 individual regressions for exploring construct validity were conducted: one for each variable measured in the Serious Game. Multiple linear regression analyses were then done to assess the prediction of Serious Game variables from personality, communication styles as evaluated in the self-report, and in the feedback-report, in order to approach construct validity of the Serious Game. In the first regression, Controlling as measured in the Serious Game was entered as the dependent variable. The hierarchical multiple regression revealed that at step one, none of the personality variables accounted for variation in Controlling as measured in the Serious Game. Introducing the Self-Report variables to the regression, the model explained 16,3% of variation in Controlling as measured in the Serious Game, $F (3,93) = 6.05$, $p < .01$. Adding Feedback-Report variables to the regression, an additional variance of 2% was explained $F (6,90) = 3.36$, $p < .01$). When all independent variables were included in the final model of the regression, only Emote as measured in the self-report was a significant predictor of Controlling as measured in the Serious Game ($\beta = -.41$, $p < .01$).

In the second regression, Asking as measured in the Serious Game was entered as the dependent variable. The hierarchical multiple regression revealed that at step one the personality trait Honesty-Humility contributed significantly to the regression model, F (1,95) = 12.36, p < .01) and accounted for 12% of the variation in Asking as measured in the Serious Game. Introducing the Self-Report variables to the model, an additional variance of 1% was explained in Ask F (4,92) = 3.25, p < .05. When adding the feedback-report variables, an additional of 8,5% of the variation in Asking as measured in the Serious Game was explained and this change in R^2 was significant, F (7,89) = 3.36, p < .01. The model as a whole explained 20.9% of the variance in Asking as measured in the Serious Game. When all independent variables were included in the final model of the regression, Honesty-Humility (β = .37, p < .01), Tell as measured in the feedback-report (β = .25, p < .05), and Versatility as measured in the feedback-report (β = .27, p < .01) were significant predictors of Asking as measured in the Serious Game.

In the third regression, Versatility as measured in the Serious Game was entered as the dependent variable. The hierarchical multiple regression revealed that at step one, none of the personality variables and accounted for any of the variation in Versatility as measured in the Serious Game. Introducing the Self-Report to the regression, the model did not significantly explain variance in Versatility as measured in the Serious Game, with the change in R^2 not being significant F (3,93) = 1.92, p > .05. Adding Feedback-Report variables to the regression, no additional variance was explained since the change in R^2 was not significant, F (6,90) = 1.36, p > .05.

Table 3. Correlation matrix showing means, standard deviations, and reliabilities of the background variables, the communication style dimensions, and the personality dimensions

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. Gender	1.32	.47	(-)																							
2. Age	.25	.71	.17	(-)																						
3. Edu	1.96	1.37	.13	**.40****	(-)																						
Game																										
4. Controlling	1421.44	213.57	**.29****	.09	.13	(-)																					
5. Asking	1252.42	158.85	-.05	.10	.05	.13	(-)																				
6. Vers	892.06	95.94	-.08	.16	.06	-.06	**.42****	(-)																			
7. Ana	372.16	182.43	.07	-.06	.08	**.64****	**.50****	.06	(-)																		
8. Ami	294.85	152.32	-.11	-.04	-.13	**-.41****	**.45****	.05	**-.23***	(-)																	
9. Dri	229.90	170.88	**.19***	.14	.01	**.51****	**-.48****	-.16	-.16	**-.52****	(-)																
10. Expr	303.09	190.10	-.15	-.04	.02	**-.74****	**-.41****	.05	**-.64****	-.11	**-.33****	(-)															
Self-report																										
11. Emoting	3.49	.47	-.15	-.16	-.12	**-.38****	-.05	.09	**-.21***	.09	**-.23***	**.33****	(.79)														
12. Telling	3.09	.40	.04	-.06	.10	-.09	**-.20***	-.14	-.14	-.08	-.03	**.23***	**.53****	(.78)													
13. Vers	3.76	.38	-.01	-.03	-.16	-.16	.13	.12	.02	.08	-.16	.06	**.18***	**-.31****	(.69)												
Feedback																										
14. Emoting	3.48	.43	**-.17***	-.15	-.07	**-.24***	-.05	-.05	**-.19***	.06	-.14	**.27****	**.62****	**.31****	.07	(.77)											
15.Telling	3.11	.35	.14	-.13	-.09	.03	-.05	-.16	.01	-.11	.03	.05	**.28****	**.50****	-.12	**.43****	(.71)										
16. Vers	3.64	.38	-.10	-.03	.00	-.01	**.24****	.05	.13	**.17***	**-.25****	-.03	.12	-.10	**.27****	.14	-.14	(.70)									
Personality																										
17. Cons	3.41	.66	.04	.06	-.06	.01	-.10	-.08	-.01	-.07	.01	.05	-.16	**-.26***	.15	.02	.14	-.04	(.72)								
18. CS	3.47	.59	**.18***	-.05	-.05	.04	-.09	-.05	.03	**-.18***	.07	.05	-.03	.08	.08	-.08	**.22***	-.17	.11	(.67)							
19. Extr	3.89	.59	.01	**-.19***	-.08	**-.18***	-.11	.00	-.14	-.05	-.04	**.22***	**.54****	**.45****	**.18***	**.32****	**.35****	**.23***	-.08	**.25***	(.80)						
20. HH	3.32	.64	**-.49****	-.05	-.06	-.14	**.34****	**.19***	.07	**.29****	**-.21***	-.11	-.12	**-.39****	.14	-.12	**-.40****	.02	-.10	**-.25***	**-.36****	(.79)					
21. Open	4.15	.39	.11	.12	.05	.04	.08	.00	.12	-.14	.07	-.06	.13	-.06	**.33****	.13	.15	.09	.01	**.27****	**.18***	**-.17***	(.52)				
22. Stab	3.04	.81	**.30****	.07	.00	.11	.13	-.02	.10	.02	.00	-.11	**-.33****	-.09	.13	**-.35****	.04	-.09	-.05	**.51****	-.01	-.09	.12	(.82)			
23. Agr	3.66	.56	-.14	-.02	.11	**-.18***	**.18***	.13	.08	.05	**-.25****	.10	.13	**-.19***	**.44****	-.02	**-.22***	**.28****	-.03	.00	.05	**.36****	**.19***	.08	(.72)		
24. SP	3.54	.55	**.23***	**-.20***	**-.18***	.00	**-.27****	**-.17***	-.03	**-.26***	.04	**.20***	**.28****	**.41****	.09	.11	**.45****	.03	**.21***	**.30****	**.53****	**-.59****	.10	-.05	-.14	(.71)

All significant correlations between the communication style dimensions and the personality dimensions are in bold. Reliabilities are shown on the diagonal.
a. Gender (f = 1, m = 2) was coded.
b. Educational level (1 = Bachelor's Degree, 2 = Highschool, 3 = I would rather not say, 4= Master's Degree, 5 = Vocational education) was coded.
c. Age (1 = 25-44, 2 = 45- 55, 3 = 55 or older, 4= under 25) was coded.
d. The means and standard deviations on the personality scales and the communication styles scales are based on the mean item score on a five-point Likert Scale
e. Edu = Education. Controlling = low levels of Responsiveness. Emoting = high levels of Responsiveness. Asking = low levels of Assertiveness. Telling = high levels of Assertiveness. Vers = Versatility. Cons = Conscientiousness. CS = Core-Self Evaluations.
** $p < 0.0l$ (one-tailed); * $p < 0.05$ level (one-tailed); $N = 97$

The model as a whole explained did not significantly explain any of the variance in Versatility as measured in the Serious Game. When all independent variables were included in the final model of the regression, Emoting as measured in the self-report ($\beta = .34$, $p < .05$), was the only significant predictor of Versatility as measured in the Serious Game.

