

**Conceptualization and Contextualization of the Temperamental Dimension of  
Secondary Function after Gerard Heymans**

Paul Matti Calet Anton Max Linus Henk Arno Flüs

S3657817

Department of Psychology, University of Groningen

PSB3E-BT15: Bachelor Thesis

2122\_2a\_10 NL/EN Vermeij

Supervisor: Rinske Vermeij

Second evaluator: Prof. Dr. Peter de Jonge

In collaboration with: Friederike Kreßmann, Julia Meffert, Nils Müller and Corné Vroomen.

July 03, 2022

*A thesis is an aptitude test for students. The approval of the thesis is proof that the student has sufficient research and reporting skills to graduate, but does not guarantee the quality of the research and the results of the research as such, and the thesis is therefore not necessarily suitable to be used as an academic source to refer to. If you would like to know more about the research discussed in this thesis and any publications based on it, to which you could refer, please contact the supervisor mentioned.*

### **Abstract**

Throughout the history of personality psychology, the consensus about which aspects of personality are most central to understanding individual differences has shifted frequently. These dynamic changes manifested in the addition and omission of various dimensions in personality typologies. However, although overall these changes were generally advantageous for the typologies, sometimes crucial dimensions were omitted. The present paper aims at identifying and analyzing one of these potential losses: The dimension of secondary function. Various researchers have interpreted and reinterpreted the dimension of secondary function in an attempt to link it to other aspects of personality and cognition. The present paper investigates these particular interpretations and connections in an attempt to answer the question: How can the dimension of secondary function be understood in contextualization with contemporary research in personality psychology and cognitive psychology? I hypothesize the dimension of secondary function to still echo in not only contemporary models on personality but also cognition. The present paper identified multiple connections between the dimension of secondary function and dimensions of the contemporary personality typology OCEAN, namely extraversion, conscientiousness and openness. Furthermore, there appear to be direct connections between the dimension of secondary function and multiple measures of cognition, particularly measures of memory and perception. These findings indicate the dimension of secondary function to conceptually underlie various aspects of human personality and cognition. Further research has to be conducted on the associations found in the present paper in an attempt to verify the interpretations and quantify the connections.

*Keywords:* Gerard Heymans, primary function, secondary function, consciousness, aftereffect, memory, perception, extraversion

## **Conceptualization and Contextualization of the Temperamental Dimension of Secondary Function after Gerard Heymans**

Throughout the history of personality psychology, researchers have formulated more and more specialized ways to classify and categorize individual differences between people. The development of models in personality psychology was steadily accompanied by the omission of old dimensions and addition of new dimensions. However, the notion of definite positive progress reflects the commonplace presentism of contemporary research. Thus, although generally these dynamic changes were advantageous for the model and the field, it is often disregarded that sometimes crucial aspects of individual differences get lost through these changes.

The present paper aims at identifying and analyzing one of these losses: The dimension of secondary function, conceptualized by Gross (1902) and applied by Heymans. In brief, secondary function is defined as the degree to which contents of the peripheral consciousness affect contents of the central consciousness (Heymans, 1932, p. 19). Heymans aligned the dimension of secondary function together with the dimension of emotionality and the dimension of activity along the three axes of a cube for the purpose of assessing individual differences. Although, the other two dimensions in Heymans typology can be directly connected to contemporary models on personality, the dimension of secondary function does not have such a clear link to other typologies. Various researchers have interpreted and reinterpreted the dimension of secondary function in an attempt to link it to other aspects of personality (Rechtschaffen & Bookbinder, 1960; Van der Werff, 1985; Hofstee, 1994). The present paper investigates and reviews these particular interpretations and connections. This leads me to my research question: How can the dimension of secondary function be understood in contextualization with contemporary research in personality psychology and cognitive psychology?

As opposed to the dimensions of emotionality and activity that are rather straightforward in their definitions and implications, the dimension of secondary function is quite difficult to pinpoint in regard to such aspects. The way Heymans defined the dimension of secondary function lacked specificity, but implied a plethora of associations. The lack of specificity in the definition of the dimension might have contributed to the absence of the dimension in contemporary personality psychology. Thus, the many implications of the dimension of secondary function failed to see the light of day despite their relevance and complexity. I consider it important to reevaluate the dimension of secondary function and shed light on the many implications of the dimension.

### **Project Outline**

The present project does not intend to justify the use of the personality model of Gerard Heymans, but rather aims to show how one of the temperamental dimensions applied in Heymans' Cube has unjustly been forgotten over the course of history and could still be used in contemporary research to measure individual differences of psychological states related to attention and memory. The present project furthermore does not intend to present a meta-analysis of all research that has been conducted on the topic of the dimension of secondary function. The project will consider and integrate different research projects that have been conducted on the topic. However, since most of these research projects focus on different aspects of the dimension of secondary function and make different claims about the potential associations and implications, the present research is a qualitative integration of varying past research on the subject with the goal of gaining a more *holistic* understanding, rather than a collection and standardization of similar past research with the goal of gaining a more *accurate* understanding.