In the fourth regression, the Analytical Communication Style as measured in the Serious Game was entered as the dependent variable. When entering personality into the regression at step one, no variance of the Analytical Communication Style as measured in the Serious Game was explained. When the self-report variables were entered at step two, the model did not significantly explain variance of the Analytical Communication Style as measured in the Serious Game, with the change in R² not being significant F $(3,93) = 1.52$, $p > .05$. Adding Feedback-Report variables to the regression, no additional variance was explained since the change in R² was not significant, $F (3,90) = 1.81$, $p > .05$. The model as a whole explained did not significantly explain any of the variance in the Analytical Communication Style as measured in the Serious Game. When all independent variables were included in the final model of the regression, there were no significant predictors found of the Analytical Communication Style as measured in the Serious Game.

In the fifth regression, the Amiable Communication Style as measured in the Serious Game was entered as the dependent variable. The hierarchical multiple regression revealed that at step one the personality trait Honesty-Humility contributed significantly to the regression model, $F (1,95) = 8.63$, $p < .01$) and accounted for 8,3% of the variation the Amiable Communication Style as measured in the Serious Game. Introducing the Self-Report variables to the model, 1,8% of additional variance in the Amiable Communication Style as measured in the Serious Game was explained $F (3,92) = 2.59$, $p < .05$). When adding the feedback-report variables Adding Feedback-Report variables to the regression, no additional variance was explained since the change in R² was not significant, $F (3,89) = 1.79$, $p > .05$. Model 3, or the

model as a whole, did not significantly explain any of the variance in the Amiable Communication Style as measured in the Serious Game. When all independent variables were included in the final model of the regression, Honesty-Humility ($\beta = .29$, $p < .05$) was the only significant predictor of the Amiable Communication Style as measured in the Serious Game.

In the sixth regression, the Driver Communication Style as measured in the Serious Game was entered as the dependent variable. The hierarchical multiple regression revealed that at step one the personality trait Altruism contributed significantly to the regression model, $F (1,95) = 6.12$, $p < .05$) and accounted for 6,1% of the variation in the Driver Communication Style as measured in the Serious Game. Introducing the Self-Report variables to the model, another 4.1% of the variance was explained, $F (4,92) = 2.59$, $p < .05$. When adding the feedback-report variables Adding Feedback-Report variables to the regression, no additional variance was explained since the change in R^2 was not significant, $F (7,89) = 1.92$, $p > .05$. The model as a whole (model 3) did not significantly explain any of the variance in the Driver Communication Style as measured in the Serious Game. When all independent variables were included in the final model of the regression, there were no significant predictors found of the Driver Communication Style as measured in the Serious Game

In the final and seventh regression, the Expressive Communication Style as measured in the Serious Game was entered as the dependent variable. The hierarchical multiple regression revealed that at step one the personality trait Extraversion contributed significantly to the regression model, $F (1,95) = 4.77$, $p < .05$) and accounted for 4,8% of the variation in the Expressive Communication Style as measured in the Serious Game. Introducing the Self-Report variables to the model, an additional variance of 6.8% was explained, $F (4,92) = 3.00$, $p < .05$). When adding the feedback-report variables Adding Feedback-Report variables to the regression, another additional 3.8% of the variance was explained, $F (7,89) = 2.31$, $p < .05$. The model as a whole explained 15.4% of the variance in the Expressive Communication Style

as measured in the Serious Game. When all independent variables were included in the final model of the regression, there were no significant predictors found the Expressive Communication Style as measured in the Serious Game.

7.4 CONGRUENT VALIDITY

In Table 5, 6 and 7 the congruent validity regression analyses are presented. To approach congruent validity of the Serious Game, multiple linear regression analyses were conducted to evaluate the prediction of the judgment of the other (feedback-report) from personality, self-report measuring communication styles and the Serious Game. All variables were entered into the multiple regression via the stepwise method.

Table 5 shows the results of the stepwise regression analysis with Emoting as measured in the feedback-report as dependent variable, measuring congruent validity. The multiple regression revealed that when all independent variables were included in the final regression model, only Emoting as measured in self-report was a significant predictor of Emoting as measured in feedback-report ($\beta = .54$, $p < .01$). Emoting as measured in feedback-report accounted for 40,3% of the variance in Emoting as measured in feedback-report.

Table 4. Construct Validity of all Serious Game Variables: Hierarchical Regression Analysis

	Game Variables													
	G_Controlling		G_Asking		G_Vers		G_Ana		G_Ami		G_Dri		G_Exp	
Independent variables	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
MODEL 1: Personality variables (stepwise)			.12**						.08**		.06**		.05*	
HH				.34**						.29**				
Agr												-.25*		
Extr														.22*
MODEL 2: Self (enter)	.16**		.01**		.06		.05		.02*		.04*		.07*	
HH				.31**						.29**				
Agr												-.20		
Extr														.03
SR Emoting		-.45**		.11		.24		-.21		.16		-.22		.26
SR Telling		.14		-.06		-.27		-.02		-.06		.04		.09
SR Vers		-.03		.06		-.01		.06		-.01		-.01		.03
MODEL 3: FB (enter)	.02**		.09**		.03		.06		.02		.03		.04*	
HH				.37**						.29**				
Agr												-.17		
Extr														.10
SR Emoting		-.41**		.06		.34*		-.08		.14		-.20		.12
SR Telling		.06		-.14		-.24		-.12		-.04		.02		.17
SR Vers		-.07		-.01		-.02		-.01		-.04		.01		.07
FB Emoting		-.08		.14		-.15		-.23		.00		-.01		.21
FB Telling		.15		.25*		-.07		.22		.01		.02		-.20
FB Vers		.10		.27**		.01		.20		.16		-.18		-.13
Total R^2	.18**		.21**		.08		.11		.12		.13		.15*	
Adjusted R^2	.13		.15		.02		.05		.05		.06		.09	
ΔF	.73		3.19*		.81		2.05		.75		1.03		1.34	
N	97	97	97	97	97	97	97	97	97	97	97	97	97	97

Notes. G_Controlling = Game Controlling. G_Asking = Game Asking. G_Vers = Game Versatility. G_Ana = Game Analytical. G_Ami = Game Amiable. G_Dri = Game Driver. G_Exp = Game Expressive. SR Emoting = Self-Report Emoting. SR Telling = Self-Report Telling. SR Vers = Self-Report Versatility. FB Emoting = Feedback Emoting. FB Telling = Feedback Telling. FB Vers = Feedback Versatility. HH = Honesty-Humility. Agr = Agreeableness. Extr = Extraversion.
The variables were analyzed through a hierarchical regression and stepwise method. Gender was added in step 1 and the personality variables and communication styles dimensions in step 2. ** $p < .01$ (two-sided); * $p < .05$ (two-sided).

Table 5. Results of the Stepwise Regression Analysis with Emoting as measured in Feedback-Report as Dependent Variable Measuring Congruent Validity

STEPWISE		
	Emoting as measured with the Feedback-Report	
	ΔR^2	β
Stability		-.17
Extraversion		.03
Self-Report Emoting		.54**
Total R^2	.40**	
Adjusted R^2	.38	
ΔF	27.86**	

Table 6 shows the results of the stepwise regression analysis with Telling as measured in the feedback-report as dependent variable, measuring congruent validity. The multiple regression revealed that when all independent variables were included in the final regression model, both Self-Presentation (β = .30, p < .01) and Telling as measured in the self-report (β = .38, p < .01) were significant predictors of Telling as measured in the feedback-report. Together the independent variables accounted for 32% of the variance in Telling as measured in the feedback-report.

Table 6. Results of the Stepwise Regression Analysis with Telling as measured with the Feedback-Reportl as Dependent Variable Measuring Congruent Validity

STEPWISE		
	Telling as measured with the Feedback-Report	
	ΔR^2	β
Self-Presentation		.30**
Self-Report Telling		.38**
Total R^2	.32**	
Adjusted R^2	.31	
ΔF	16.28**	

Table 7 shows the results of the stepwise regression analysis with Versatility as measured in the feedback-report as dependent variable, measuring congruent validity. The multiple regression revealed that when all independent variables were included in the final regression model, Altruism (β = .23, p < .05), Extraversion (β = .30, p < .01), Core Self-

Evaluation (β = -.22, p < .05) and Asking as measured in the Serious Game (β = .22, p < .05) were significant predictors of Versatility as measured in the feedback-report. Together the independent variables accounted for 22% of the variance Versatility as measured in the feedback-report.

Table 7. Results of the Stepwise Regression Analysis with Versatility as measured with the Feedback-Report as Dependent Variable Measuring Congruent Validity

STEPWISE	Versatility as measured with the Feedback-Report	
	ΔR^2	β
Altruism		.23*
Extraversion		.30**
Conscientiousness		-.22*
Game Asking		.22*
Total R^2	.22**	
Adjusted R^2	.19	
ΔF	5.28*	

7.5 FACE VALIDITY

Finally, as hypothesis 13 stated, it was expected that on average the scores on the Face Validity Questionnaire will be higher than a three on the five-point Likert scale used in this questionnaire. It was decided to look at this numeric average, since higher than three indicated a *yes* (4) or a *YES*! (5). These values are perceived as high and are associated with a very positive result looking at this questionnaire. In Table 8 a descriptive table is presented. Results have shown that the average of the face validity questionnaire was between 3.5 and 4.12, indicating that players react positively to the game.

Table 8. Descriptives of Evaluation Questionnaire Variables

	Minimum	Maximum	Mean	St. Deviation
Face Validity	1.57	5	3.5	.75
Fairness Perception	1.75	5	3.68	.62
Opportunity to perform	1	5	3.36	.84
User Experience	2.6	5	4.12	.53
Perceived Predictive Validity	1	4.67	3.11	.86

In Table 9 a correlational table is presented, in which the results of all components of the Face Validity Questionnaire are correlated with the results of the Serious Game.

	Minimum	Maximum	Mean	St. Deviation
Face Validity	1.57	5	3.5	.75
Fairness Perception	1.75	5	3.68	.62
Opportunity to perform	1	5	3.36	.84
User Experience	2.6	5	4.12	.53
Perceived Predictive	1	4.67	3.11	.86

Table 9. Correlation matrix showing means and standard deviation of the Face Validity Questionanire Items and the Serious Game Variables

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Controlling	1421.44	213.57	(-)											
2. Asking	1252.42	158.85	.13	(-)										
3. Vers	892.06	95.94	-.06	**.42****	(-)									
4. Ana	372.16	182.43	**.64****	**.50****	.06	(-)								
5. Ami	294.85	152.32	**-.41****	**.45****	.05	**-.23***	(-)							
6. Dri	229.90	170.88	**.51****	**-.48****	-.16	-.16	**-.52****	(-)						
7. Exp	303.09	190.10	**-.74****	**-.41****	.05	**-.64****	-.11	**-.33****	(-)					
8. FV	3.50	.75	-.04	.01	.03	-.03	-.05	-.01	.08	(-)				
9. FP	3.68	.62	-.08	-.05	-.02	-.03	-.11	.02	.10	**.47****	(-)			
10. OP	3.36	.84	-.14	-.04	.13	-.13	.01	-.11	**.22***	**.51****	**.75****	(-)		
11. UX	4.12	.53	-.14	.13	.15	-.09	.11	-.08	.08	**.34****	**.22***	**.25***	(-)	
12.PPV	3.11	.86	-.14	-.11	-.06	-.13	-.01	-.05	.17	**.38****	**.73****	**.76****	.14	(-)

All significant correlations between the communication style dimensions and the personality dimensions are in bold. Reliabilities are shown on the diagonal.

Notes. Ana = Game Analytical. Ami = Amiable. Dri = Driver. Exp = Expressive. FV = Face Validity. FP = Fairness Perception. OP = Opportunity to Perform. UX = User Experience. PPV = Perceived Predictive Validity.

The means and standard deviations on both scales are based on the mean item score on a five-point Likert Scale

** $p < 0.0l$ (2-tailed); * $p < 0.05$ level (2-tailed); N = 97

8. CONCLUSION AND DISCUSSION

8.1 FINDINGS

Besides that being aware of one's communication within an organization or team is important, it should be highlighted that, in addition to recognizing, improving and developing these communication abilities is also critical for organizational or team performance (Bente & Breuer, 2010; Eck, 2006). In a world where innovation and development are the norm, it is thus critical to keep learning new things (Jiménez-Jiménez & Sanz-Valle, 2011). Organizations are becoming increasingly interested in team development and the formation of a learning organization (Bollinger & Smith, 2001). One of the reasons for this is that constantly learning reduces personnel knowledge loss within an organization (Suter et al., 2009). It is stated that successful organizations are constantly innovating, ensuring that employees 'learning processes are accelerated and, as a result, their performance improves (Jiménez-Jiménez & Sanz-Valle, 2011; Tushman & Nadler, 1986). Workers gain from consistent growth not just in terms of their work performance, but it also saves time, money, and boosts employee retention rates (Ma et al., 2018).

One approach for team members to continue to develop and innovate is to pay greater attention to communication, collaboration, and teamwork (Suter et al., 2009). As stated in this study, one may enhance communication and achieve specific goals more effectively by knowing more about their own style of communication as well as the style of others (Heldeweg et al., 2010; Husain, 2013; Van Dijk, 2000). Because an organization's communication is critical to its success, this study created the Serious Game *CommOn!* that maps out a person's communication styles.

The current study sought to create a Serious Game to assess workplace communication styles, drawing on the Social Styles Model (Merill & Reid, 1981) as a basis. An existing

communication styles instrument was employed in dated research and is transformed into a newer, better version. This study builds on that existing measurement, considering the insights and limits gained from the previous edition to produce an even better functional instrument. To qualify the Serious Game as a scientifically established measurement, this study shows its validation and reliability with 97 participants playing the Serious Game. In summary, it was expected that (1) the construct validity of the Serious Game would be high, inclining that the Serious Game measured the same constructs as the self-report and feedback report, (2) the congruent validity, whether the 360 report produces similar results as the Serious Game, was explored, (3) participants would rate the Serious Game positively, indicating high face validity, and (4) the Serious Game would show a relationship with personality.