Since the present research aims to develop a holistic understanding of the dimension of secondary function of the temperamental dimensions, I am primarily interested in insight

rather than data. Thus, a qualitative approach is more adequate than a quantitative approach for the present research. Although, I will draw from quantitative research for some parts of the analysis, there is no necessity to conduct a statistical analysis, as most of the relevant research required for the analysis has already been conducted and published by other researchers (Kouwer & Van der Werff, 1968). In the present research, I will review, interpret and integrate existing research on the topic of secondary function and the connections claimed to exist between the dimension of secondary function and other personality dimensions as well as other measures of cognitive performance.

### **State of the Art**

Van der Werff (1985) has conducted research on the temperamental dimensions of Gerard Heymans. They have coined the temperamental dimension that Heymans generally referred to as the dimension of secondary function as the dimension of aftereffect. While Heymans often mentioned the aspect of aftereffect in conjunction with the dimension of secondary function, he did not actually specify the term as the title of the dimension. I completely agree with the decision made by Van der Werff to rename the dimension for the sake of specificity, but will refrain from reformulation of the name of the dimension for the sake of clarity and adherence to the source material. Nonetheless, the approach chosen by Van der Werff points out the significance of the aspect of aftereffect for the interpretation of the dimension of secondary function, which will be important to keep in mind for the analysis. The terminology I will use of the two extremes of the dimension will also adhere to the terminology proposed by Heymans and, thus, be referred to as primary function and secondary function respectively.

The phenomenon of aftereffect in particular has been adopted into the field of cognitive psychology. Research has been conducted on the influence of various aspects of cognition, such as judgement time and expectation, on figural aftereffect (Over, 1970).

Figural aftereffects are hereby defined as the perceptual changes of the shape or location of a figure following its perception. Eysenck (1955) has studied the association between figural aftereffect and measures of extraversion. However, figural aftereffect is only one of many variations on aftereffect that has been researched in the field of cognitive psychology. Other research in the field focused on motion aftereffect (Freeman, 1999). Motion aftereffect refers to the perceived movement of a physically stationary scene following exposure to visual motion (Freeman, 1999). These variations on the phenomenon of aftereffect vary in the specifics, but generally resemble similar experiments conducted by Heymans and Wiersma (1906) on perceptual aftereffect.

In one of these experiments, Heymans and Wiersma presented a rotating color disk with red and green segments to the participants and observed how long it took them to perceive the different colors of the disk as one homogenous color. In another experiment, they observed how long it took participants to visually readjust and recognize a weak point of light after being exposed to a bright light (Heymans & Wiersma, 1906). The resemblance of experiments conducted by Freeman (1999) and Over (1970) with the experiments conducted by Heymans and Wiersma (1906) indicate that contemporary research on cognitive and perceptual variants of aftereffect find their root in the research conducted by Heymans and his colleagues. The similarity between these experiments further underlines the importance of the aspects of aftereffect in the interpretation of the dimension of secondary function.

Additionally, research has been conducted to compare Heymans' Cube with the five factors of the Abridged Big Five Circumplex, establishing important connections between the temperamental dimensions and dimensions agreed upon in contemporary research (Hofstee, 1994). The Abridged Big Five Circumplex is a variation of the traditional OCEAN Personality Model (McCrae & John, 1992), that aligns the five personality dimensions on a circumplex. For the present research, the five dimensions of the two personality typologies are

of particular interest. Thus, the peculiar structure of the Abridged Big Five Circumplex will be disregarded and the focal point will be set to the associations found between the personality dimensions conceptualized in the OCEAN Personality Model and the dimension of secondary function.

### **Heymans' Cube**

The basis for the present research will be the three temperamental dimensions applied by Gerard Heymans. The personality model known as Heymans' Cube aligns the three temperamental dimensions emotionality, activity and secondary function along the axes of a three-dimensional cube (Heymans, 1932, p. 133). Each of the eight corners of the cube corresponds to one of eight personality types. The eight personality types are Amorphus, Sanguinicus, Nervous, Cholericus, Apaticus, Phlegmatician, Sentimental and Passionate. Each of these eight types is characterized by a specific combination of scores on the three temperamental dimensions. For example, an individual with high scores on each of the three dimensions is classified as Passionate, while an individual with low scores on each of the three dimensions is classified as Amorphus. In reality, however, people are not as easily classified into types as implied by the classification of Heymans' Cube. Most individuals score somewhere in the middle of each dimension, with only few individuals displaying extremely high or extremely low scores.