The results of the study found that personality, the self-report, and the feedback-report influence communication styles in the Serious Game: between 15 and 21% of the variance of the Serious Game is explained by these three predictors together. The outcomes also provide partial evidence supporting the Serious Game's construct validity. In line with what was expected, a relation has been found between both Emoting as measured in the Self-Report ($r = -.38$) and in the Feedback-Report ($r = -.24$) with Controlling measured in the Serious Game. However, against expectations, there is no correlation between Assertiveness and Versatility among the self-report and feedback-report in relation to the Serious Game. It is intriguing that there is no correlation between the Serious Game of communication styles and the self- and other report scales. The relationship between the participant and the person who completed the feedback-report may be a potential cause of this. If the reporter for example never worked together with the participant in real-life or never saw the participant in a work-related setting, therefore the reporter might not view the participant's actions as versatile or assertive. Since the Serious Game was in a work-related setting, this could have led to disruption between the self- and feedback reports, and the Serious Game.

The results of this study provided partly support for the construct validity of the Serious Game. This finding opens the door for future study to investigate the possible incremental validity of the Serious Game over self-report in predicting communication styles. The variation in the Serious Game was effectively explained significantly, namely by Responsiveness, Assertiveness, and the Expressive communication style. Against expectations, the variables Versatility, Analytical, Amiable, and Driver communication style showed no construct validity and explained no significant variance in the Serious Game. This can possibly be explained by the insufficient weightings of these variables in the Serious Game.

Concerning congruent validity, it has been found that the correlations between the communication styles measured with the self-report and the feedback-report were high, indicating consistency between how one rates him or herself and how others rate that same participant. Next to that, the communication style variables significantly explained between 30 and 45% of the variance of the feedback-report. Interesting to mention is that there is a significant relationship found between Asking as measured in the Serious Game and Versatility as measured in the feedback report. This shows that when you implement Asking behavior, one's versatility increases. This indicated that by listening actively to one's communication partner and to ask questions frequently, one communicates more versatile.

The Serious Game does not predict over and above existing self-report scales measuring communication styles. However, it is critical to evaluate the impact of face validity in this case. For example, we can properly evaluate communication styles using personality and self-reports, but the face validity of these measurements is rather poor. The findings of the current study corroborate the anticipation that players would rate their experience while playing the Serious Game positively. Perceptions of participants are essential in test motivation and acceptability of the selection process (McCarthy). Players find the Serious Game more pleasant and believe that it accurately represents their ability. The latter is not irrational, given that an

online interactive game is frequently seen as a more trustworthy predictor than a pen-and-paper self-report. Instruments that are both perceived valid and candidate-accepted get stronger support among participants, which boosts test motivation and, as a result, can assure improved test performance (Anderson et al., 2010; McCarthy et al., 2017).

The relationships between the communication styles within the Serious Game and personality were examined. In total, between 5 and 12% of the variance of the Serious Game is solely explained by personality when not considering the influence of self-report and feedback-report variables. However, only Honesty-Humilty explains part of the variance of Asking and Amiable communication style in the Serious Game when all variables are included in the analysis.

Extraversion was found to be a significant predictor of Expressive communication style in the Serious Game. The higher the degree of Extraversion, the more Expressive a person is in their communication. Contrary to expectations, Extraversion was not found to be a significant predictor of Controlling and Asking as measured in the Serious Game.

Second, Agreeableness was found to be a significant predictor of the Driver communication style in the Serious Game. The higher the degree of Agreeableness, the less 'Driver 'a person is in their communication.

Third, Honesty-Humility was found to be a significant predictor of Asking in the Serious Game. The higher the degree of Honesty-Humility, the more Asking a person is in their communication (empathic, being cooperative, asking questions, carefully listening to the other person). Furthermore, Honesty-Humility was found to be a significant predictor of the Amiable communication style in the Serious Game. The higher the degree of Honesty-Humility, the more Amiable a person is in their communication. Additionally, Honesty-Humility was found to be a significant predictor of the Driver communication style in the Serious Game. The higher the degree of Honesty-Humility, the less 'Driver 'a person is in their communication.

Fourth, Self-Presentation was found to be a significant predictor of Asking in the Serious Game. The higher the degree of Self-Presentation, the less 'Asking 'a person is in their communication, which automatically indicates more 'Telling'. This means talking a lot, taking initiative, utilizing loudness, and making a position clear to others. Additionally, Self-Presentation was found to be a significant predictor of the Amiable communication style in the Serious Game. The higher the degree of Self-Presentation, the less Amiable a person is in their communication. Moreover, Self-Presentation was found to be a significant predictor of the Expressive communication style in the Serious Game. The higher the degree of Self-Presentation, the more Expressive a person is in their communication.

Lastly, Conscientiousness, Stability, Openness to Experience, and Core Self-Evaluations were no significant predictors of any of the communication style variables in the Serious Game.

8.2 Limitations of this study and suggestions for future research

Although the psychometric qualities of the Serious Game appear promising, the first question is whether the Serious Game scores are predictive of real behavior and/or work performance in a team role. As a result, the most pressing recommendation for future research is to investigate predictive validity. Following that, incremental validity may be investigated in comparison to other methodologies. Given the little overlap with personality, self-report, and the feedback-report, there appears to be plenty of opportunity for this, however further study will be required to determine this experimentally. This could be a different weighting of the variables measured in the Serious Game, or modified item-factor classifications.

Second, future studies can go deeper into the impact of Serious Games on concentration, test motivation, and test performance. It is possible that virtual reality technologies may create diversions, for example, that Expressive and extravert players or

players who find the Serious Game particularly enjoyable may become carried away by the Serious Game and hence be less attentive to the content. Next to that, the Serious Game does not contain a practice scenario to assist players become acquainted with Serious Game, more practice opportunities need to be available.

Furthermore, this study also shows that there are mean gender differences in communication styles in the Serious Game. In table 9, the means and standard deviations of the scores of all communication style facets as measured in the Serious Game of men and women are presented. Independent samples t-tests have been conducted to compare communication styles in the Serious Game for men and women. There was a significant difference in the Control scores between men (M=1511.61, SD=230.33) and women (M=1379.09, SD=192.82); $t(95)$=2.96 , $p < .01$. This is in line with existing literature, stating that males are more autonomous and unemotional or connected in conversations (less responsive), whereas females are more social-emotional in their relationships and conversations with others (Chodorow, 1978; Eagly, 1987). However, based on other research it could have been expected that there would also be significant differences between men and women on scores of Assertiveness, Driver, and Expressive whilst playing the Serious Game. For instance, it has been discovered that women are more Expressive and polite in speech whereas males are more assertive and Driver-oriented (Basow & Rubenfeld, 2003). Since this was not considered whilst formulating the hypotheses for this study, this may be included in further research to investigate why there only has been found a significant effect for Responsiveness scores, and not for other scores in the Serious Game.

Additionally, it is also reasonable to assume that those who tend to be more sociable, assertive, active, and upbeat (scoring high on Extraversion) will tend to evaluate themselves, in a more positive manner (in both the self-report and Serious Game). Therefore, this could have led to a discrepancy between the feedback-report and the self-report and serious report.

Because there is currently insufficient data to support *CommOn!* its predictive value, it is too early to recommend the test as a stand-alone instrument for selection or development. However, this study provides evidence that the Serious Game is perceived as very positive, and that the participants feel that it is a significant and reliable predictor of their abilities and communication style in the workplace. For follow-up research it is therefore very important that this face validity is compared to that of the self-report. Here it would be expected that the Serious Game will result in higher face validity values compared to the self-report that measures communication styles.

8.3 IMPLICATIONS FOR PRACTICE

The degree of agreement between one's own and other people's assessments has certain practical ramifications. The main result is that differences between one's own and other people's evaluations might offer crucial information regarding management and leadership performance (Nilsen & Campbell, 1993). Many 360-degree assessment users believe that comprehending the distinctions between one's own perspective and those of others is a crucial step in the growth of leadership, despite the paucity of research on the reasons for these variances (Dalton, 1996; McCauley & Moxley, 1996). Therefore, incorporating self-awareness into the evaluation might increase the effect of the feedback. Only when the evaluation offers input from all angles pertinent to a manager his or her success, including self-ratings, can this kind of influence be attained.

8.4 CONCLUSION

The central objective in this study was to develop a comprehensive instrument - a Serious Game called *CommOn*! – assessing communication styles and Versatility by determining the reliability and construct, congruent, and face validity of the new measurement, as well as examining the relationship between communication styles measured in the Serious

Game and personality. The instrument aims to measure insight into communication styles, and it is also the first time that it has been psychometrically studied. The results provide sufficient confidence for the measurement of the Serious Game, where Responsiveness is correctly measured by the Serious Game. The construct and congruent validity of the instrument are high and face validity with the Serious Game could partly be demonstrated. However, not all variables measured in the Serious Game had construct validity, therefore this still needs to be more clearly substantiated. The Serious Game is positively received by candidates, who also find the test fun and accurate. After the successful first development of *CommOn!,* this Serious Game may become the next medium to make measuring communication styles more appealing, modern, and truthful.

R<small>EFERENCES</small>

Al Khidir, T., & Zailani, S. (2009). Going Green in Supply Chain Towards Environmental

Sustainability. *Global Journal of Environmental Research*, *3*(3), 246–251.

Alvarez, J., & Michaud, L. (2008). *Serious games. Advergaming, edugaming, training and*

more. https://doi.org/10.1145/1361083.1361093

Anderson, N., Salgado, J. F., & Hülsheger, U. R. (2010). Applicant Reactions in Selection:

Comprehensive meta-analysis into reaction generalization versus situational specificity.

International Journal of Selection and Assessment, *18*(3), 291–304.

https://doi.org/10.1111/j.1468-2389.2010.00512.x

Ashton, M. C., & Lee, K. (2005). Honesty-Humility, the Big Five, and the Five-Factor

Model. *Journal of Personality*, *73*(5), 1321–1354. https://doi.org/10.1111/j.1467-

6494.2005.00351.x

Bagherian, M., & Mojambari, A. K. (2016). The Relationship between BIG Five Personality

Traits and Assertiveness. *Педагошка Стварност*, *65*(1), 69–81.

https://doi.org/10.19090/ps.2019.1.69-81

Bakar, H. A., & Mustaffa, C. S. (2013). Organizational communication in Malaysia

organizations: Incorporating cultural values in communication scale. *Corporate*

Communications, *18*(1), 87–109. https://doi.org/10.1108/13563281311294146

Basow, S. A., & Rubenfeld, K. (2003). "Troubles talk": Effects of gender and gender-typing.

Sex Roles, *48*(3–4), 183–187. https://doi.org/10.1023/A:1022411623948

Bente, G., & Breuer, J. (2010). Why so serious? On the Relation of Serious Games and

Learning. *Eludamos - Journal for Computer Game Culture*, *4*(1), 7–24.

http://www.eludamos.org/index.php/eludamos/article/viewArticle/vol4no1-2

Bollinger, A. S., & Smith, R. D. (2001). Managing organizational knowledge as a strategic

asset. *Journal of Knowledge Management*, *5*(1), 8–18.

https://doi.org/10.1108/13673270110384365

Bolton, R., & Bolton, D. G. (2009). *People Styles at Work--and Beyond: Making Bad Relationships Good and Good Relationships Better.* Amacom Books.

Bouchard, M. -A, Lalonde, F., & Gagnon, M. (1988). The Construct Validity of Assertion: Contributions of Four Assessment Procedures and Norman's Personality Factors. *Journal of Personality*, *56*(4), 763–783. https://doi.org/10.1111/j.1467-6494.1988.tb00476.x

Carnahan, S., Agarwal, R., & Campbell, B. (2010). The Effect of Firm Compensation Structures on the Mobility and Entrepreneurship of Extreme Performers. *Business*, *920*(October), 1–43. https://doi.org/10.1002/smj

Cassandro, V. J., & Simonton, D. K. (2010). Versatility, Openness to Experience, and Topical Diversity in Creative Products: An Exploratory Historiometric Analysis of Scientists, Philosophers, and Writers. *The Journal of Creative Behavior*, *44*(1), 9–26. https://doi.org/10.1002/j.2162-6057.2010.tb01322.x

Chodorow, N. (1978). The reproduction of mothering. In *University of California press.*

Cialdini, R. B. (2007). *Influence: The Psychology of Persuasion* (EPub ed.). New York: Collins. http://elibrary.bsu.az/books_400/N_232.pdf

Corti, K. (2006). Games-based Learning: a serious business application. *Informe de PixelLearning, 34(6)*, 1–20.

Darling, J. R., & Walker, E. W. (2001). Effective conflict management: Use of the behavioral style model. *Leadership & Organization Development Journal*, *22*(5), 230–242. https://doi.org/10.1108/01437730110396375

De Freitas, S. I. (2006). Using games and simulations for supporting learning. *Learning, Media and Technology*, *31*(4), 343–358. https://doi.org/10.1080/17439880601021967

Dubbelt, L., Oostrom, J. K., Hiemstra, A. M. F., & Modderman, J. P. L. (2015). Validation of

a Digital Work Simulation to Assess Machiavellianism and Compliant Behavior. *Journal of Business Ethics*, *130*(3), 619–637. https://doi.org/10.1007/s10551-014-2249-x

Dunkel, C. S., & Van der Linden, D. (2014). Evidence for the general factor of personality as social-effectiveness. *Personality and Individual Differences*, *64*, 147–151. https://doi.org/10.1016/j.paid.2014.02.030

Dweck, C. S. (2017). From needs to goals and representations: Foundations for a unified theory of motivation, personality, and development. *Psychological Review*, *124*(6), 689–719. https://doi.org/10.1037/rev0000082

Eagly, A. H. (1987). *Sex differences in sexual behavior: A social-role interpretation.*

Eck, R. Van. (2006). Digital Game-Based Learning : It 's Not Just the Digital Natives Who Are Restless …. *Educause Review*, *41*(2), 1–16.

Fano, R. M. (1949). THE TRANSMISSION OF INFORMATION. *RESEARCH LABORATORY OF ELECTRONICS: MASSACHUSETTS INSTITUTE OF TECHNOLOGY*, *65*, 878–887.

Funke, J. (1998). Computer-based testing and training with scenarios from complex problemsolving research: advantages and disadvantages. *International Journal of Selection and Assessment*, *6*(2), 90–96. https://doi.org/10.1111/1468-2389.00077

Galton, F. (1949). *The measurement of character.*

Girard, C., Ecalle, J., & Magnan, A. (2013). Serious games as new educational tools: How effective are they? A meta-analysis of recent studies. *Journal of Computer Assisted Learning*, *29*(3), 207–219. https://doi.org/10.1111/j.1365-2729.2012.00489.x

Goldberg, L. R. (1990). An Alternative "Description of Personality": The Big-Five Factor Structure. *Journal of Personality and Social Psychology*, *59*(6), 1216–1229. https://doi.org/10.1117/12.642204

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment*, *4*(1), 26–42.

Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist*, *48*(1), 26–34. https://doi.org/10.1016/j.amc.2009.04.028

Goldhaber, G. M., & Rogers, D. P. (1979). Auditing organizational communication systems: The ICA communication audit. *Kendall/Hunt Publishing Company*.

Greenbaum, H. H., Clampitt, P., & Willihnganz, S. (1988). Organizational communication: An examination of four instruments. *Management Communication Quarterly*, *2*(2), 245–282.

Grover, S. M. (2005). The Foundation of Collaboration. *AAOHN Journal*, *53*(4), 177–182.

Gumperz, J. J., & Cook-Gumperz, J. (1981). Ethnic differences in communicative style. In *Language in the USA* (pp. 430–445).

Hamamura, T., Heine, S. J., & Paulhus, D. L. (2008). Cultural differences in response styles: The role of dialectical thinking. *Personality and Individual Differences*, *44*(4), 932–942. https://doi.org/10.1016/j.paid.2007.10.034

Hargie, O. (2016). The Importance of Communication for Organisational Effectiveness. In *Psicologia do Trabalho e das Organizações: Contributos* (Issue June). https://doi.org/10.17990/axi/2016_9789726972556_015

Hargie, O., & Tourish, D. (2009). Auditing organizational communication: A handbook of research, theory and practice. In *Auditing Organizational Communication: A Handbook of Research, Theory and Practice*. Routledge/Taylor & Francis Group. https://doi.org/10.4324/9780203883990

Hausknecht, J. P., Day, D. V., & Thomas, S. C. (2004). Applicant reactions to selection procedures: An updated model and meta-analysis. *Personnel Psychology*, *57*(3), 639–683. https://doi.org/10.1111/j.1744-6570.2004.00003.x

Heldeweg, B., Van Grunsven, G., & Désar, M. (2010). *Waarom begrijp je me niet?: beter samenwerken door het (h)erkennen van communicatiestijlen.* Van Duuren Management.

Hiemstra, A., Op de Beek, M., & Serlie, A. (2011). *Handleiding G5R. Ongepubliceerd intern document GITP. Rotterdam.*

Hofstede, G., Hofstede, G., & Minkov, M. (2010). Cultures and Organizations: Software of the mind: Intercultural cooperation and its importance for survival. *New York: McGraw Hill*, *3*, 53–88.

Hogard, E., & Ellis, R. (2006). Evaluation and communication: Using a communication audit to evaluate organizational communication. *Evaluation Review*, *30*(2), 171–187. https://doi.org/10.1177/0193841X05278789

Holtgraves, T. (2004). Social Desirability and Self-Reports: Testing Models of Socially Desirable Responding. *Personality and Social Psychology Bulletin*, *30*(2), 161–172. https://doi.org/10.1177/0146167203259930

Husain, Z. (2013). Effective communication brings successful organizational change. *The Business and Management Review*, *3*(2), 43–50. http://www.abrmr.com/myfile/conference_proceedings/Con_Pro_12315/7-dubai13.pdf

Ivanov, M., & Werner, P. D. (2010). Behavioral communication: Individual differences in communication style. *Personality and Individual Differences*, *49*(1), 19–23. https://doi.org/10.1016/j.paid.2010.02.033

Jiménez-Jiménez, D., & Sanz-Valle, R. (2011). Innovation, organizational learning, and performance. *Journal of Business Research*, *64*(4), 408–417. https://doi.org/10.1016/j.jbusres.2010.09.010

Jones, E., & Nisbett, R. (1971). The Actor and the Observer: Divergent Perceptions of the causes of Behavior. *Attribution: Perceiving the Cause of Behavior*, 79–94.

Judge, T. A., Erez, A., Bono, J. E., & Thoresen, C. J. (2003). The core self-evaluations scale:

Development of a measure. *Personnel Psychology*, *56*(2), 303–331.

https://doi.org/10.1111/j.1744-6570.2003.tb00152.x

Judge, T. A., & Kammeyer-Mueller, J. D. (2011). Implications of core self-evaluations for a

changing organizational context. *Human Resource Management Review*, *21*(4), 331–

341. https://doi.org/10.1016/j.hrmr.2010.10.003

Judge, T. A., Locke, E. A., Durham, C. C., & Kluger, A. N. (1998). Dispositional effects on

job and life satisfaction: The role of core evaluations. *Journal of Applied Psychology*,

83(1), 17–34. https://doi.org/10.1037/0021-9010.83.1.17

Karadağ, Ş., & Kaya, S. D. (2019). The effects of personality traits on willingness to

communicate: A study on university students. *MANAS Sosyal Araştırmalar Dergisi*,

8(1), 397–410.

Kim, M. S. (1994). Cross-cultural comparisons of the perceived importance of conversational

constraints. *Human Communication Research*, *21*(1), 128–151.

Kim, M. S., Hunter, J. E., Miyahara, A., Horvath, A. M., Bresnahan, M., & Yoon, H. J.

(1996). Individual-vs. culture-level dimensions of individualism and collectivism:

Effects on preferred conversational styles. *Communication Monographs*, *63*(1), 29–49.

http://ezaccess.libraries.psu.edu/login?url=http://search.ebscohost.com/login.aspx?direct

=true&db=ufh&AN=9604122083&site=ehost-

live&scope=site%0Ahttp://content.ebscohost.com.ezaccess.libraries.psu.edu/ContentSer

ver.asp?T=P&P=AN&K=9604122083&S=R&D=ufh&Ebsc

Kirst, L. K. (2011). Investigating the relationship between assertiveness and personality

characteristics. *Thesis*, *2011*, 55. https://stars.library.ucf.edu/honorstheses1990-

2015/1200%0Ahttps://stars.library.ucf.edu/honorstheses1990-2015/1200/

Koczwara, A., Patterson, F., Zibarras, L., Kerrin, M., Irish, B., & Wilkinson, M. (2012).

Evaluating cognitive ability, knowledge tests and situational judgement tests for

postgraduate selection. *Medical Education*, *46*(4), 399–408.

https://doi.org/10.1111/j.1365-2923.2011.04195.x

Kottawatta, H. (2019). BIG FIVE PERSONALITY AND COMMUNICATION STYLES. In

Economic and Social Development: Book of Proceedings (pp. 123–131).

https://www.researchgate.net/publication/341443992

Laamarti, F., Eid, M., & El Saddik, A. (2014). An Overview of Serious Games Fedwa.

International Journal of Computer Games Technology, *2014*.

Landrigan, P. J., Stegeman, J. J., & Fleming, L. E. (2020). Human health and ocean pollution.

Annals of Global Health, *86*(1).

Leary, T. (1957). *Interpersonal diagnoses of personality: A functional theory and*

methodology for personality evaluation. The Ronald Press.

Lee, C., & Green, R. T. (1991). Cross-cultural examination of the Fishbein behavioral

intentions model. *Journal of International Business Studies*, *22*(2), 289–305.