The temperamental dimension of emotionality describes a difference between people in the modality with which they experience their own emotions. Heymans hereby emphasizes the consideration of the subjective relevance of the stimulus that triggered the emotion, in that some stimuli inherently trigger stronger emotional reactions than others. There are multiple aspects to the individual differences that exist in regard to emotionality. Heymans primarily defines emotionality with the focus on emotional intensity, with individuals that score high on the dimension of emotionality generally experiencing emotions as much more intense than

individuals that score low (Heymans, 1932, p. 77). However, Heymans points out that there are other factors that determine the emotionality of an individual as well, such as temporal and directional aspects. Individuals differ in regard to how fast emotional reactions occur with respect to the stimulus that caused them, in the way that some individuals react to the stimulus right away, whereas other individuals only react retrospectively (Heymans, 1932, p. 78). Individual differences in the directionality of emotions concern the tendency of the emotions of an individual being predominantly positive or predominantly negative (Heymans, 1932, p. 80).

The temperamental dimension of activity describes a difference between people in the extent to which they possess an inner drive to act upon motivation. Heymans hereby emphasizes the importance of the emotional weight of any given motivation. Some motivations are inherently more likely to prompt behavior than others. Thus, in order to assess the activity levels of an individual, the emotional weight of the motivation that sparked or failed to spark behavior has to be considered (Heymans, 1932, p. 103). Where active types naturally respond to even weak motivations and engage with their environment in an intuitive manner, nonactive types have to put in an active effort to achieve the same engagement even with strong motivations.

The temperamental dimension of secondary function is a lot more complex as a psychological characteristic than its two co-dimensions. Heymans defines the dimension of secondary function as the degree to which contents of the peripheral consciousness affect contents of the central consciousness (Heymans, 1932, p. 19). By extension, the dimension of secondary function describes a difference between people in the duration of which information remain in the peripheral consciousness and the likelihood of said information to passively spill or be actively recalled into the central consciousness. Thus, the dimension of secondary function describes the extent to which information within the peripheral



consciousness manifest in aftereffects within the central consciousness. The dimension of secondary function is hereby understood as a gradient between the two extremes primary function and secondary function. Individuals that experience short aftereffects classify as primary functioning individuals and are characterized by shortened retention durations and, thus, lower likelihood of spillover or recall. Individuals that experience long aftereffects classify as secondary functioning and are characterized by prolonged retention durations and, thus, higher likelihood of spillover or recall. The distinction between primary types and secondary types was inspired by the work of Otto Gross (1902). He referred to the psychological effect of impressions and emotions while they are in the central consciousness as the primary function, whereas the psychological effect of said impressions and emotions after they left the central consciousness and were only still present in the peripheral consciousness was referred to as the secondary function (Heymans, 1932, p. 20).

### **OCEAN Personality Model**

In order to relativize the work done by Gerard Heymans, the OCEAN personality model (McCrae & John, 1992) will be used as a comparison to assess the similarity between the temperamental dimension of secondary function and contemporary research on the subject of individual differences. The OCEAN personality model is a contemporary personality model created in 1980 and continuously refined in the years after. There is no single researcher associated with the OCEAN personality model as it follows a different approach from most theories and models in the field of psychology. Instead, it is an integrated model that many researchers have contributed to and thereby improved upon over the course of time. As a result, the OCEAN personality model is well formulated, developed and researched and, thus, accepted by psychologists as one of the most valid and reliable personality models in the field. The OCEAN personality model features five different dimensions, namely Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism.

The dimension of Openness to experience is an indicator of intellectual curiosity and the degree to which an individual seeks out novel stimuli. The dimension furthermore entails aspects of aesthetic sensitivity and liberal values. Individuals with low scores on the dimension of Openness are generally described as cautious and consistent, while individuals with high scores are described as curious.

The dimension of Conscientiousness is an indicator of organization and the degree to which an individual tends to plan ahead. Individuals with low scores on the dimension of Conscientiousness are generally described as organized and efficient, while individuals with high scores are described as careless.

The dimension of Extraversion is an indicator of sociability and the degree to which an individual seeks out social situations. Individuals with low scores on the dimension of Extraversion are generally described as solitary and reserved, while individuals with high scores are described as energetic and outgoing. However, contemporary approaches to Extraversion move away from the idea that the dimension primarily describes social facets and instead propose that the dimension of Extraversion measures sensitivity to stimulation, where individuals with a low score on the dimension have a lower optimal level of stimulation than individuals with a high score.

The dimension of Agreeableness is an indicator of social convergence and the degree to which an individual tends to empathize with subjective states of other individuals. Individuals with low scores on the dimension of Agreeableness are generally described as friendly and compassionate, as opposed to individuals with high scores on the dimension that are described as critical and rational.

Lastly, the dimension of Neuroticism is an indicator of emotional sensitivity and the degree to which an individual fluctuates in their emotional state. Individuals with low scores

on the dimension of Neuroticism are generally described as sensitive and nervous, while individuals with high scores are described as resilient and confident.

### **Analysis**

Knowledge of the OCEAN personality typology will become important at a later point in the present paper. However, to not get ahead of myself, I will move back from the contemporary personality typology to the typology from the past and begin to properly conceptualize and contextualize the dimension of secondary function.

### **Cognitive Aspects of the Secondary Function**

In order to understand the dimension of secondary function, we have to start at the beginning and consider the precise words Heymans chose to describe the dimension. Heymans defines secondary function as the degree to which contents of the peripheral consciousness affect contents of the central consciousness (Heymans, 1932, p. 19). Both of these terms are rather rare nowadays, as this distinction of the mind is quite abstract and vague. Thus, in order to understand what exactly it is secondary function entails, we have to first understand the distinction Heymans based the dimension on.

### ***Central Consciousness and Peripheral Consciousness***

According to Heymans the peripheral consciousness contains all that information which one knows or keeps in mind without momentarily thinking about it (Heymans, 1932, p. 16). Heymans considers the contents of the peripheral consciousness to be detached, faint and virtually subconscious (Heymans, 1932, p. 17). The contents of the peripheral consciousness can passively spill or be actively recalled into the central consciousness. This process occurs with varying levels of ease and accuracy, which depend on characteristics of the individual such as emotional, intellectual and associative aspects. Heymans states that the peripheral consciousness is what the colloquial terms of intuition, common sense and tactfulness rely on, as these concepts arise from the aftereffects of long forgotten experiences.

The central consciousness on the other hand contains all that information which is present to the individual as a distinct content and which the individual is momentarily thinking about. The contents of the central consciousness are hereby characterized by attention and focus. The central consciousness is much narrower as a system than the broad accumulation of information that is the peripheral consciousness. However, it is important to consider that the central consciousness itself can also vary in its range and intensity (Heymans, 1932, p. 18). These two aspects hereby occur in reversed states. The central consciousness can shift between a narrow and deep state and a broad and shallow state, depending on situational as well as individual differences. Certain situations such as a sudden noise or a deeply philosophical problem promote a narrow and deep state of the central consciousness, whereas situations like the execution of a mechanical and automated task promote a broad and shallow state. The individual differences arise from personal preferences and are according to Heymans connected to aspects of primary and secondary function. Individuals that are predominantly primary types prefer a broad and shallow state, while predominantly secondary types prefer a deep and narrow state.

### ***Long-term and Short-term Memory***

Heymans explanation for what peripheral consciousness and central consciousness entails strongly resembles another distinction of information retention systems in human cognition, namely the distinction of memory into long-term memory and short-term memory. Analogue to the peripheral consciousness, the long-term memory retains a broad range of information over long stretches of time. This information is not constantly available to the individual, but can move into the short-term memory through passive spillover or active recall, where they are then momentarily available to the individual (Cowan, 2006).

Furthermore, Heymans describes central consciousness in a similar manner to how short-term memory is understood in contemporary psychology. As opposed to long-term

memory, short-term memory is conceptualized as an operational system rather than a storage system. This aspect of short-term memory is specified through the term working memory. Some theories claim the working memory to exist as a separate system next to the short-term memory, while other theories claim them to be two different aspects of the same system (Cowan, 2006). Regardless of which perspective one might choose, the concept of central consciousness can be understood to contain both the short-term memory as well as the working memory, as the central consciousness entails aspects of brief memory storage as well as aspects of attention and focus.

Heymans (1932, p. 33), in fact, briefly mentions memory in conjunction with consciousness. He explains how impressions fade as soon as the stimulus that triggered the impression is not actively perceived anymore. The impressions do, however, leave behind a memory trace that can be recalled at a later time. This memory trace is best understood as the retention of the impression in the peripheral consciousness (Heymans, 1932, p. 33). This indicates, that what Heymans referred to as peripheral consciousness is very similar to what we refer to as long-term memory in contemporary psychology.