Leonard, M., Graham, S., & Bonacum, D. (2004). The human factor: The critical importance

of effective teamwork and communication in providing safe care. *Quality and Safety in*

Health Care, *13*(SUPPL. 1), 85–90. https://doi.org/10.1136/qshc.2004.010033

Leung, S. K., & Bond, M. H. (2001). Interpersonal communication and personality: Self and

other perspectives. *Asian Journal of Social Psychology*, *4*(1), 69–86.

https://doi.org/10.1111/1467-839X.00076

Lievens, F., & Coetsier, P. (2002). Situational tests in student selection: An examination of

predictive validity, adverse impact, and construct validity. *International Journal of*

Selection and Assessment, *10*(4), 245–257. https://doi.org/10.1111/1468-2389.00215

Lievens, F., & De Soete, B. (2012). Simulations. *The Oxford Handbook of Personnel*

Assessment and Selection, 383–410.

Lievens, F., & Patterson, F. (2011). The Validity and Incremental Validity of Knowledge

Tests, Low-Fidelity Simulations, and High-Fidelity Simulations for Predicting Job

Performance in Advanced-Level High-Stakes Selection. *Journal of Applied Psychology*,

96(5), 927–940. https://doi.org/10.1037/a0023496

Lievens, F., Peeters, H., & Schollaert, E. (2008). Situational judgment tests: A review of

recent research. *Personnel Review*, *37*(4), 426–441.

https://doi.org/10.1108/00483480810877598

Lievens, F., & Sackett, P. R. (2006). Video-based versus written situational judgment tests: A

comparison in terms of predictive validity. *Journal of Applied Psychology*, *91*(5), 1181–

1188. https://doi.org/10.1037/0021-9010.91.5.1181

Lievens, F., Van Dam, K., & Anderson, N. (2002). Recent trends and challenges in personnel

selection. *Personnel Review*, *31*(5–6), 580–601.

https://doi.org/10.1108/00483480210438771

Lobel, A. (2016). *The Relation Between Gaming and the Development of Emotion Regulation

Skills*.

Ma, Q. K., Mayfield, M., & Mayfield, J. (2018). Keep them on-board! How organizations

can develop employee embeddedness to increase employee retention. *Development and

Learning in Organizations*, *32*(4), 5–9. https://doi.org/10.1108/DLO-11-2017-0094

Mabe, P. A., & West, S. G. (1982). Validity of self-evaluation of ability: A review and meta-

analysis. *Journal of Applied Psychology*, *67*(3), 280–296. https://doi.org/10.1037/0021-

9010.67.3.280

Macht, G. A., & Nembhard, D. A. (2015). Measures and models of personality and their

effects on communication and team performance. *International Journal of Industrial

Ergonomics*, *49*, 78–89. https://doi.org/10.1016/j.ergon.2015.05.006

Magalhães, E., Costa, P., & Costa, M. J. (2012). Empathy of medical students and

personality: Evidence from the Five-Factor Model. *Medical Teacher*, *34*(10), 807–812.

https://doi.org/10.3109/0142159X.2012.702248

Marin, G., Gamba, R. J., & Marin, B. V. (1992). Extreme response style and acquiescence among Hispanics: The role of acculturation and education. *Journal of Cross-Cultural Psychology*, *23*(4), 498–509.

Marsh, T. (2011). Serious games continuum: Between games for purpose and experiential environments for purpose. *Entertainment Computing*, *2*(2), 61–68. https://doi.org/10.1016/j.entcom.2010.12.004

Martin, G. C. (2014). The Effects Of Cultural Diversity In The Workplace. *Journal of Diversity Management (JDM)*, *9*(2), 89–92. https://doi.org/10.19030/jdm.v9i2.8974

McAdams, D. P., & Pals, J. L. (2006). New Big Five.Pdf. In *American Psychologist* (Vol. 61, Issue 3, pp. 204–217).

McCarthy, J. M., Bauer, T. N., Truxillo, D. M., Anderson, N. R., Costa, A. C., & Ahmed, S. M. (2017). Applicant Perspectives During Selection: A Review Addressing "So What?," "What's New?," and "Where to Next?" *Journal of Management*, *43*(6), 1693–1725. https://doi.org/10.1177/0149206316681846

McCrae, & Costa, P. T. (1989). The Structure of Interpersonal Traits: Wiggins's Circumplex and the Five-Factor Model. *Journal of Personality and Social Psychology*, *56*(4), 586–595. https://doi.org/10.1037/0022-3514.56.4.586

McCrae, R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology*, *1*, 81–90.

McCrae, R. R., & Costa, P. T. (1995). Trait explanations in personality psychology. *European Journal of Personality*, *9*(4), 231–252. https://doi.org/10.1002/per.2410090402

McCroskey, J. C., & McCroskey, L. L. (1988). Self-report as an approach to measuring communication competence. *Ministerio de Salud y Protección Social*, *108-113*.

McDaniel, M., Morgeson, F., Finnegan, E., Campion, M., & Braverman, E. (2001). Use of situational judgment tests to predict job performance: a clarification of the literature. *Journal of Applied Psychology*, *86*(4), 730–740.

McDaniel, M., & Nguyen, N. (2001). Situational Judgment Tests: A Review of Practice and Constructs Assessed. *International Journal of Selection and Assessment*, *9*(1–2), 103–113. https://doi.org/10.1111/1468-2389.00167

McDaniel, M., & Whetzel, D. (2007). Situational judgment tests. *Applied Measurement: Industrial Psychology in Human Resources Management*, 235–257.

Means, J. R., Wilson, G. L., Sturm, C., Biron, J. E., & Bach, P. J. (1990). Humility as a psychotherapeutic formulation. *Counselling Psychology Quarterly*, *3*(2), 211–215.

Merchant, K. (2012). How men and women differ: Gender differences in communication styles, influence tactics, and leadership styles. *CMC Senior Theses*, 0–62. http://scholarship.claremont.edu/cmc_theses/513/

Merrill, D. W., & Reid, R. H. (1981). *Personal Styles & Effective Performance: Make Your Style Work for You*. CRC Press.

Michael, D., & Chen, S. (2006). *Games That Educate, Train and Inform.*

Michels, W. (2010). *Communicatie Handboek.*

Mitgutch, K. (2009). (Re)Learning in computer games like Shadow of the Colossus. *Journal for Computer Game Culture*, *3*(1), 9–22.

Musek, J. (2007). A general factor of personality: Evidence for the Big One in the five-factor model. *Journal of Research in Personality*, *41*(6), 1213–1233. https://doi.org/10.1016/j.jrp.2007.02.003

Negatu, A. S. (2009). Cognitively Inspired Decision Making for Software Agents: Integrated Mechanisms for Action Selection, Expectation, Automatization and Non-Routine Problem Solving. *The Knowledge Engineering Review*, *24*(4), 410–410.

https://doi.org/10.1017/s0269888909990245

Nguyen, N. T., Biderman, M. D., & McDaniel, M. A. (2005). Effects of response instructions on faking a situational judgment test. *International Journal of Selection and Assessment*, *13*(4), 250–260. https://doi.org/10.1111/j.1468-2389.2005.00322.x

Norton, R. (1978). Foundation of a communicator style construct. *Human Communication Research*, *4*(2), 99–112.

Norton, R., & Warnick, B. (1976). Assertiveness as a communication construct. *Human Communication Research*, *3*(1), 62–66.