Furthermore, Heymans points out a connection between the two systems of consciousness, and by association the two systems of memory, and secondary function. In individuals that are predominantly primary types, the system that relates to central consciousness and short-term memory is preferred over the peripheral counterpart. On the other hand, individuals that are predominantly secondary types are more adept at utilizing the peripheral consciousness and the long-term memory (Heymans, 1932, p. 37). This implies an interesting contrast between the two types, in that secondary types are better at memory recall, since it requires a reconsolidation of information from the long-term memory, while primary types are better at memory retention, since retention is promoted by strong associative connections that require momentary attention in order to be formed. However, in reality the

differences are naturally not black and white. Since most individuals score somewhere around the mean of the dimension, most individuals simply prefer one memory process over the other, rather than being completely limited to one of them.

### ***Perceptual Aspects***

However, when considering the dimension of secondary function isolated from the typology it is presented in, it can potentially be understood not only as a cognitive aspect of memory but also of perception. Heymans (1932, p. 21) states that secondary functioning individuals tend to lack the mental flexibility required to direct attention to new stimuli, since the new stimuli figuratively drown in the sheer mass of information that is constantly processed in secondary functioning individuals. Thus, Heymans explains, secondary functioning individuals tend to lack precision in accurately perceiving present stimuli and adaptability in dealing with these situations. The interpretations made by Heymans indicate an association between the aftereffect dimension and perception.

Heymans and Wiersma (1906) conducted experiments on the perceptual aspect of the dimension of secondary function, as mentioned above. He investigated the difference in the time it takes individuals to perceive the color of a rotating disk with red and green sections as one color rather than two. In his experiment he demonstrated how in secondary functioning individuals after having been “exposed to a rotating disk with red and green sectors, a relatively low rotation speed was enough for them to see an evenly gray disk” (Heymans & Wiersma, 1906). In another experiment, Heymans measured the time it took the participants to readjust to decreased light levels and detect a weak light stimulus after having been exposed to a strong light stimulus. Heymans found secondary functioning individuals to need much longer to rediscover the weak light stimulus.

The experiments conducted by Heymans and Wiersma (1906) point out the importance of the perceptual aftereffect in the differentiation between primary functioning individuals and

secondary functioning individuals. Secondary functioning individuals experience longer aftereffects than their primary functioning counterparts. This difference in the experience of aftereffects manifests as a difference in perception. In the case of the color wheel, perceptual information of the different colors of the wheel lingers longer in the peripheral consciousness of secondary functioning individuals and, thus, result in perceptual overlap much quicker. Therefore, the rotation speed of the color wheel required for the individual to perceive both colors segments as one homogenous whole is lower in secondary functioning individuals than in primary functioning individuals. In the case of the adjustment to decreased light levels, a similar process is in place. In secondary functioning individuals, the perceptual information of the strong light stimulus lingers longer and thereby inhibits the individual to readjust to the decreased light levels. Primary functioning individuals do not experience such an inhibition and are able to adjust to the decreased light levels much quicker. The research conducted on the cognitive aspect of the dimension of secondary function strongly indicates that the individual differences in the dimension of secondary function have implications that reach even into the domain of perception, where the aspect of aftereffect is the bridge that connects the two concepts.

Research conducted by Over (1970) and Eysenck (1955) on figural aftereffect furthermore emphasizes the perceptual aspect of the temperamental dimension. In his research, Eysenck defines figural aftereffect on a neurological basis, following the terminology proposed by Köhler and Dinnerstein (1947). When sensory cells communicate information to the brain via neurons, they cause a polarization in the involved cells. This polarization persists and inhibits additional polarization for a brief period of time, similar to the refractory period of action potentials. The neurological explanation of the occurrence of aftereffects underlines the reliance of aftereffects on sensory processes, which further emphasizes the perceptual aspect of the dimension of secondary function.

## **Secondary Function in the Context of Individual Differences**

Now that we understand the cognitive aspect of the dimension of secondary function and its implications for memory and perception, I would like to move on to contextualize the dimension of secondary function within the model it is presented in and, furthermore, establish associations between the dimension of secondary function and particular personality dimensions from the OCEAN personality model.

### ***Temperamental Dimensions***

First, in order to contextualize the dimension of secondary function, we need to consider its relative position to the other two dimensions in Heymans' cube, activity and emotionality. Although, it is often quite difficult to achieve in reality, the different dimensions of a model ideally should not correlate with each other in any meaningful capacity. High internal correlation of separate dimensions within a model indicates multicollinearity and gives rise to the question whether the separate dimensions are different enough in what they measure to merit distinction. Thus, I will examine the internal correlations of the temperamental dimensions in order to better understand the dimension of secondary function as a component in the context of a model. Furthermore, it is important to consider the correlation between the dimension of aftereffect as adapted by Van der Werff (1985) and the the dimension of secondary function as conceptualized by Heymans in order to determine the importance of the aspect of aftereffect in the definition of the dimension of secondary function.