Omura, M., Stone, T. E., & Levett-Jones, T. (2018). Cultural factors influencing Japanese nurses 'assertive communication: Part 2 – hierarchy and power. *Nursing and Health Sciences*, *20*(3), 289–295. https://doi.org/10.1111/nhs.12418

Oostrom, J. K., Born, M. P., Serlie, A. W., & van der Molen, H. T. (2010). Webcam testing: Validation of an innovative open-ended multimedia test. *European Journal of Work and Organizational Psychology*, *19*(5), 532–550. https://doi.org/10.1080/13594320903000005

Oostrom, J. K., de Rijke, L. M., Serlie, A. W., & Heldeweg, B. (2014). Individuele verschillen in communicatiestijlen. *Gedrag & Organisatie*, *27*(4), 361–384. https://doi.org/10.5553/geno/092150772014027004001

Paulhus, D. L., & Vazire, S. (2007). The self-report method. In *Handbook of research methods in personality psychology* (Vol. 1, pp. 224-239.). https://doi.org/10.1002/0470013435.ch6

Pratidina Susilo, A., van den Eertwegh, V., van Dalen, J., & Scherpbier, A. (2013). Leary's Rose to improve negotiation skills among health professionals: Experiences from a Southeast Asian culture. *Education for Health: Change in Learning and Practice*, *26*(1), 54–59. https://doi.org/10.4103/1357-6283.112803

Ratan, R. A., & Ritterfeld, U. (2009). *Classifying serious games Classifying Serious Games Rabindra Ratan and Ute Ritterfeld. February*, 9–24.

Reiners, T., & Wood, L. C. (2015). Gamification in education and business. *Gamification in Education and Business*, 1–710. https://doi.org/10.1007/978-3-319-10208-5

Riggio, H. R., & Riggio, R. E. (2002). Emotional expressiveness, extraversion, and Neuroticism: A meta-analysis. *Journal of Nonverbal Behavior*, *26*(4), 195–218. https://doi.org/10.1023/A:1022117500440

Rijsdijk, J., Born, M. P., Koch, B. P. N., & Hiemstra, A. M. F. (2021). De validering van een virtual reality situationele. *GEDRAG & ORGANISATIE 34.1*, *1*, 107–139. https://doi.org/10.5117/G

Roberts, K. H., & O'Reilly, C. A. (1974). Measuring organizational communication. *Journal of Applied Psychology*, *59*(3), 321–326. https://doi.org/10.1037/h0036660

Robertson, C. (2008). Employee development: Getting the information you need through a 360 feedback report. *Chemical Engineering*, *115*(4), 63.

Shute, V., Ventura, M., Bauer, M., & Zapata-Rivera, D. (2009). Melding the power of serious games and embedded assessment to monitor and foster learning: Flow and Grow. In *Serious Games* (pp. 317–343). Routledge.

Sims, C. M. (2017). Do the Big-Five Personality Traits Predict Empathic Listening and Assertive Communication? *International Journal of Listening*, *31*(3), 163–188. https://doi.org/10.1080/10904018.2016.1202770

Smith, P. B. (2011). Communication styles as dimensions of national culture. *Journal of Cross-Cultural Psychology*, *42*(2), 216–233. https://doi.org/10.1177/0022022110396866

Snavely, W. B. (1981). The impact of social style upon person perception in primary relationships. *Communication Quarterly*, *29*(2), 132–143. https://doi.org/10.1080/01463378109369398

Stapleton, A. J. (2004). Serious Games : Serious Opportunities. *Health Care*, *1*(September), 1–6. http://andrewstapleton.com/wp-content/uploads/2006/12/serious_games_agdc2004.pdf

Streiner, D. L., Norman, G. R., & Cairney, J. (2015). *Health measurement scales: a practical guide to their development and use.* Oxford University Press.

Susi, T., Johannesson, M., & Backlund, P. (2007). Simulation of long term evolution (LTE) based communication system with different protocols. *School of Humanities and Informatics*, *2007-02–05*, 488–491. https://doi.org/10.1109/UEMCON.2017.8249059

Suter, E., Arndt, J., Arthur, N., Parboosingh, J., Taylor, E., & Deutschlander, S. (2009). Role understanding and effective communication as core competencies for collaborative practice. *Journal of Interprofessional Care*, *23*(1), 41–51. https://doi.org/10.1080/13561820802338579

Trapnell, P. D., & Wiggins, J. S. (1990). Extension of the Interpersonal Adjective Scales to Include the Big Five Dimensions of Personality. *Journal of Personality and Social Psychology*, *59*(4), 781–790. https://doi.org/10.1037/0022-3514.59.4.781

Tushman, M., & Nadler, D. (1986). Organizing for Innovation. *CALIFORNIA MANAGEMENT REVIEW*, *28*(3), 74–92.

van de Ven, N., Bogaert, A., Serlie, A., Brandt, M. J., & Denissen, J. J. A. (2017). Personality perception based on LinkedIn profiles. *Journal of Managerial Psychology*, *32*(6), 418–429. https://doi.org/10.1108/JMP-07-2016-0220

Van der Linden, D., Bakker, A. B., & Serlie, A. W. (2011). The General Factor of Personality in selection and assessment samples. *Personality and Individual Differences*, *51*(5), 641–645. https://doi.org/10.1016/j.paid.2011.05.032

Van Dijk, B. (2000). *Beïnvloed anderen, begin bij jezelf: Over gedrag en de roos van Leary.* Thema.

Van Tongeren, D. R., Davis, D. E., & Hook, J. N. (2014). Social benefits of humility: Initiating and maintaining romantic relationships. *Journal of Positive Psychology*, *9*(4), 313–321. https://doi.org/10.1080/17439760.2014.898317

Velentzas, J., & Broni, G. (2014). Communication cycle : Definition , process , models and examples. *Recent Advances in Financial Planning and Product Development*, 117–131. http://www.wseas.us/e-library/conferences/2014/Istanbul/FINANCE/FINANCE-00.pdf

Velentzas, Mamalis, S., & Broni, G. (2010). Communication, Public Relations & Advertisement. *IuS*.

Waldherr, A., & Muck, P. M. (2011). Towards an integrative approach to communication styles: The interpersonal circumplex and the five-factor theory of personality as frames of reference. *Communications*, *36*(1), 1–27. https://doi.org/10.1515/COMM.2011.001

Wales, T. (2013). Organizational sustainability: What it is, and why does it matter? *Review of Enterprise and Management Studies*, *1*(1), 38–49.

Watt, J., Hamilton, M., Nowak, K., & Christensen, J. (2016). Serious Game, Serious Results: A Case Study with Evidence. *Journal of Computer Games and Communication*, *1*(1), 13–25. https://doi.org/10.15340/2148188111925

Wernimont, P. F., & Campbell, J. P. (1968). Signs, Samples, and Criteria. *Journal of Applied Psychology*, *52*(5), 372–376. https://doi.org/10.1037/h0026244

Wiio, O. A., & Helsila, M. (1974). Auditing communication in organizations: a standard survey, LTT communication audits. *Finnish Journal of Business Economics*, *4*(1), 303–315.

Wilson, L. (2004). *The social styles handbook: Find your comfort zone and make people feel comfortable with you.* Herentals: Nova Vista Publishing.

Table 2. One-way ANOVAs

	Age		Educational Level	
	F	Sig.	*F*	Sig.
Game Control	1.23	.30	.47	.76
Game Ask	.52	.67	.85	.50
Game Versatility	1.15	.42	.10	.98
Game Analytical	.97	.33	.50	.74
Game Amiable	1.88	.14	.65	.63
Game Driver	1.08	.36	.73	.57
Game Control	.16	.92	.42	.79

Where df (3, 96) relies in all cases