Kouwer and Van der Werff (1968) performed a factor analysis on a sample of subjects from Heymans' research. They found the three factors emotionality, activity and aftereffect, which, as mentioned above, is an adaptation of the dimension for secondary function as proposed by Heymans. However, they found there to be items in the questionnaire that relate to different variants of what one might understand as activity, resulting in four categories



altogether. The two different categories for activity differed in the way that while one was marked by “an accent on energy and vigor, the other [referred] to assiduity and regularity in one’s duties” (Kouwer & Van der Werff, 1968). They furthermore investigated how the scores of the subjects on the four dimensions correlated with notes made by Heymans for each subject on whether they are viewed as primary functioning or secondary functioning. The analysis showed that the determined score for secondary function noted by Heymans correlated most with the dimension of aftereffect ( $r = 0.59$ ). However, the dimension of aftereffect also showed a strong positive correlation with one of the two factors for activity ( $r = 0.55$ ) and a moderate negative correlation with the factor for emotionality ( $r = -0.31$ ). The correlation coefficients indicate an imperfect state of correlations. While the high correlation between the dimension of aftereffect and the dimension of secondary function indicates strong overlap between the two concepts, the correlation between the dimension of aftereffect and the dimension of activity is barely lower. This indicates strong conceptual overlap between the dimension of aftereffect and the dimension of secondary function as well as the dimension of activity that refers to assiduity and dutifulness. However, this indicates that the two terms of aftereffect and secondary function are not interchangeable. Instead, the correlation coefficients indicate that the aspect of aftereffect is simply a crucial component of the dimension of secondary function.

In regard emotionality, the dimension of secondary function primarily influences temporal aspects of the dimension. Primary types are not inhibited by accumulated impressions and can therefore immediately react emotionally to a stimulus, while secondary types require some time to overcome the accumulated impressions that linger in their peripheral consciousness (Heymans, 1932, p. 78). Similarly, aftereffects also contribute to the duration of emotional states. In primary types, emotions arise uninhibited, reach their peak intensity quickly and fade out of the central consciousness just as swiftly as they emerged. In

secondary functioning types, this pattern is reversed. The emotions arise inhibited, only gradually reach their peak intensity and rather than to fade out, they leave behind traces in the peripheral consciousness (Heymans, 1932, p. 78). However, aftereffects do not affect the emotional intensity itself. This results in personality types that can have quite complex contrasts united within themselves, such as primary functioning individuals with high emotionality that display very intense emotional states which fade out quickly without a trace or secondary functioning individuals with low emotionality that display comparably weak emotional states that nonetheless leave a persistent trace in the central consciousness (Heymans, 1932, p. 78).

Heymans (1932, p. 20) furthermore emphasizes the association between secondary function and emotionality. He points out that people high in emotionality can be falsely interpreted to experience long aftereffects, since they perceive a stronger emotional involvement with memories leading to said memories lingering for longer. Heymans states, that whether someone classifies as primary functioning or secondary functioning depends on aspects beyond emotion. Thus, someone only classifies as secondary functioning if they indicate impressions to linger longer than average in their conscious, regardless of the emotionality of the impression.

Considering the relation between secondary function and activity, Heymans (1932, p. 22) states that primary functioning individuals generally tend to be mentally more flexible, while secondary functioning individuals tend to be calmer. Heymans explains how primary functioning individuals tend to be more persistent in their work process, while secondary functioning individuals are characterized by procrastination and sudden work surges. Heymans attributes this difference to the fact that secondary functioning individuals have a natural tendency to get distracted by the steady array of information from their peripheral consciousness that gets processed by the central consciousness. On the other hand, primary

functioning individuals tend to have a higher readiness to engage with their environment due to the lack of preoccupation. This statement also resonates with the previously mentioned research findings of Kouwer and Van der Werff (1968). In their factor analysis, they found the dimension of aftereffect to correlate positively with the factor for activity that relates to dutifulness and persistence.

### ***Conscientiousness, Extraversion and Openness to Experience***

The majority of research on the associations between the dimension of secondary function and other dimensions of personality has been conducted on the subject of extraversion (Eysenck, 1955; Rechtschaffen & Bookbinder, 1960), while a minor quantity of research also investigated the connections between the dimension of secondary function and the dimensions for conscientiousness and openness respectively. The personality dimension of neuroticism is virtually equivalent to the temperamental dimension of emotionality, which I already investigated above. The dimension of agreeableness is conceptually unrelated to the dimension of secondary function to the extent that there is little merit in specific investigation of the connection between the two dimensions.

Heymans describes primary functioning individuals as impulsive and resolute, but inflexible in the face of difficulties and secondary functioning individuals as slow to approach a situation, but persistent in overcoming difficulties that may arise. Furthermore, the association between the dimension of aftereffect and the aspect of the dimension of activity that relates to dutifulness and persistence (Kouwer and Van der Werff, 1968) indicates an association between the dimension of secondary function and the dimension of conscientiousness.

Heymans describes secondary functioning individuals to be often occupied and distracted by the contents of the peripheral consciousness, as opposed to primary functioning individuals that tend to seek stimulation from their external world (Heymans, 1932, p. 22).

This description indicates a conceptual association between the dimension of secondary function and the dimension of openness to experience, in that individuals with short aftereffects display higher openness to experience than individuals with long aftereffects. The tendency to seek out stimulation can additionally be interpreted as a manifestation of higher extraversion levels.

In fact, Heymans (1932, p. 21) explains how the dimension of secondary function is associated with a solitary tendency. Individuals that possess a strong secondary function experience a constant influx of information from the peripheral consciousness. This influx can distract the individual from adequately perceiving their immediate environment. The result is a lack of momentary attention that would be required to engage with the environment in a meaningful way (Heymans, 1932, p. 21). The observations and interpretations of Heymans imply a negative association between the dimensions of secondary function and extraversion.

However, experiments conducted by Eysenck (1955) on figural aftereffect have demonstrated the exact opposite. Eysenck found extraversion to correlate positively with the aspect of aftereffect. His results indicated that extraverted personality types develop figural aftereffects more quickly, at a greater intensity and persistence. The discrepancy between the observations made by Heymans and Eysenck could be attributed to a difference in the precise characteristic that was measured in each of the two experiments.

This discrepancy is further underlined by research conducted by Rechtschaffen and Bookbinder (1960). In their research on kinesthetic aftereffect, they found there to be no significant relationship between aftereffect and extraversion at all. This observation might also merely be due to differences in the specifics of the measured phenomenon. However, from a conceptual standpoint, the investigated variations of aftereffect all belong to the same overarching concept of perceptual aftereffect and, thus, should not result in three entirely different observations.

## **Discussion**

We have now established the relative position of the temperamental dimension of secondary function within the personality model proposed by Heymans and connected the dimension of secondary function to contemporary personality dimensions to better grasp the context of the dimension and its associations with other aspects of personality. Furthermore, we have determined the importance of the aspect of aftereffect in the conceptualization of the dimension of secondary function and linked the dimension to aspects of memory and perception. Thus, we are now able to integrate the different facets of the dimension of secondary function and answer the initial research question: How can the dimension of secondary function be understood in contextualization with contemporary research in personality psychology and cognitive psychology?

## **Conclusion**

The dimension of secondary function is a very complex psychological characteristic. Although, the dimension is not frequently mentioned in contemporary research, there appears to be a plethora of connections, as hypothesized at the start of the research project. The dimension of secondary function is connected to contemporary personality models like the OCEAN personality model with particular weight on the dimension of extraversion as well as the dimensions of conscientiousness and openness to experience to a lesser extent. Even within the personality model proposed by Heymans, the dimension of secondary function appears to have quite interesting interactions with the dimensions of activity and emotionality.

However, the most important aspect of the dimension of secondary function is its connections and resulting implications with concepts from the field of cognitive psychology. The dimension of secondary function is associated with cognitive measures of memory, attention and perception, mediated by the aspect of aftereffect. The link between personality psychology and cognitive psychology is hereby quite relevant. Generally, the two fields are

rather different in how they evaluate traits of individuals. While in personality psychology it is often emphasized how a trait is conceptualized like a gradient between two extremes on a horizontal scale, neither of which being superior to the other, in cognitive psychology traits are usually expressed on a vertical scale that has zero as its baseline and only moves into one direction from there. The connections I have found to be present between the dimension of secondary function and cognitive measures imply that there is merit to understanding vertical cognitive measures in a similar fashion as horizontal personality dimensions, where there is no such thing as a strictly better score. In reality, this could for example mean, that while a certain individual scores low on one particular scale, the same individual might score high on a different cognitive measure due to the same factors that led them to score low on the first scale. Thus, rather than splitting the manifestations of a certain trait into multiple scales, there might be merit to integrate these scales in order to get a better understanding of the trait at hand.

The present paper highlights the relevance of a personality dimension that was conceptualized about a century ago and forgotten over the course of time. The paper emphasizes how this personality dimension underlies various aspects of cognition and personality and implies potential connections between the two domains. I consider the present paper a link between subjects that can serve as a starting point for further research about the dimension of secondary function that aims at the resurrection of the forgotten dimension in contemporary personality research and cognitive science.

### **Limitations and Future Research**

Naturally, the interpretations and claims made in the present paper are limited by decisions and discoveries made in the process of the analysis. The differences in the observations made by Heymans (1932, p. 21), Eysenck (1955) and Rechtschaffen and Bookbinder (1960) on the association between aftereffect and extraversion indicate that the

two concepts of secondary function as defined by Heymans (1932, p. 21) and perceptual aftereffect as defined by Köhler (1947) might not be as directly related as interpreted in the present research project. Thus, further research is required to determine the connection between the dimension of secondary function as defined by Heymans and the perceptual aftereffect that is subject of cognitive and neurological research. In an experiment, the two measurement approaches of the perceptual response to a color wheel on one hand, as proposed by Heymans and Wiersma (1906), and the perceptual response to the removal of persistent stimulation of sensory cells on the other, as proposed by Eysenck (1955), can be replicated and correlated. The results of such an experiment could present evidence for or against the equivalence of the two investigated concepts and clarify the dissonance between the different observations on the connection between aftereffect and extraversion.

Furthermore, due to the qualitative approach of the research project, a minor limitation lies in the interpretative nature of the analysis and the conclusion and the lack of statistical evidence to support the claims made in the present paper. It is therefore difficult to draw strong inferences without a statistical analysis to verify the interpretations made in the present paper. Thus, quantitative research on the connections between the dimension of secondary function and other dimensions of personality or measures of cognition could complement the present paper and enhance the insight about the precise inner workings and associations of the dimension of secondary function.

### **Personal Growth**

I, as a student and researcher, grew with the creation of the present research paper. This is the first paper I have written where I chose a qualitative approach and prior to this research project I have been doubtful about the merit of qualitative research, since the majority of research I have conducted throughout the study of psychology has been quantitative in nature and I found it hard to believe qualitative research to have the same

firmness in their conclusions due to the lack of hard evidence. There are clear advantages and disadvantages I have encountered throughout the process that made me understand the validity of both approaches in contemporary research. There are pros and cons to either approach, one might say, and the decision of which approach is adequate is a very delicate process that has to be considered with respect to the topic and the goal.



## References

- Cowan, N. (2006). Chapter 20 What are the differences between long-term, short-term, and working memory. *Progress in brain research*, 323-338.  
[https://doi.org/10.1016/S0079-6123\(07\)00020-9](https://doi.org/10.1016/S0079-6123(07)00020-9)
- Eysenck, H. J. (1955). Cortical inhibition, figural aftereffect, and theory of personality. *The Journal of Abnormal and Social Psychology*, 51(1), 94–106.  
<https://doi.org/10.1037/h0043564>
- Freeman, T. C. (1999). The Motion Aftereffect: A Modern Perspective. *Trends in Cognitive Sciences*, 3(2), 83. [https://doi.org/10.1016/s1364-6613\(98\)01279-0](https://doi.org/10.1016/s1364-6613(98)01279-0)
- Gross, O. (1902). Die cerebrale Sekundärfunktion. Vogel.
- Hofstee, W. K. B. (1994). The Abridged Big Five Circumplex (AB5C) model of trait structure: Comparisons with Heymans' cube, Kiesler's interpersonal circle, and Peabody and Goldberg's double cone model. *European Review of Applied Psychology / Revue Européenne de Psychologie Appliquée*, 44(1), 27–33.
- Heymans, G. (1932). Einführung in die spezielle Psychologie. JA Barth.
- Heymans, G., & Wiersma, E. D. (1906). *Beiträge zur speziellen Psychologie auf Grund einer Massenuntersuchung*. Verlag von Johann Ambrosius Barth.
- Kouwer, B. J., & Van der Werff, J. J. (1968). Primaire-secundaire functie in Heymans' materiaal. *Persoon en Existentie*, 151-165.
- Köhler, W., & Dinnerstein, D. (1947). Figural after-effects in kinesthesia. *Miscellanea psychologica Albert Michotte*, 199, 196-220.
- McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of personality*, 60(2), 175-215.  
<https://doi.org/10.1111/j.1467-6494.1992.tb00970.x>

Over, R. (1970). Individual differences in figural aftereffects. *Psychological Bulletin*, 74(6), 405–410. <https://doi.org/10.1037/h0032943>

Rechtschaffen, A., & Bookbinder, L. (1960). Introversion-extraversion and kinesthetic aftereffects. *The Journal of Abnormal and Social Psychology*, 61(3), 495–496. <https://doi.org/10.1037/h0048517>

Van der Werff, J. J. (1985). Heymans' temperamental dimensions in personality research. *Journal of Research in Personality*, 19(3), 279-287. [https://doi.org/10.1016/0092-6566\(85\)90019-4](https://doi.org/10.1016/0092-6566(85)90019-4)